Table of Contents

List of Figures

List of Tables

Introduction

Overview

The Bismarck-Mandan metropolitan area has experienced continued population and employment growth and community expansion in all directions. Growth in the region has generally occurred directly adjacent to the primary roadway corridors including:

- US 83 on the north side of Bismarck.
- ND 1804 on the south side of Bismarck.
- Bismarck Expressway in the south and eastern areas of Bismarck.
- West Century Avenue in the northwestern area of Bismarck.

In many of the corridors, the level of development has resulted in traffic volumes that approach or exceed the current roadway capacity and in the case of US 83 north of I-94, retail expansion has recently resulted in the need to expand the four-lane corridor to six lanes with turn lanes. As the corridor developed and traffic volumes increased, additional traffic signals were added to the corridor. While the signals improve traffic operations on the cross routes, the efficiency of the US 83 mainline to move volume through the corridor has dropped. Over a short period of time, seven signalized intersections were established in the 1.2 mile stretch of US 83 from East Capitol Avenue to Calgary Avenue. At this density, the efficiency of traffic operations in the corridor has been substantially reduced, because the potential to establish reasonable traffic progression in the corridor has been compromised.

The lower level of traffic efficiency provided in the corridor would not be a substantial issue if the corridor did not share the dual role of being the primary corridor for carrying traffic into and out of the metro area and being the corridor that provides access to adjacent property development. The relatively balanced dual role that the US 83 corridor serves creates conflict between through vehicle volume and turning vehicle volume. Both of the movements must be accommodated in the signal cycle at each intersection and one movement cannot be overly burdened by substantially favoring the other. Thus, through vehicle movements and left turn movements compete for a limited amount of cycle green time. At many of the intersections along the US 83 corridor from south of I-94 through Calgary Avenue, either the through movements, the left turning movements or both need more effective green time to accommodate current volume. As development continues adjacent to the corridor, traffic operations will deteriorate unless improvements that add capacity to the area are implemented.

The members of the Bismarck-Mandan Metropolitan Planning Organization (MPO) seek to actively address economic development and traffic operations conflicts within the portion of the US 83 corridor from Calgary Avenue through 110th Avenue to:

- Allow the areas adjacent to the corridor to develop relatively unimpeded.
- Define a priority between the competing elements of providing a high level of mobility (accommodating through traffic) and reasonable land access.
- Maintain an acceptable level of traffic operations for the principal arterial corridor.

Coordination of Development and Infrastructure Expansion

Traditionally in the Bismarck-Mandan region, developers have been responsible for providing the urban infrastructure associated with their development, including water, sewer, roadways, etc. Through this model, development of the suburban and rural areas of the region has been segmented as individual developers provide the system needs for their specific parcels; many times without taking into account adjacent areas. The practice provides no incentive for preconstruction period coordination of the proposal for one parcel with adjacent parcels or in the case of leapfrog development with those developments between the urban services boundary and the proposed development parcel. There is likely an argument that the practice encourages leapfrog development, because once a developer is outside the current urban services boundary, there is no reason to even attempt to stay within a relative proximity of where urban services are provided. With land costs inside or directly outside the urban services boundary generally being higher than property two or more miles beyond the boundary, current infrastructure financing practices likely actually encourage leapfrog development as developers look for lower cost land. Whether you are 1,000 feet or four miles outside the urban services boundary the level of services being financed by the developer are similar, so why not select the less expensive land further out from the city?

The practice of segmented, piecemeal infrastructure expansion has created numerous issues associated with the transportation system in the area, including:

- Few, if any, continuous corridors outside the section line road system on a one-mile grid. In many parts of the county this system is also incomplete.
- Undersized collector streets with undesirable levels of direct land access when viewed from the 20 to 40 years into the future perspective.
- Uncoordinated intersections with collectors, minor arterial and principal arterial corridors resulting in offset intersections from one side of the road to the other.

This study is a major step in the direction of implementing more coordinated development practices in the region. The study has brought together the transportation system managers/providers of the city, the county, the North Dakota Department of Transportation (NDDOT) and developers as well as those responsible for land development, land development administration and infrastructure provision and management. Through a coordinated effort at various jurisdictional levels (city, county and state) a consistent desire for coordinated planning of urban infrastructure has been devised, including:

- The city, county and developers need to work together in establishing a more equitable model for providing urban infrastructure. The current practice of "first-in" pays a disproportionate percentage of the startup costs needs to change. While this study is not the appropriate forum to flesh out an entire program, through the products of the study a regional master plan of the transportation infrastructure of collector, minor arterial and principal arterial corridors will be established. Thus, a blueprint of the system will be available for use in site plan development.
- The city, county, and the NDDOT, with input from developers, need to create an improved financing plan for transportation system improvements for the minor arterial and collector systems. Presently, there is not a sustainable program that will allow for construction of extended segments of the collector and arterial corridor. Thus, the overall system developed through this plan could very well be constructed in 500 foot or 1,000 foot segments as development is completed. A program that allows for construction of one or more miles of the system prior to development of the adjacent land or at least concurrent with development needs to be established. A program that leads to construction of more continuous collector and arterial segments will reduce the investment required to accommodate development traffic on those more continuous routes in the study; of which US 83 is the most prominent

and would suffer the greatest burden if the north-south and east-west arterial and collector system is not provided.

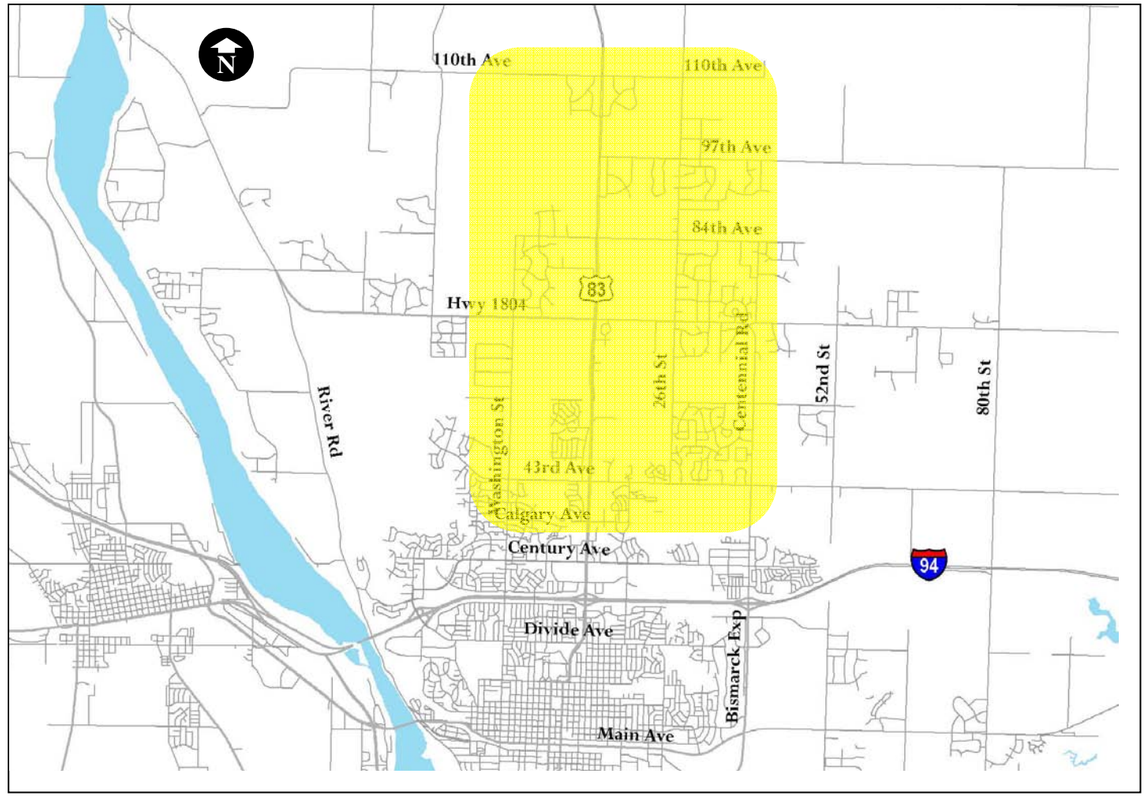
- The city, county and developers need to prepare an organized plan for development of the study area. It is commonly accepted planning practice to require a connected and continuous infrastructure system be in place (transportation and utilities) prior to allowing, or concurrent with development at a density that would need those services. Thus, if a developer wanted to construct a subdivision in a rural area at a density greater than one dwelling per two acres, a plan for providing the water, sewer and transportation systems required to serve that development and connect to the overall transportation and infrastructure plan must be prepared and the system must be in place at the time that development is ready for occupancy.

PROJECT STUDY AREA

While the study has been titled the US 83 Corridor Study, the project limits extend well beyond the footprint of the US 83 right-of-way. The study area has been established based on the primary travelshed, or traffic drawing area, of the US 83 corridor, which is estimated to extend from Washington Street to Centennial Road. Through working with staff from the MPO member jurisdictions and agencies, a study area limits as listed below and displayed in Figure 1 was developed:

- Southern limits: Calgary Avenue.
- Eastern limits: Centennial Road.
- Northern limits: 110th Avenue.
- Western limits: Washington Street.

FIGURE 1: US 83 CORRIDOR STUDY AREA

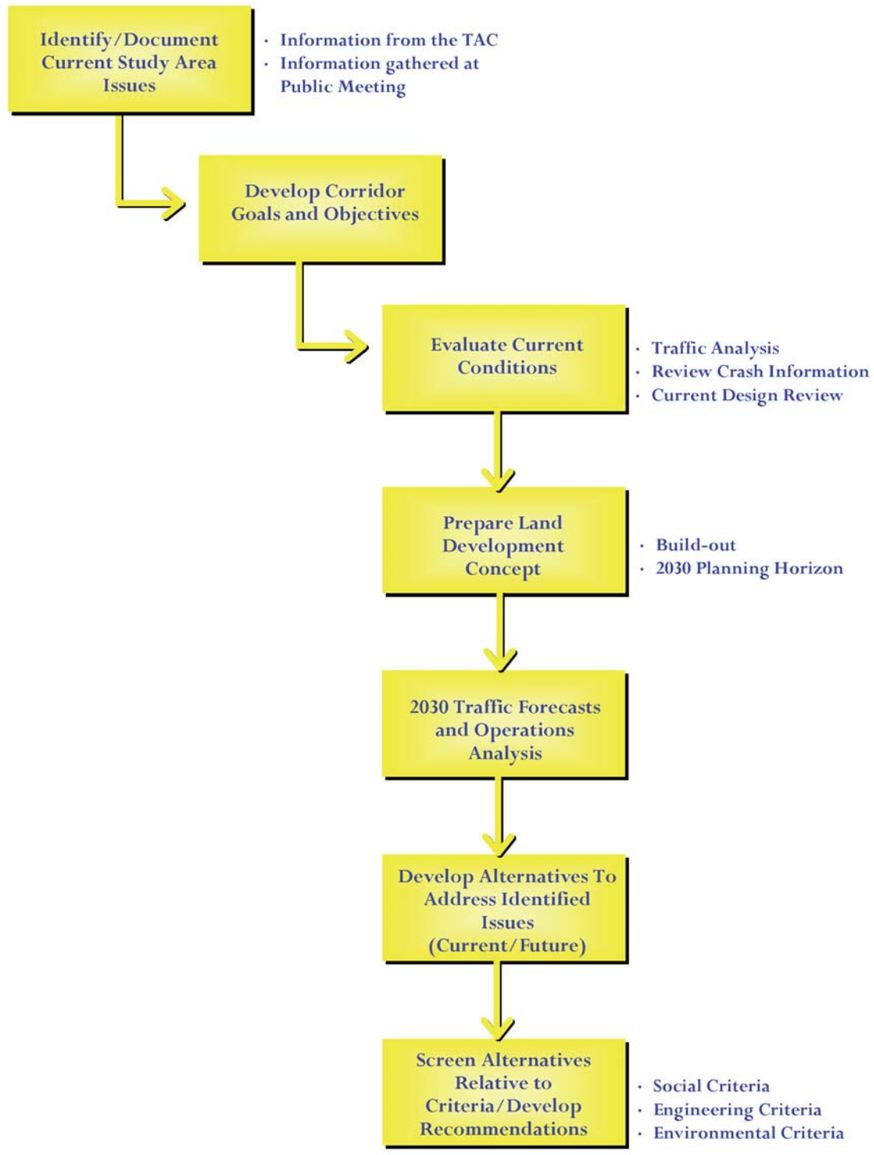


Study Process

The study process employed in conducting the US 83 Corridor Study is outlined in the following bulletpoints and is illustrated in Figure 2:

- Identify Current and Emerging Corridor Issues: A set of issues to be addressed through the study was identified through workshops with the MPO Technical Advisory Committee (TAC) and the public.
- Develop Goals and Objectives: The consultant team worked with representatives from the MPO membership to develop a set of goals for how the US 83 corridor should serve the regional transportation system.
- Evaluate Current Conditions: Consultant staff reviewed and documented the traffic level, peak period traffic operations, and corridor crash assessment
- Establish a Future (2030) Land Development Concept: The consultant team worked closely with City/County Planning Department staff, land owners in the study area and land development stakeholders in preparing a detailed land use concept for the entire study area. Implementation of the complete build-out of the concept will likely take until well beyond the 2030 planning horizon. Thus, a 2030 period build concept for land use was developed and incorporated in the regional travel demand model.
- Estimate 2030 Traffic and Traffic Operations: The consultant staff prepared daily and peak period traffic forecasts for the US 83 corridor and daily forecasts for the collector and arterial system in the remainder of the study area. In this step of the process, a microscale simulation of the US 83 traffic operations was prepared.
- Identify and Evaluate Study Area Improvements to Address Issues and Goals: The consultant team, with MPO representatives, prepared an arterial and collector support system for the US 83 Corridor Study Area. The support system included:
  - Improvements to the US 83 corridor to increase the capacity and improve safety.
  - Enhanced access management within the US 83 corridor and in adjacent support corridors.
  - A north-south and an east-west arterial and collector system that provides alternatives to the US 83 corridor for short and intermediate length trips.
- Develop Recommendations: Recommendations that address the current and future corridor needs and the corridor goals were developed by working with MPO member representatives, then presented to the public for comment and ultimately adopted by the MPO Policy Board.

Figure 2: US 83 Corridor Study Process



Existing Conditions

The purpose of the Existing Conditions section is to provide a summary of the various elements of the transportation system within the study area as the existed in 2005. Gaining an understanding of the current system is important for the overall corridor improvement planning process in that the existing system forms the underlying foundation of the future system needs. Corridor issues that were investigated as part of this study included the following:

- Access drives along the corridor.
- Roadway network and traffic control.
- Traffic volumes for the corridor.
- Traffic operations analyses methodology.
- Findings of the traffic operations analyses.
- Crash history for the corridor.
- Physical conditions and land use.

The data used for this analysis of existing conditions were primarily provided the by City of Bismarck, the North Dakota Department of Transportation (NDDOT), and the Bismarck-Mandan MPO. Field reviews to supplement the database information were conducted by consultant team personnel.

Roadway and Block Layout

In the current conditions, the roadway system is comprised of a one-mile arterial grid and local routes that are flexible in their layout. Most of the minor roads and blocks are laid in a curvilinear design, which generally is a representation of a suburban roadway layout model.

While the majority of the parcels were originally laid out to conform to a one-mile grid system, collector and local streets within the one-mile grid are curvilinear with relatively long blocks (over 500 feet). Few blocks with the study area are shorter than 500 feet. The long blocks reduce the ease of pedestrian connections between blocks and as a result the roadway environment mainly focused on automobile traffic.

The Dakota, Missouri Valley and Western Railroad runs north and south through the study area.

US 83

Looking south on N Washington Street

Access Drives

The US 83 corridor currently has a high degree of access control/management throughout the study area. US 83 is constructed as a divided highway with left-turn median breaks typically spaced at approximately one-quarter mile. Private drives within the study area with direct access to US 83 are limited to six developed property/field access drives. The access points are described below:

- South of 57th Avenue: Historic access to Tree Tops development parcel (Panel 1 in Appendix). This parcel is currently being developed and it is proposed to relocate the driveway to Brookside Lane.
- Approximately half way between 57th Avenue and 71st Avenue: A farm field access drive is located on the west side of US 83 just north of what would be 64th Avenue (Panel 4).
- Approximately one-quarter mile south of 57th Street: A farm field access is located on the west side of US 83 at Northstar Drive (Panel 4).
- Approximately a half mile north of ND 1804 (71st Avenue): A Private driveway is located on the west side of the US 83 corridor (Panel 7).
- Approximately one-quarter mile south of 84th Avenue: Farm field access drive is located west of US 83 Panel 7).
- Approximately 1,700 feet north of 84th Avenue: Private driveway is located west of US 83 just south of Plainview Drive Panel 10).

Roadway Network

The US 83 corridor serves as a key north/south transportation corridor within Bismarck and through Burleigh County. The corridor has experienced significant traffic volume growth over the last several years as development has expanded north of I-94. Traffic levels in the study area will likely continue to increase as the adjacent area is expected to be a major development area for the Bismarck community. Roadways within or immediately adjacent to the study area are classified as follows:

- US 83: Principal Arterial.
- Washington Street: Minor Arterial.
- Centennial Road: Minor Arterial.
- 19th Street: Collector.
- 26th Street: Minor Arterial.
- Interstate Avenue: Collector.
- Century Avenue, west of US 83: Principal Arterial.
- Century Avenue, east of US 83: Minor Arterial.
- Weiss Avenue west of US 83: Collector.
- Calgary Avenue: Collector.
- 43rd Avenue: Minor Arterial.
- 57th Avenue: Collector.

- 71st Avenue/Highway 1804: Collector.
- All other streets within the study area are classified as local streets.

Source: Bismarck Mandan MPO Functional Classification Network map (2004)

Posted speed limits along the US 83 corridor range from 40 mph from I-94 through Skyline Avenue to 55 mph north of Skyline Avenue to ND 1804 (71st Avenue). North of the ND 1804 (71st Avenue) intersection the speed limit increases to 70 mph. The speed limit on most of the other major roadway segments within the study area is 35 mph with a few signed for 25 mph. The speed limits on 43rd Avenue and 71st Avenue are higher (i.e., 45 to 55 mph) due to the rural nature surrounding each roadway.

A summary of the existing lane configurations at the major study area intersections within the study area is provided in Table 1.

TABLE 1: INTERSECTION LANE CONFIGURATION

Intersection	Intersection Approach (1)			
	Eastbound	Westbound	Northbound	Southbound
US 83/I-94 Eastbound	L, LTR, R	- -	T, T, T, R	L, T, T, T
US 83/I-94 Westbound	- -	L, LTR, R	L, T, T, T	T, T, T, R
US 83/Interstate Avenue	L, T, R	L, T, TR	L, L, T,T,T, R	L, L, T,T,T, R
US 83/Gateway Mall	R	R	L, T, T, TR	L, T, T, TR
US 83/Century Avenue	L, T, T, R	L, T, T, R	L, L, T,T,T, R	L, L, T,T,T,R
US 83/Harvest Lane	L, T, R	L, T, R	L, T, T, T, R	L, T, T, T, R
US 83/Calgary Avenue	L, TR	L, TR	L, T, T, R	L, T, T, R
US 83/43rd Avenue (2)	L, TR	L, TR	L, T, T, R	L, T, T, R
US 83/71st Avenue	L, T, R	L, T, R	L, T, T, R	L, T, T, R

Notes:
(1) L= Left-turn lane; T = Through lane; R = Right-turn lane; LT, LR, TR, LTR = Shared lanes
(2) For the northbound/southbound approaches at these intersections the shoulder can be used as a right-turn lane.

All other intersection side-street approaches within the study area consist of a single-lane. Based on the intersection operations analysis and field observation, most of the turn-lanes appear to have adequate storage capacity to meet demand. A number of turn lanes and extended turn lanes were completed with the last reconstruction for US 83. That reconstruction project also resulted in additional through capacity on US 83.

TRAFFIC CONTROL

Signalized intersections within or directly adjacent to the study area include:

- US 83/I-94 EB.
- US 83/I-94 WB.
- US 83/Interstate Avenue.
- US 83/Century Avenue.
- US 83/Harvest Lane/Weiss Avenue.
- US 83/Calgary Avenue.
- US 83/43rd Avenue.
- US 83/ND 1804 (71st Avenue).

All other intersections and access points along US 83 utilize two-way stop sign control. During the morning and afternoon peak periods a 90 second cycle length is utilized, with the exception of 71st Avenue, where the traffic signal operates in free mode (fully actuated). Along US 83, signal timing splits ranged from 55 percent/45 percent up to 70 percent/30 percent in favor of US 83 traffic. Most of the signalized intersections listed above utilize some form of left-turn phasing. All of the US 83 intersections utilize protected only left-turn phasing for US 83 left-turning traffic. Most of the signalized intersections in the corridor study area provide a left turn arrow phase for the cross routes. The signal system along US 83 includes the I-94 ramp intersections and extends up to 43rd Avenue. The 71st Avenue traffic signal is not coordinated with those intersections to the south.

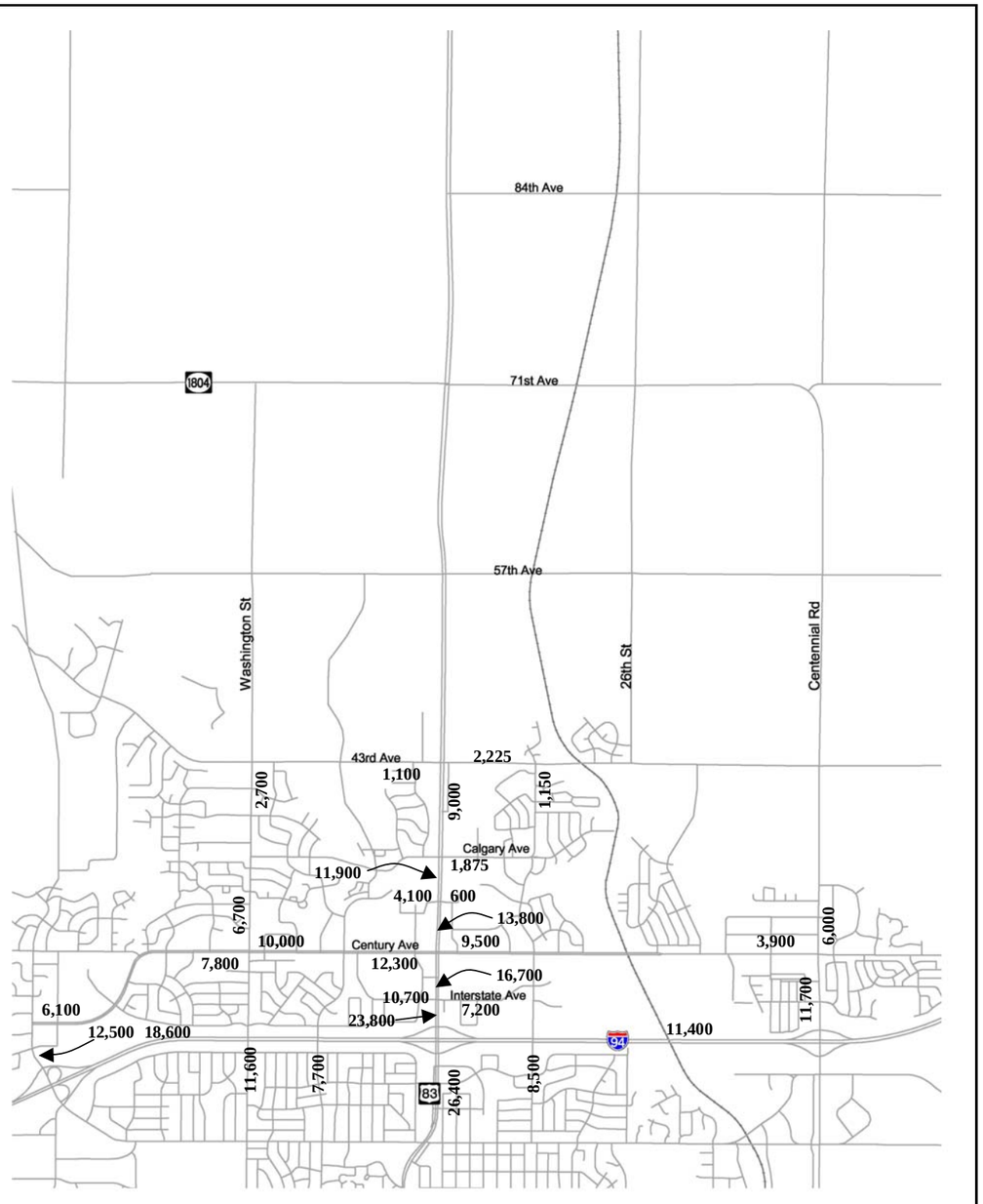
TRAFFIC VOLUMES

Intersection hourly turning movement volumes used for this study were provided by the City of Bismarck. Average annual daily traffic (AADT) volumes were taken from the *2001 Bismarck/Burleigh County Traffic Volume Map* that was produced by the NDDOT. The average annual daily traffic (AADT) volumes for the study area are provided in Figure 3.

Intersection turn movement counts for study area intersections were conducted by the City of Bismarck and the NDDOT between 1997 and 2004. Most of these turn movement counts were completed in either 1997 or 1998. This time lapse between some of the earlier counts and later ones results in some differences in traffic volumes between adjacent intersections. The differences were adjusted during a "smoothing" process in order to develop more consistent turn movement volumes between up and downstream intersections.

On January 29, 2005, additional turn movement counts at the US 83 intersections with 43rd Avenue and ND 1804 (71st Avenue) were conducted by the consultant team. Counts were taken to obtain the current traffic volumes and to gain a better understanding of the amount of traffic growth that has occurred at these intersections over the last several years. Intersection turn movement volumes for the morning and afternoon peak hours are provided in Figures 4 and 5.

As part of the US 83 corridor data collection, a 48-hour tube count on 71st Avenue east of US 83 was completed. This traffic count indicates that approximately twenty percent of the vehicles on 71st Avenue could be classified as trucks. This helped confirm that trucks are using 71st Avenue and Centennial Road as a truck route to access I-94 and to avoid US 83 traffic near I-94.



Source: 2001 Bismarck/Burleigh County Traffic Volume Map, NDDOT

FIGURE 3: EXISTING DAILY TRAFFIC VOLUMES

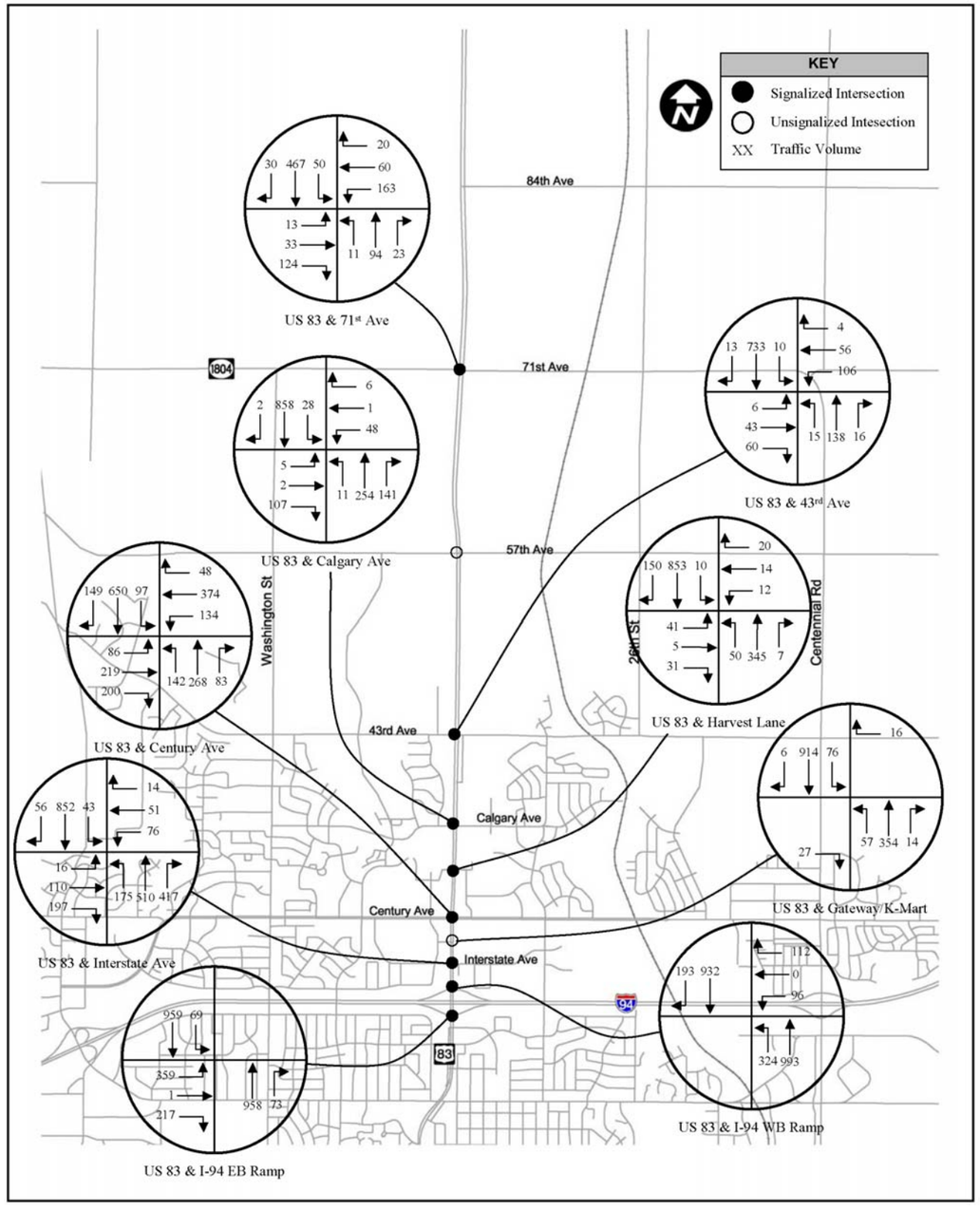


FIGURE 4: EXISTING AM PEAK TRAFFIC VOLUMES

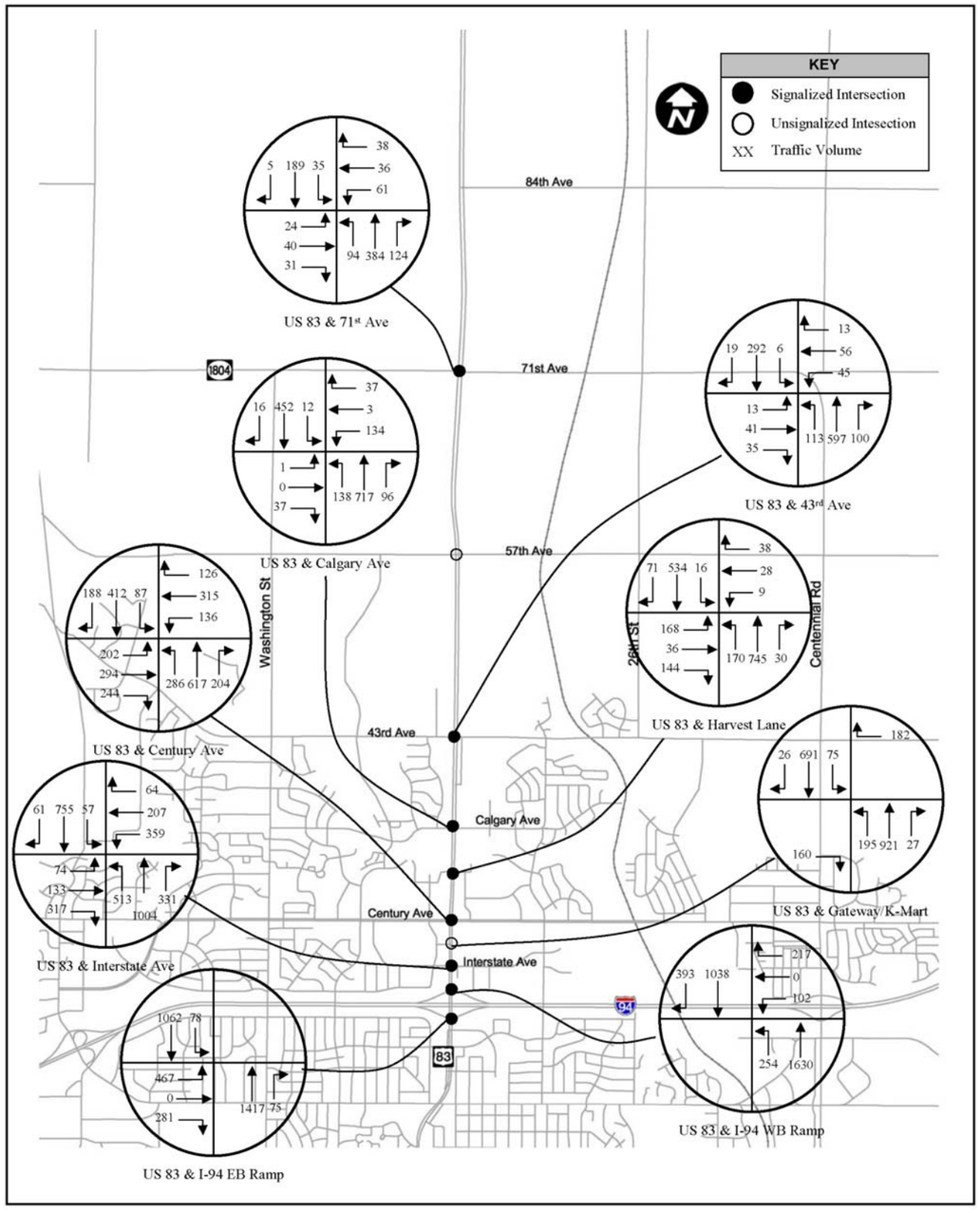


FIGURE 5: EXISTING PM PEAK TRAFFIC VOLUMES

TRAFFIC OPERATIONS ANALYSIS METHODOLOGY

The evaluation of intersections under existing traffic conditions utilized the procedures and methodologies contained in the *2000 Highway Capacity Manual* (HCM). These procedures and methodologies were applied using Version 5 of the Synchro program. Both signalized and unsignalized intersections were evaluated as part of this study.

Observations of traffic volumes provide an understanding of the general nature of traffic, but are insufficient to indicate either the ability of the street network to carry additional traffic or the quality of service provided by the street system. For this reason, the concept of level of service (LOS) has been developed to correlate numerical traffic volume data to subjective descriptions of traffic performance at intersections. LOS categories range from A (best) to F (worst) as shown in Table 2.

For the purposes of this study, a deficiency is defined as LOS D or worse. This threshold was developed based on discussions with the City of Bismarck.

TABLE 2: LEVEL OF SERVICE DESCRIPTIONS

Level of Service	Delay per Vehicle (Seconds)		Description
	Signalized	Unsignalized	
A	≤10	≤10	Free flow, minimal delays
B	>10 and ≤20	>10 and ≤15	Stable flow, occasional delays
C	>20 and ≤35	>15 and ≤25	Stable flow, periodic delays
D	>35 and ≤55	>25 and ≤35	Restricted flow, regular delays
E	>55 and ≤80	>35 and ≤50	Maximum capacity, extended delays
F	>80	>50	Forced flow, excessive delays

Source: 2000 Highway Capacity Manual, Transportation Research Board

At signalized intersections, LOS is based on the weighted average of all approach delays. For unsignalized intersections, the LOS is based on the worst minor street movement delay (usually the left turn movements on the cross streets).

FINDINGS OF THE TRAFFIC OPERATIONS ANALYSES

The results of the signalized and unsignalized intersection capacity analyses for each peak period are summarized in Tables 3 and 4.

The existing condition intersection capacity analyses indicate that acceptable levels of service are provided throughout the study area with the exceptions of a few intersection movements. Although the peak hour capacity analyses indicate acceptable levels of service, congestion exists for selected movements at several intersections in the study area. The congested period typically lasts for 15 to 30 minutes and occurs most weekdays. These key congestion locations include the following:

- Currently, almost all of the intersections and each approach within an intersection operate at an acceptable level of service, with the exception of the westbound approach of Interstate Avenue/US 83 that operates at LOS D. In addition, there are numerous specific approach movements, primarily left turn movements from or to US 83 operating at LOS D. One reason for this is the US 83 left-turn movements have heavy volumes and are operating under protected only left-turn phasing.
- There are a few intersections where the side street left-turn movements use the permissive only mode of operation. A couple of these movements are approaching the capacity of that mode of operation.

As noted earlier, the last reconstruction of US 83 addressed many of the turn bay and through capacity issues for this roadway. It is anticipated that the only modifications needed in the near term may be signal timing changes to accommodate changing travel patterns.

TABLE 3: SUMMARY OF INTERSECTION TRAFFIC OPERATIONS - MORNING (AM) PEAK HOUR (2005)

Intersection	MOE (1)	Overall	Intersection Approach (2)			
			EB	WB	NB	SB
US 83/I-94 Eastbound Ramp	Delay (Sec)	11.9	30.4	--	10.5	2.0
	LOS	B	C	--	B	A
US 83/I-94 Westbound Ramp	Delay (Sec)	14.2	--	33.4	10.8	14.7
	LOS	B	--	C	B	B
US 83/Interstate Avenue	Delay (Sec)	16.9	19.3	20.3	16.2	16.3
	LOS	B	B	C	B	B
US 83/Gateway Mall and K-Mart driveways (3)	Delay (Sec)		9.9	9.7		
	LOS		A	A		
US 83/Century Avenue	Delay (Sec)	23.1	21.3	28.1	28.9	17.5
	LOS	C	C	C	C	B
US 83/Harvest Lane and Weiss Drive (Menard's)	Delay (Sec)	7.6	24.2	21.3	9.2	4.7
	LOS	A	C	C	A	A
US 83/Calgary Avenue	Delay (Sec)	8.8	7.3	29.2	6.1	8.9
	LOS	A	A	C	A	A
US 83/43rd Avenue	Delay (Sec)	12.2	10.5	24.9	9.1	10.2
	LOS	B	B	C	A	B
US 83/71st Avenue	Delay (Sec)	12.3	9.5	19.3	12.8	9.8
	LOS	B	A	B	B	A

Notes:
(1) MOE = Measures of Effectiveness
(2) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
(3) Unsignalized intersection

TABLE 4: SUMMARY OF INTERSECTION TRAFFIC OPERATIONS - AFTERNOON (PM) PEAK HOUR (2005)

Intersection	MOE (1)	Overall	Intersection Approach (2)			
			EB	WB	NB	SB
US 83/I-94 Eastbound Ramp	Delay (Sec)	19.5	31.5	--	14.9	16.8
	LOS	B	C	--	B	B
US 83/I-94 Westbound Ramp	Delay (Sec)	11.6	--	32.1	3.8	17.0
	LOS	B	--	C	A	B
US 83/Interstate Avenue	Delay (Sec)	26.8	22.2	35.5	21.6	34.0
	LOS	C	C	D	C	C
US 83/Gateway Mall and K-Mart driveways (3)	Delay (Sec)		11.1	13.4		
	LOS		B	B		
US 83/Century Avenue	Delay (Sec)	20.7	22.4	23.0	18.4	20.6
	LOS	C	C	C	B	C
US 83/Harvest Lane and Weiss Drive (Menard's)	Delay (Sec)	9.9	19.9	20.4	7.2	6.9
	LOS	A	B	C	A	A
US 83/Calgary Avenue	Delay (Sec)	13.7	0.9	25.7	11.5	14.3
	LOS	B	A	C	B	B
US 83/43rd Avenue	Delay (Sec)	10.4	16.2	19.0	8.2	11.0
	LOS	B	B	B	A	B
US 83/ND 1804 (71st Avenue)	Delay (Sec)	12.6	15.4	16.2	10.6	14.1
	LOS	B	B	B	B	B

Notes:
(1) MOE = Measures of Effectiveness
(2) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
(3) Unsignalized intersection

CRASH DATA REVIEW

A review of the crash history for the intersections along US 83 was conducted to determine whether any high accident locations are present and to identify accident trends within the study area. Accident data for the three-year period from 2002 through 2004 was obtained from the North Dakota DOT. The data provided for this review only covered the area along US 83 from Calgary Avenue to just north of 110th Avenue. A summary of the crash data analysis for key intersections and roadway segments within the study area are provided in Tables 5 and 6. The key findings of the crash data review are summarized below:

- The recent transition from stop sign to traffic signal control at 43rd Avenue and ND 1804 (71st Avenue) makes the crash data invalid for current conditions.
- The crash rates at the intersections of US 83 with 43rd Avenue and US 83 with ND 1804 (71st Avenue) were both relatively high for unsignalized intersections, and the injury rate for ND 1804 (71st Avenue) is considered to be high. Higher vehicle operating speeds make it harder for motorists to judge appropriate gaps for completing their turn maneuvers. Installation of traffic signals at these locations was done, in part, to address crashes at the intersections.
- The most common roadway segment crash type involved animals, accounting for 71 percent of all segment crashes. Vehicles that loss control and either overturned or hit a fixed object accounted for another 20 percent of segment crashes.

- The injury rate for US 83 segment crashes is relatively low, with only 3 out of 44 crashes involving an injured occupant.

TABLE 5: CRASH DATA REVIEW SUMMARY FOR INTERSECTIONS (2002 THROUGH 2004)

Intersection	Number of Crashes	Accident Type (1)					Accident Severity (2)			3-Year Accident Rate (3)
		LT	A	RE	P/B	O	PDO	I	F	
US 83/Calgary Avenue	5			2	1	2	3	2		0.38
US 83/43rd Avenue (4)	16	2	12	1		1	11	5		1.57
US 83/71st Ave (4)	13	2	9			2	7	6		1.16

(1) LT = Left-turn; A = Angle; RE = Rearend; P/B = Pedestrian/Bicycle; O = Other (e.g., sideswipe, fixed-object)
(2) PDO = Property Damage Only; I = Injury; F = Fatality
(3) Accidents per million entering vehicles
(4) Traffic signal control was recently (Nov. 2004) installed at the intersections of 43rd and 71st Avenue. Only 2 of the 29 crashes at these two intersections occurred after traffic signal control was installed.

TABLE 6: CRASH DATA REVIEW SUMMARY FOR SEGMENTS (2002 THROUGH 2004)

Segment	Number of Crashes	Number of Crashes by Type (1)					Number of Crashes by Severity (2)		
		An	SS	FO	RE	O	PDO	I	F
US 83: Calgary Avenue to 43rd Avenue	1				1		1		
US 83: 43rd Avenue to ND 1804 (71st Avenue)	14	10		1	2	1	11	3	
US 83: ND 1804 (71st Avenue) to MP 96 (just north of 110th Ave)	29	22		4		3	29		

(1) An = Animal; SS = Sideswipe; FO = Fixed object; RE = Rearend; O = Other (e.g., overturn, left-turn)
(2) PDO = Property Damage Only; I = Injury; F = Fatality

PHYSICAL CONDITIONS AND LAND USE

This section provides a summary of the existing physical conditions and characteristics of the study area and was developed using information provided by city staff and through site reconnaissance. The intent of this section is to frame an understanding of the general study area landscape environment so the significance of potential impacts can be addressed. Characterizing the current conditions will also allow for a better approach to developing the proposed land use concept plan.

BUILT FORM

Most of the buildings in the study area have been constructed in the last 40 years and are a mix of framed and masonry building types. Building heights vary from a single story to up to four stories. Commercial buildings are generally located along the half-mile corridor directly east and west of US 83. Outside of the half-mile area, single-family residential uses have historically been the dominant built form, but multi-family residential uses have made up an increasing percentage of the more recent construction. Small areas of office and warehousing are located along the more southern arterial corridors. Building materials include lumber, clay bricks, limestone or sandstone, concrete, and stucco with natural stone accents. No particular architectural style dominates the built form and the buildings are well maintained.

LAND USE

Commercial retail use is generally concentrated adjacent to US 83 with several infill office buildings. Big box retailers, such as Home Depot, Wal-Mart, Menard's and Dan's Super Market occupy some of the larger parcels adjacent to US 83. Many of the big box activities are flanked by related outparcels of moderate and lower intensity retail stores that serve the regional market. Several hotels are found along the corridor, and are generally concentrated within a one mile radius of the I-94/US 83 junction. A few commercial and office uses are found north of 57th Street; however, the majority of the land area north of 57th is vacant. Several mixed-density residential properties, such as duplexes and apartments are located south of 43rd Street. Low-density single-family residential properties dominate the residential use found along Washington Street and Centennial Road. Public institutions, such as schools and churches, are found along Washington Street.

PARKS AND OPEN SPACE

There are several neighborhood parks and a trail system within the study area. The Bismarck Parks and Recreation District is currently preparing a comprehensive parks and open space plan that will incorporate parcels within the study area. Identified open space areas and active use parks to be included in the park plan are shown on the land use plan. Staff from the Parks and Recreation District provided the information on open space and active use parks. The park plan will include future trails, bikeways, conservation areas, active and passive parks, and parkways.

PHYSICAL FEATURES

The natural landscape of the study area is comprised of undulating lowlands that were converted into agricultural fields and ultimately turned into urban development as commercial and residential uses. Remnants of the undulating lowlands still exist at the northwest section of the study area along an extension of Washington Street. Streams and natural swales exist throughout the study area and are part of the parks and open spaces plan. There are small groves of trees within the study area, however, the primary vegetation cover is cultivated crops and pasture grasses.

UNDULATING LOWLANDS

LAND USE ALONG US 83

Inventory and Assessment Summary

In summary, this section reveals that most of the land area is vacant/open space with more dense commercial activities concentrated along US 83. Residential development is found along the eastern side of the US 83, and major roads are located at the one-mile section. The existing pattern of development, such as the one mile grid, commercial growth along US 83, and some infill use, provides some guidance for long-range land use planning, circulation network and introduction to a new urban development pattern.

Stakeholders Workshop and Survey

A stakeholders' workshop, personal interviews, and a fill-in survey were conducted to gather input regarding the land use vision, anticipated and use, and development patterns for the corridor. As part of the tasks completed in the initial stage of the study, a survey was conducted with the stakeholders and local persons with an understanding of the local development market. The intent of the survey, which was not intended to be a statistically valid sample for the entire community, was to gain insight into the local ideas for area within the stud limits. The following is a summary of the survey results:

A) In the category of planning an ideal US 83 corridor, the following were considered as "Very Important" or "Important".

Very Important

- Shopping, restaurants, entertainment 75%
- Big Box Retail 100%
- Parking 50%
- Corporate Offices 50%

Important

- Mixed Housing 100%
- Professional and Service Type Business 75%
- Educational Opportunities 75%
- Public Open Spaces and Green Space 75%
- Pedestrian/Bike Accessibility 75%
- Corporate Offices 50%
- Parking 50%

B) For US 83 Improvement the "Very Important" and "Important" elements were:

Very Important

- Landscaping 100%
- Gateways 75%
- Decorative Lighting 50%

Important

- Street Trees 50%
- Decorative Lighting 50%

C) For the five most ideal features to the vision, the following elements were:

- Big Box Retail
- Corporate Offices
- Professional and Service Type Business
- Mixed Housing
- Shopping, Restaurants, Entertainment

D) Over 50 percent of the respondents live near, own properties or operate a business in the corridor.

Survey Conclusions

In general, the respondents tended to favor a land use pattern consisting big box retail/commercial, mixed use, office and mixed housing within the study area. The respondents also saw a strong need for beautification of US 83 corridor based on their responses of the need for landscaping.

Land Use Development Concept

Overview

A key input into the process of developing a transportation improvement plan for the US 83 corridor was identification of the increment of development likely to occur within the study area. While the transportation element of the corridor study is focused on the US 83 corridor, the land use plan includes the area estimated to be the primary travelshed for the portion of the US 83 corridor that is under study. The information from the development plan was converted to households and employment and used as an input to the regional travel demand model as a means of estimating trip generation.

The purpose of this section of the study report is to provide documentation of the land development concept plan and the associated socioeconomic data. The purpose of the land use concept plan is to provide guidance to the future land uses within the immediate US 83 travelshed, covering the area from Calgary Avenue to 110th Avenue and from Washington Street to Centennial Road, and to provide a key input to the 2030 travel forecasting process.

Concept Plan development Process

The planning process employed in preparation of the land development plan concept was separated into three phases outlined in the following sections.

Phase I - Strategic Analysis

The initial phase of the plan development focused on identifying a vision (or range of visions based on the information source) for the US 83 study area and included the following:

- Interviewing key stakeholders regarding activities and development ideas/proposals.
- Meeting with public agencies.
- Reviewing previous plans and reports *(City of Bismarck Growth Management Plan, July 2003 and the Draft Bismarck Area Public Facilities Concept Plan, December 30, 2003)* for pertinent information.
- A visioning session with landowners, city/county staff and other stakeholders to develop a general idea of needs for the area.
- Assessing the project area site conditions relative to development feasibility.

The goals of this phase were to:

1. Gain an understanding of the diversity of the stakeholder's future development plans for parcels within the study area.
2. Establish a baseline for preserving greenway corridors, natural features and potential development constraints.
3. Develop a vision and establish goals through a consensus building approach. The city's Growth Management Plan and Generalized Future Land Use Plan focused on areas of commercial development along US 83, and did not document to the same degree proposals for other types of development (such as residential or mixed use) for areas set back from the US 83 corridor. The Bismarck Area Public Facilities plan showed proposed greenways and storm water corridors, proposed parks, and schools. These elements play a critical role in the future development of the corridor.

Phase II – Conceptual "High-Level" Development Alternative

This phase of the project resulted in preparation of a series of "high-level" master plan alternatives for the study area. In the process, "high-level" was defined as a more generalized concept plan. For instance, for areas that are conceived or developed as residential uses, the high-level plan would not identify whether the area would be low-density single family, moderate density or high-density multi-family development. The more detailed outlining of specific areas was completed in Phase III.

The goals of this phase were to:

1. Ensure that an efficient and safe multimodal transportation network can be supported by the identified future development pattern.
2. Craft a compatible and diverse land use plan.
3. Determine that future municipal services can be accommodated within the new growth areas.

As part of this phase in the land development concept preparation, a series of plan alternatives were prepared by the consultant team, discussed with city/county planning staff and other stakeholders, and revised to reflect local input/comments.

The recommended development concept for the study area is displayed in Figure 6.

Phase III is Recommended Concept Master Plan

This phase of the plan development was based on the products from Phase II and resulted in the:

- Recommended master plan layout.
- Character sketches for various nodes in the study area.
- Preliminary proposed support street pattern and hierarchy.
- Development guidelines covering lands within the study area.

The goal of this phase is to prepare a flexible master plan future development of the corridor.

Land Use Concept Plan

The land development concept plan displayed in Figure 6 was established through working through the three land use phases described in the previous section. The development concept includes general ideas of the types of land uses that are likely to be developed in the study area. The concept incorporates a broad range of uses, which are intended to provide opportunities for people to work, live, and conduct their everyday business within the study area. As a result of having each of the three opportunities, the travel impacts of the increment of development can be lessened because average trip lengths would be shorter and fewer routes would be impacted. This is not to say that the study area would be 100 percent self sufficient, but rather there is a broad mixture of complementary opportunities that have been shown to result in lowering the transportation impacts relative to more homogeneous development patterns.

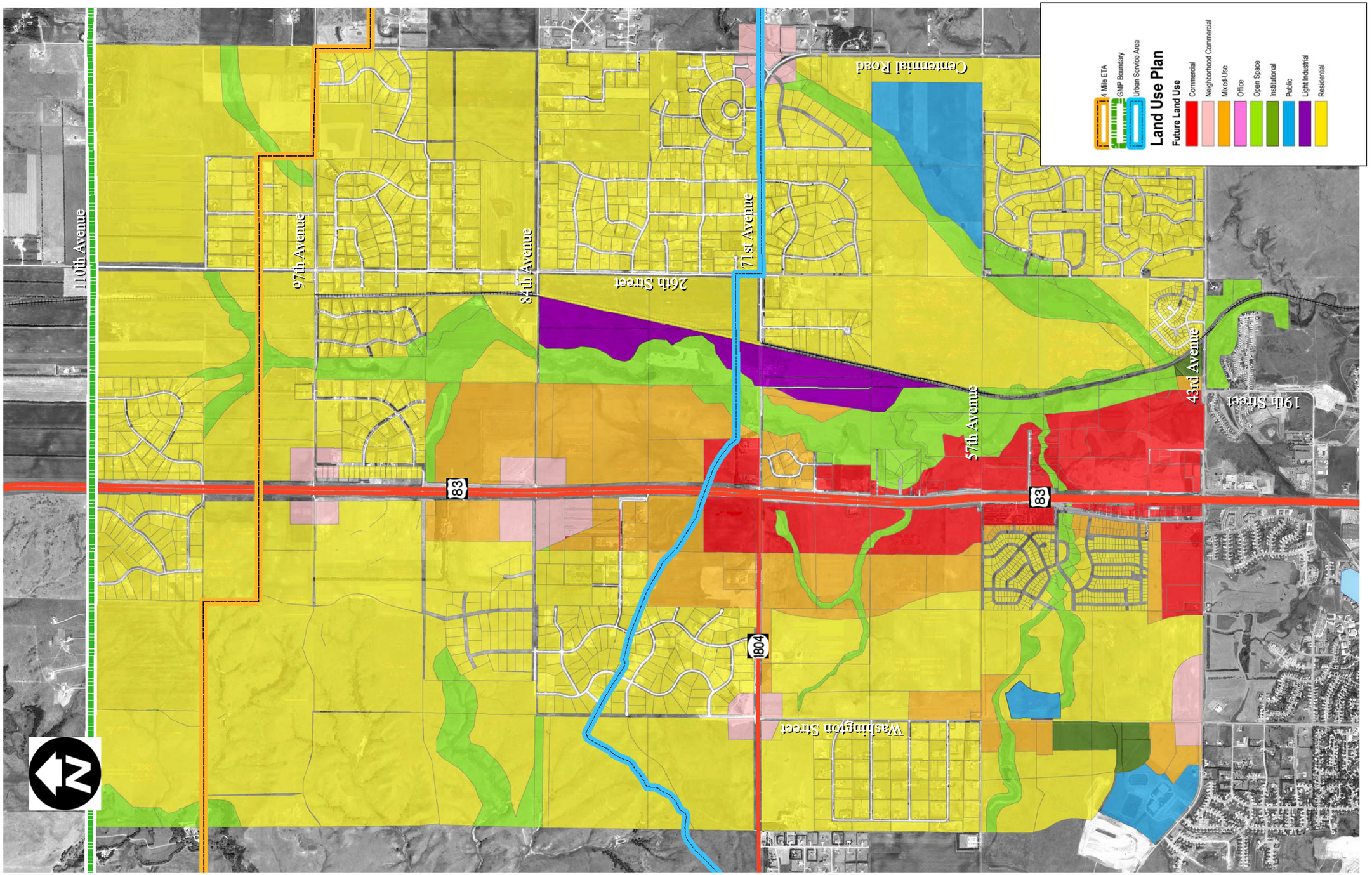


FIGURE 6 – PROPOSED LAND USE PLAN

Definitions of Land Uses in the Study Area

Outlined in the following subsections are explanations of the various uses being incorporated into the plan for the US 83 study area.

Mixed Use

This use generally includes a range of vertically-integrated uses (such as residential above ground-floor commercial or office use, commercial and office use, office with light industrial use) and/or horizontally-integrated mixed uses, such as a variety of uses within a block. Within the mixed use designation there are three more detailed categories:

- Mixed Use 1 - Residential/Commercial/Office: This use indicates horizontally-integrated residential with commercial and/or office uses. At least 50 percent residential coverage for the developed area of a parcel is generally the ideal mix for this intensity of mixed use.
- Mixed Use 2 - Commercial/Office: This use indicates horizontally-integrated commercial and office use. The assumption would be that commercial and office activities would be fairly evenly balanced (50-50) within the overall study area.
- Mixed Use 3 - Office/Light Industrial: This use indicates horizontally-integrated office and light industrial use. The assumption would be that office and light industrial would be fairly evenly balanced (50-50) within the overall study area.

Listed below are the general distribution assumptions between each mixed use category allocated across the areas designated as mixed use:

- Mixed Use 1: 20 percent
- Mixed Use 2: 40 percent
- Mixed Use 3: 40 percent

Commercial

This use includes retail and service activities, sometimes in combination with offices. Two retail categories have been established, with the primary differences between them being the intensity and focus of the activities. Commercial uses have been divided into:

- High-Intensity Commercial: These uses would be focused adjacent to the US 83 corridor and located south of ND 1804 (71st Avenue). High-intensity retail uses would include discount retail, home improvement retailers, and multiple tenant shopping centers of more than 100,000 square feet.
- Neighborhood Commercial: Neighborhood commercial uses are typically activities that are closely associated with the development areas directly adjacent to them. In the concept plan, neighborhood commercial uses are focused on the intersections along the section line roads. Types of activities included are gas stations, convenience stores, dry cleaners, video rentals, restaurants, coffee shops and similar uses.

Office

This use includes buildings utilized primarily for office purposes, including medical and government offices.

Light Industrial

This use includes product assembly, wholesaling and warehousing/shipping activities, and large office tenants located in business parks. Fabrication and manufacturing are not permitted.

Institutional

This use includes both private institutions such as places of worship and semi-public institutions such as a hospital and recreation centers.

Open Space

This use includes both passive green space such as conservation areas and corridors, streams, rivers, wetlands, and active green space such as ballfields, golf courses, trail and bikeways. Areas identified as Open Space would be consistent with the Bismarck Parks and Recreation District's Open Space Plan.

Public

This use includes associated with community service institutions such as schools, police stations, and fire stations.

Residential

This use includes a range of home types from low-density detached homes to higher density apartment complexes. For the purposes of this transportation needs study the range of definitions include:

- Urban Density Residential: This use includes a combination of low-density single-family through high-density multi-family uses. A composite density of 3.0 dwelling units per acre was used. Areas designed as urban density residential are located inside the assumed urban services boundary.
- Rural Density Residential: This use includes low-density single family residential with a density of 0.5 units per acre (one unit per two acres).

Socioeconomic Data

Throughout the initial stages of the corridor study, the consultant team worked with staff from the MPO and the Bismarck-Burleigh County Planning Department to prepare a future land use concept for the study area. In general, the concept reflected build-out of the US 83 Corridor Study coverage area. It is unlikely that the entire increment of development included in the study area would be built within the current planning horizon of 2030. Additionally, it is desirable to prepare a 2030 traffic forecast that can be used as a comparison tool to the Long Range Transportation Plan development concept. Thus, determination of how much of the Build-out increment could reasonably be in place by 2030 is required in order to complete the traffic volume comparison.

Unlike with development of traffic forecasts, there is no regional program that would aid in determining how much of the overall increment of development would likely come on line each year or in the period between 2005 and 2030. Thus, through working extensively with staff form the City/County Planning Department staff, estimates as to a reasonable increment and distribution throughout the study area were made.

Input provided by the Planning Department staff was that there would likely be some level of development in the northern portion of the study area, and that the 50 percent of Build-out is reasonable for the southern (south of 84th Avenue) portion of the study area. Thus, the recommended development concept reflected the following:

- 50 percent of the build out development concept south of 84th Avenue, as presented to the TAC and Policy Board in August 2005.
- 25 percent of the Build-out residential development in the area north of 84th Avenue. The area to the north contains lower levels of commercial and mixed-use development areas relative to the areas south of 84th Avenue.

URS staff believed that through 2030 the vast majority of the commercial, office and industrial development would occur south of or immediately adjacent to the 71st Avenue/ND 1804 corridor. This assumption was based on the more intense need for urban services by these uses, relative to low-density residential development.

2030 Traffic Forecasts

The scope of work for the US 83 Corridor Study includes development of daily and peak hour traffic forecasts for US 83 and adjacent arterial and collector routes. The forecasts for 2030 are intended to reflect the study-derived land use concept. The consultant team worked closely with the MPO and the Bismarck Planning Department in preparation of the future land use concept and worked with the MPO and the North Dakota State University Advanced Traffic Analysis Center (ATAC) to incorporate the development concept into the regional travel demand model dataset. It should be noted that the land development concept presented in the Land Use Development Concept section documents assumptions on build-out of the study area from Calgary Avenue through 110th Avenue and from Washington Street through Centennial Road. This area encompasses approximately 16.8 square miles; which reflects coverage of approximately 30 percent of the area of the city. At typical development densities for Bismarck, build-out of the study area reflects the following:

- 4,300 acres of residential development.
- 590 acres of commercial development.
- 195 acres of neighborhood commercial development.
- 820 acres of mixed use (a combination of office, retail, industrial and residential).
- 160 acres of industrial uses.
- 50 acres of institutional uses, including schools, churches, etc.
- 1,030 acres of open space.

When the increment of developed land is converted to units of measure used in the regional model (dwelling units and employment), the build-out land use concept reflects the following for the study area:

- 9,860 new dwelling units.
- 11,730 new service/industrial (non-retail) sector employees.
- 4,120 new retail sector employees.

The increment of development identified in the development concept, measured in new dwelling units and employment, far exceeds the increment included in the recently adopted Long Range Transportation Plan. This observation was not unexpected due to:

- Extending the regional model coverage area from approximately 84th Avenue to beyond 110th Avenue.
- Increasing the assumptions on development density for residential uses.
- Incorporating updated information on anticipated employment for selected large-scale developments in the study area that were unknown at the time forecasts were developed as part of the long transportation planning process.

The increments of new dwellings and employment included in the Long Range Transportation Plan are listed below:

- 6,420 new dwelling units.
- 1,340 new service/industrial (non-retail) sector employees.
- 890 new retail sector employees.

As part of the corridor study scope of work, the consultant prepared two forecasts:

- Build-out of the study area.
- 2030 forecast that would replace the forecast developed as part of the Long Range Transportation Planning process.

Based on historical absorption rates for residential and commercial land, the increment of development associated with the study area Build-out very likely exceeds the level that would reasonably be brought on-line within the 2030 planning horizon. Thus, estimates of the increment associated with the 2030 planning horizon need to be established. As part of this step the consultant team prepared traffic forecasts that reflected the following incremental development concepts:

- Build-out of the study area as described in the land use concept plan.
- 75 percent build-out of the study area as described in the land use concept plan.
- 50 percent build-out of the study area as described in the land use concept plan.
- 25 percent build-out of the study area as described in the land use concept plan.

The intent of providing the incremental development concepts was to allow local staff and decision-makers access to information that would aid in selecting a development concept that could be adopted as a reasonable and defensible for a 2030 planning horizon. It is unlikely that the 2030 reasonable and defensible concept is the full build-out, and it is unlikely that it is the concept identified in the current Long Range Transportation Plan reflects a level likely in place by 2030. The most reasonable plan is likely somewhere in between the Long Range Transportation Plan and the Build-out. As part of the travel forecasting process, the consultant team presented traffic modeling results for each of the development level concepts to the TAC and the MPO Policy Board. The TAC proposed use of a development concept that reflected 50 percent of the Build-out levels south of 84th Avenue and 25 percent of the Build-out level north of 84th Avenue as reasonable for 2030. The results of this proposal were submitted to the MPO Policy Board and approved for use in the study.

The remainder of this section provides documentation of:

- Methods employed in preparing the daily traffic forecasts.
- Daily traffic forecasts reflective of the each of the recommended development levels.
- Peak hour forecasts at the key intersection along US 83.

Traffic Forecasting Methodology/Assumptions

Development of daily traffic forecasts along the key routes in the study area reflects application of the Bismarck-Mandan area regional travel demand model maintained by the MPO and ATAC. This model has been developed as part of the Long Range Transportation Planning process and has been approved by the MPO Policy Board as a tool in conducting area traffic forecasting work. The general modeling structure is described in the following bulletpoints:

- Trip Generation: The number of daily person and/or vehicle trips in the study area is estimated through application of predetermined trip production and attraction rates or formulas to the current or proposed future levels of dwelling units and employment. Thus, a linear relationship exists between change in development and change in trip generation. If development levels increase by 10 percent, trip generation would increase by 10 percent. The consultant team provided ATAC staff with a database of socioeconomic data that reflected the incremental development scenarios for the study area. Future levels of dwelling units and employment for the remainder of the Bismarck-Mandan metro area were reflective of the level used in the current Long Range Transportation Plan.

- Trip Distribution: Distribution of the productions and attractions the development scenario used a Gravity Model distribution; which is consistent with the Long Range Transportation Plan application.

- Traffic Assignment: Vehicle trips are assigned to the roadway network through an incremental capacity restrained application that requires a series of passes through the assignment module. The base network for the assignments was the recommended Long Range Transportation Plan network. After each assignment iteration, volume-to-capacity ratios were recalculated, and travel times were adjusted to reflect the relative levels of congestion observed in the previous iteration. A final assignment was obtained through a process of combining the results from each iteration in a way to obtain the optimal balancing of congestion throughout the system. The method employed is consistent with the method used in the Long Range Transportation Plan.

Daily Traffic Forecasts

The daily traffic forecasts associated with the 2030 recommended development scenario relative to the current daily traffic volumes are displayed in Figure 7. The forecasts documented in Figure 8 reflect the Long Range Transportation Plan network as defined in the ATAC model. The network includes a new I-94 interchange at 66th Street connecting to a 71st Avenue north beltway. The beltway forecasts along 71st Avenue in the Long Range Transportation Plan were less than 1,000 vehicles per day. If these volumes reasonably reflect the future demand (at least through 2030), there may not be enough demand to support investment into improvements of the 71st Avenue corridor east of Centennial Road.

To take the analysis a step further than reviewing the model assignments, the consultant team requested regional model origin-destination information for the links that represent US 83 and Centennial Road just north of I-94. The information on origins-destinations is known as selected link analysis. From the information extracted from the combination of the model trip table and the network assignment, the forecasted origin and destination of each vehicle assigned to a specific link/roadway can be traced. The purpose of this analysis is to quantify the number of daily trips that could logically be assigned to a 71st Avenue to 66th Street route, but find faster routes in the model using US 83 to I-94 and/or Centennial Road to I-94. If a significant number of trips are observed using the US 83 or Centennial Road corridors as routes between origins/destinations east of the US 83 study area and origins/destinations north of I-94, it is likely logical to assign a portion of these trips to the 71st Avenue to 66th Street corridor.

The results of the selected link analyses along US 83 and Centennial Road north of I-94 include:

- It is unlikely that many travelers with origins/destinations south of 53rd Avenue would travel north, out of their way, to use a 71st Avenue beltway to get to/from eastern areas of the metro or to I-94.

- For the Centennial Road corridor, there are likely very few regional model trips that could be, or should be, redirected to use a 71st Avenue to 66th Street beltway. The vast majority of the Centennial Road trips with a complementary orientation (to/from the east in the I-94 corridor) to 71st Avenue/66th Street are located south of 53rd Avenue. Thus, the current version of the model already captures all of the Centennial Road trips and has diverted them to 71st Avenue/66th Street.

- For the US 83 corridor, there are likely about 1,400 two-way trips that logically could be diverted from the currently assigned corridor to the combination of 71st Avenue to 66th Street. This observed level would increase the forecasted traffic on 71st Avenue east of Centennial Road from 500 vehicles per day to approximately 2,000 vehicles per day.

As a result of the selected-link analysis, approximately 1,400 vehicles per day were redirected from the US 83 to I-94 corridor to the 71st Avenue east of US 83 corridor.

Year 2030 Peak Hour Traffic Forecasts

The modeled daily traffic growth rates for the corridor was applied to the existing year smoothed traffic volumes to develop 2030 peak hour traffic forecasts for the US 83 corridor. Displayed in Figure 9 and Figure 10 are the forecasted 2030 AM and PM peak hour turning movement forecast at each intersection along the US 83 corridor from the I-94 interchange to the northern limits of the study area.

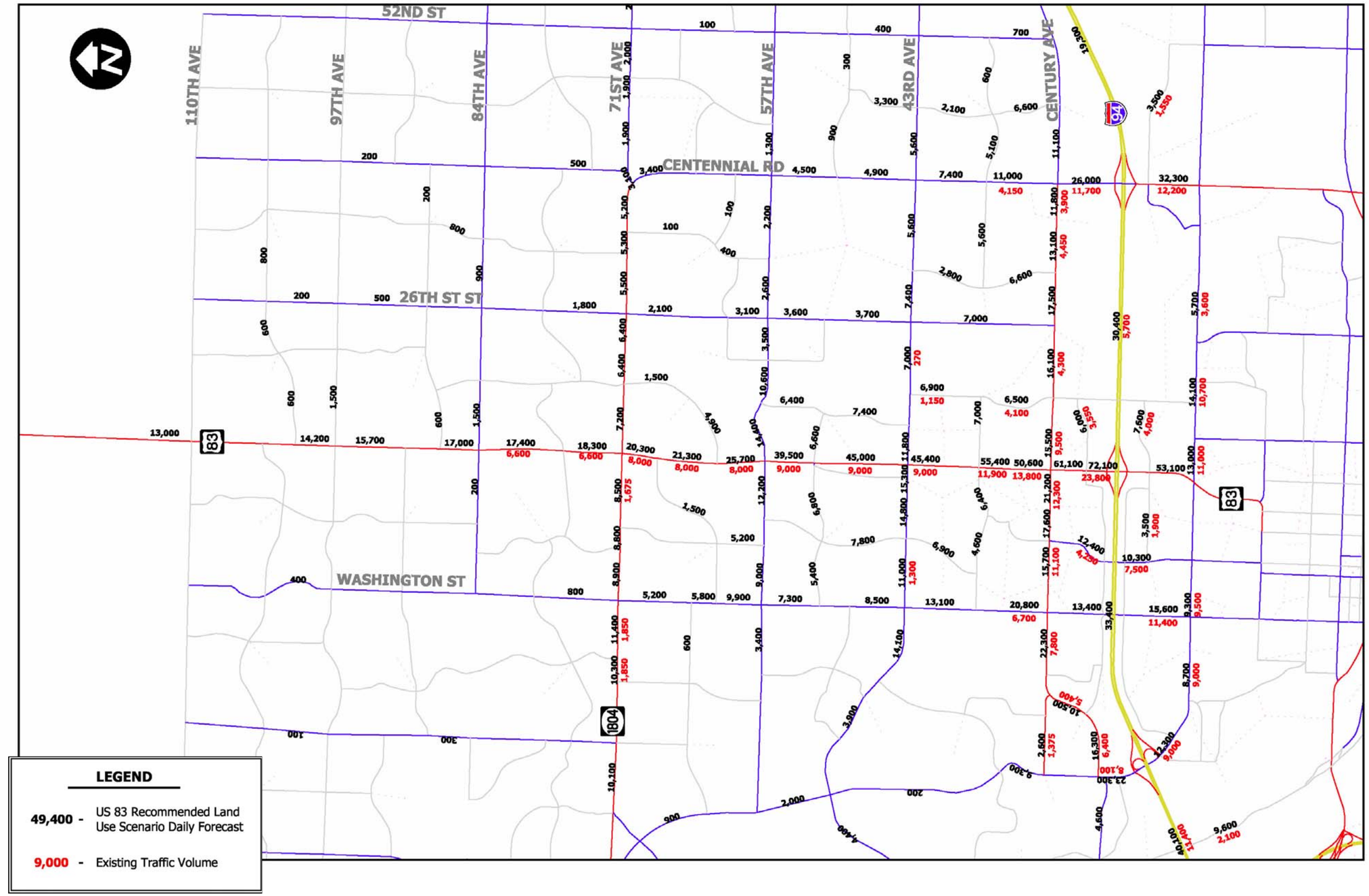


FIGURE 7: 2030 DAILY FORECAST COMPARED TO EXISTING

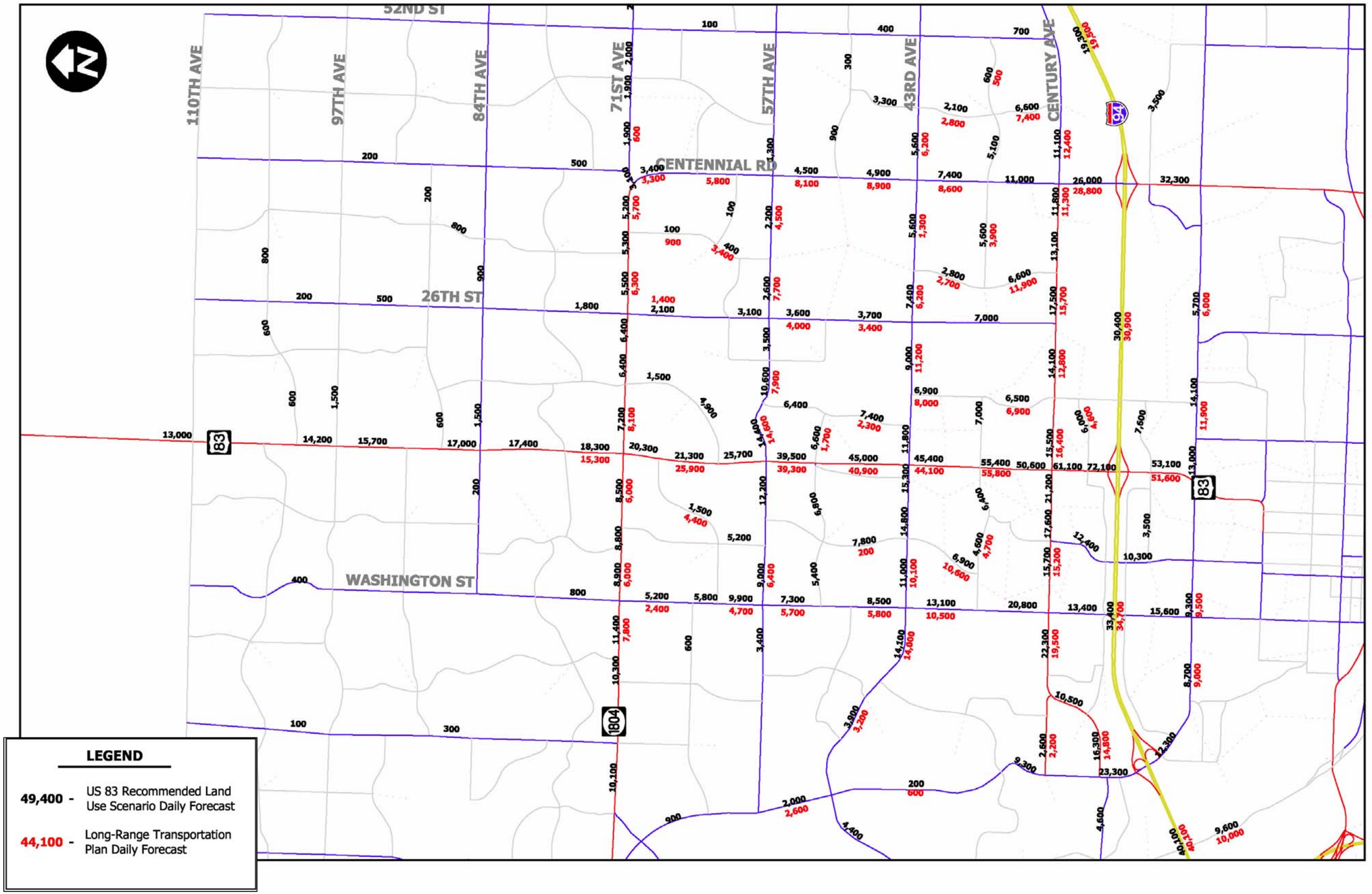


FIGURE 8: 2030 DAILY FORECAST COMPARED TO LRTP FORECAST

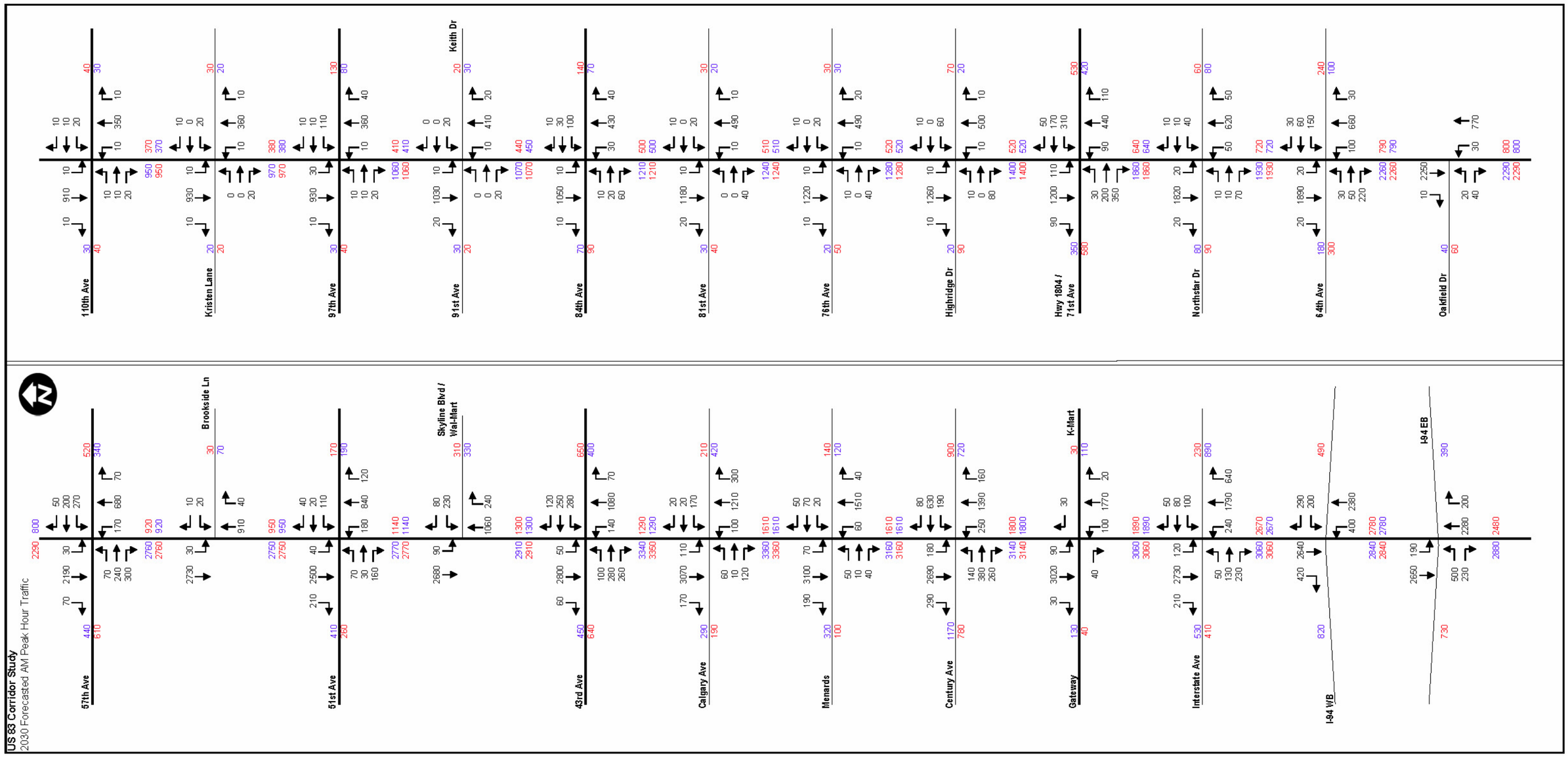


FIGURE 9: 2030 AM PEAK HOUR TRAFFIC FORECAST

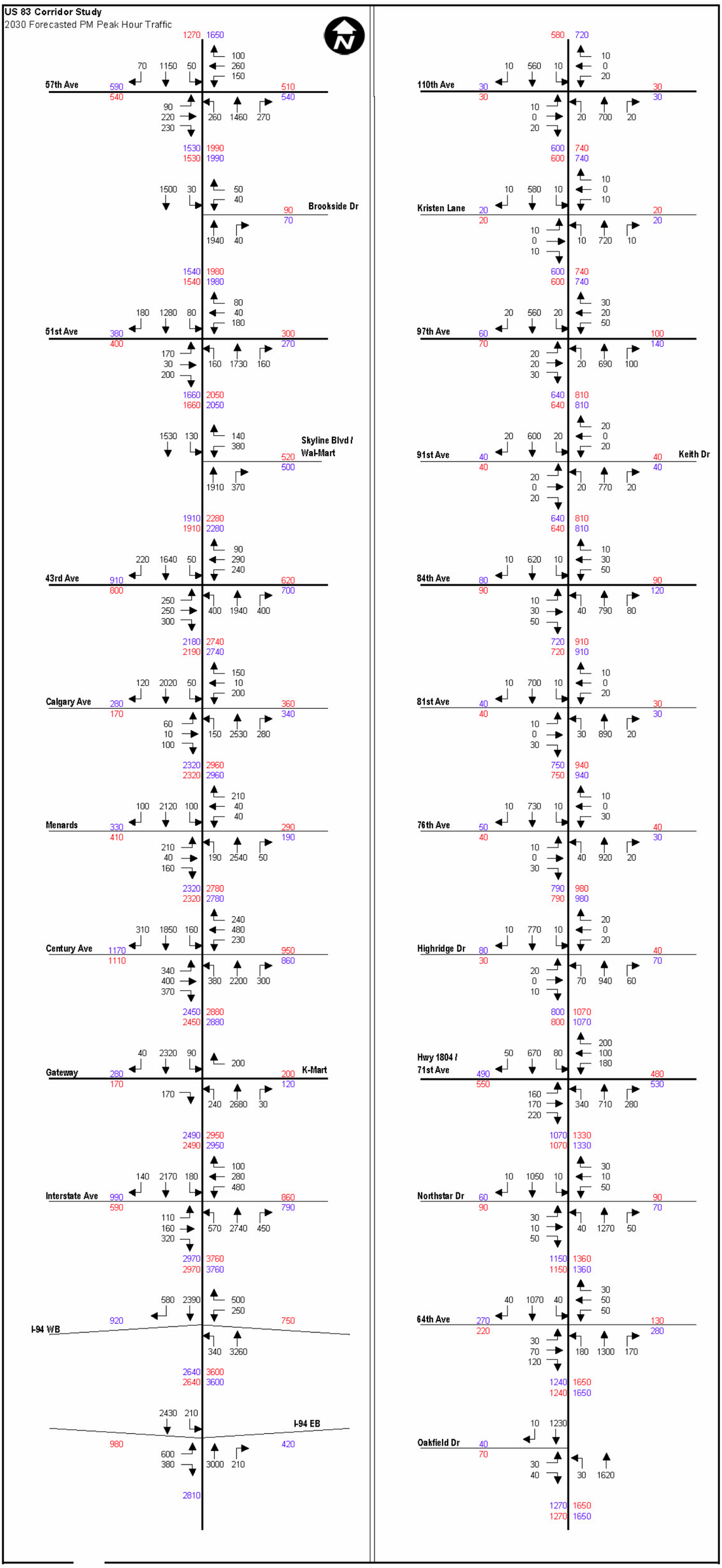


FIGURE 10: 2030 PM PEAK HOUR TRAFFIC FORECAST

2030 Traffic Operations (No-Build)

The purpose of the 2030 Traffic Operations chapter is to provide a summary of the projected traffic operations for the US 83 corridor for the 2030 horizon year. For each of the current and future new access points anticipated along the corridor, a traffic operation analyses was completed for both the 2030 AM and PM peak hours. The results of the 2030 AM peak hour analysis are documented in Table 7 and the 2030 PM peak hour analysis is documented in Table 8.

The 2030 No-Build alternative reflects maintaining the four-lane segment for US 83 north of Calgary Avenue and maintaining the current signal operations/timings at all traffic signals, along with the following:

- Implement the Wal-Mart (northeast corner of US 83/43rd Avenue intersection) development roadway improvements included in the traffic impact study.
- Collector road intersections with US 83 would be constructed as two-lanes with westbound left turn lanes and eastbound right turn lanes provided to account for these heavier volume movements. Intersection control would be a mixture of two-way stop control or traffic signal for the cross route.
- Arterial road intersections with US 83 would be constructed as two-lanes with left and right turn lanes on the minor street approaches and most would ultimately use traffic signal control.

For the purposes of the No-Build analyses the only new traffic signal is the signal located at US 83 and Skyline Drive that is proposed as part of the Wal-Mart development.

The majority of the intersections south of 71st Avenue are projected to operate at an unacceptable level of service in one or both peak hours. As can be observed through the table information, by 2030 the forecasted level of traffic will exceed the through capacity along US 83, particularly in the southern portion of the corridor.

The traffic forecasts for many of the arterial cross streets would benefit from an upgrade from stop sign control to traffic signals. This type of improvement along with other geometric improvements is discussed in the next chapter.

Table 7: Summary of 2030 No-Build Traffic Operations - Morning (AM) Peak Hour

Intersection	MOE (1)	Overall	Intersection Approach (2)			
			EB	WB	NB	SB
US 83/I-94 Eastbound Ramp	Delay (Sec)/LOS	44.2/D	31.3/C	--	81.8/F	14.8/B
US 83/I-94 Westbound Ramp	Delay (Sec)/LOS	69.6/E	--	31.7/C	22.5/C	118/F
US 83/Interstate Avenue	Delay (Sec)/LOS	90.2/F	20.4/C	20.1/C	36.3/D	152/F
US 83/Gateway Mall/ K-Mart driveways (3)	Delay (Sec)/LOS		13.8/B	16.4/C		
US 83/Century Avenue	Delay (Sec)/LOS	94.0/F	27.2/C	52.9/D	37.8/D	154/F
US 83/Harvest Lane/Weiss (Menard's)	Delay (Sec)/LOS	56.0/E	23.2/C	22.8/C	18.4/B	76.4/E
US 83/Calgary Avenue	Delay (Sec)/LOS	168/F	13.0/B	40.2/D	21.7/C	254/F
US 83/43rd Avenue	Delay (Sec)/LOS	190/F	232/F	189/F	41.1/D	247/F
US 83/Skyline Boulevard	Delay (Sec)/LOS	77.1/E		28.9/C	8.1/A	115/F
US 83/LaSalle Drive (3)	Delay (Sec)/LOS		*/F	*/F		
US 83/Brookside Lane (3)	Delay (Sec)/LOS			*/F		
US 83/57th Avenue (3)	Delay (Sec)/LOS		*/F	*/F		
US 83/Oakfield Drive (3)	Delay (Sec)/LOS		*/F			
US 83/64th Avenue (3)	Delay (Sec)/LOS		*/F	*/F		
US 83/Northstar Drive (3)	Delay (Sec)/LOS		*/F	*/F		
US 83/71st Avenue	Delay (Sec)/LOS	52.3/D	27.0/C	219/F	13.1/B	17.8/B
US 83/Highridge Drive (3)	Delay (Sec)/LOS		58/F	*/F		
US 83/76th Avenue (3)	Delay (Sec)/LOS		51/F	58/F		
US 83/81st Avenue (3)	Delay (Sec)/LOS		17/C	55/F		
US 83/84th Avenue (3)	Delay (Sec)/LOS		86/F	*/F		
US 83/91st Avenue/Keith Drive (3)	Delay (Sec)/LOS		14/B	42/E		
US 83/97th Avenue (3)	Delay (Sec)/LOS		45/E	*/F		
US 83/Kristen Lane (3	Delay (Sec)/LOS		13/B	26/D		
US 83/110th Avenue (3)	Delay (Sec)/LOS		37/E	32/D		

Notes for Table 7:
(1) MOE = Measures of Effectiveness
(2) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
(3) Unsignalized intersection
* = Approach delay is projected to exceed 100 seconds.

TABLE 8: SUMMARY OF 2030 NO-BUILD TRAFFIC OPERATIONS - AFTERNOON (PM) PEAK HOUR

Intersection	MOE [1]	Overall	Intersection Approach [2]			
			EB	WB	NB	SB
US 83/I-94 Eastbound Ramp	Delay (Sec)/LOS	108/F	43.9/D	--	194/F	26.1/C
US 83/I-94 Westbound Ramp	Delay (Sec)/LOS	50.9/D	--	39.4/D	29.7/C	79.5/E
US 83/Interstate Avenue	Delay (Sec)/LOS	150/F	24.9/C	107/F	157/F	184/F
US 83/Gateway Mall/ K-Mart Driveways [3]	Delay (Sec)/LOS		12/B	*/F		
US 83/Century Avenue	Delay (Sec)/LOS	66.8/E	83.6/F	36.7/D	47.2/D	95.5/F
US 83/Harvest Lane/Weiss Drive (Menard's)	Delay (Sec)/LOS	34.2/C	29.8/C	27.1/C	33.9/C	36.3/D
US 83/Calgary Avenue	Delay (Sec)/LOS	139/F	14.6/B	27.2/C	154/F	146/F
US 83/43rd Avenue	Delay (Sec)/LOS	141/F	204/F	134/F	125/F	140/F
US 83/Skyline Boulevard	Delay (Sec)/LOS	31.6/C		30.3/C	47.8/D	9.7/A
US 83/LaSalle Drive [3]	Delay (Sec)/LOS		*/F	*/F		
US 83/Brookside Lane [3]	Delay (Sec)/LOS			*/F		
US 83/57th Avenue [3]	Delay (Sec)/LOS		*/F	*/F		
US 83/Oakfield Drive [3]	Delay (Sec)/LOS		*/F			
US 83/64th Avenue [3]	Delay (Sec)/LOS		*/F	*/F		
US 83/Northstar Drive [3]	Delay (Sec)/LOS		*/F	*/F		
US 83/71st Avenue	Delay (Sec)/LOS	34.9/C	20.2/C	41.9/D	49.7/D	16.2/B
US 83/Highridge Drive [3]	Delay (Sec)/LOS		92/F	96/F		
US 83/76th Avenue [3]	Delay (Sec)/LOS		27/D	*/F		
US 83/81st Avenue [3]	Delay (Sec)/LOS		24/C	67/F		
US 83/84th Avenue [3]	Delay (Sec)/LOS		70/F	*/F		
US 83/91st Avenue/Keith Drive [3]	Delay (Sec)/LOS		30/D	36/E		
US 83/97th Avenue [3]	Delay (Sec)/LOS		47/E	62/F		
US 83/Kristen Lane [3	Delay (Sec)/LOS		22/C	25/C		
US 83/110th Avenue [3]	Delay (Sec)/LOS		18/C	30/D		

Notes for Table 8:
(1) MOE = Measures of Effectiveness
(2) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
(3) Unsignalized intersection
* = Approach delay is projected to exceed 100 seconds.

Mitigation Analysis/ Recommendations

The purpose of the Mitigation Analysis/Recommendations section is to present the concepts that were evaluated to address transportation issues and concerns in the study area and to present the recommendations for the transportation system improvements. The range of alternatives was based on input received through meetings and workshops with the public and stakeholders, and from meetings with MPO, city, county, and NDDOT staff. Some of the key mitigation alternatives developed for the study area and the US 83 corridor included the following:

- Recommended street network for the study area.
- Modification to access drives along the corridor.
- US 83 corridor geometric and traffic control changes.

Street Network for Study Area

The US 83 study area covers an area of 16.8 square miles and a significant amount of development is projected to occur within this study area. In order to support this development, it is important to develop a street network that distributes traffic throughout the study area and not just rely on US 83 and a few selected discontinuous roadways. The recommended collector and arterial system plan is provided in Figure 11. Additional detail on the roadway alignments and the estimated right-of-way is provided on section-by-section figures in the Appendix. The recommended street network has been reviewed by the public and by staff from the NDDOT, the city, the county, and the MPO relative to the:

- Recommendations from the Fringe Area Road Master Plan.
- Existing plats and/or project site plans available for the study area.
- Growth Management Plan.
- Long Range Transportation Plan (2030) improvements.
- US 83 study area land use concept plan.

In developing the routes, URS/Houston Engineering staff employed the following set of assumptions:

- The collector and arterial routes need to support US 83 by providing relatively continuous routes that provide connectivity between current/future residential and commercial development areas. The level of continuity decreases as the functional hierarchy decreases from arterial (US 83 and the one-mile section routes) to collectors (half-mile and quarter-mile roadways).
- Routes need to reflect topographic constraints in the study area. A generalized vertical profile was developed for each of the routes. The vertical profiles were developed more to determine whether there are significant topographic constraints that impact the feasibility of providing a route along a particular alignment. Many of the alignments displayed have been adjusted from the initial concepts to avoid difficult terrain areas. It should be noted that detailed engineering work on the alignments was not completed as part of this planning study.
- Engineering guidelines developed by the city, county and the NDDOT were incorporated into the concept plan.
- Access management criteria were established for the US 83 corridor and other routes. In general the following access densities were employed:
  - US 83: Maximum density – one quarter-mile spacing between access points and no private driveway access.
  - ND 1804: Maximum density – quarter-mile spacing between access points and no private driveway access.
  - Minor Arterial (section line roads): Maximum access density – one-eighth-mile spacing. Private drives would not be provided on new route segments, but current access points would likely not be recommended for closure/consolidation unless their proximity would result in conflicts with major route junction operations and/or safety.
  - Collector: Minimum access spacing of one-eighth-mile. Private drives along collectors would be discouraged, but allowed if land access was not convenient from a local route.
- Routes established as part of the Fringe Area Road Master Plan should be followed unless there is a reason to adjust the route. Reasons for deviating from the Fringe Area Road Master Plan recommendations include:
  - The junction points with arterial routes in the Fringe Area Road Master Plan do not reflect the desired level of access control being developed from the US 83 Corridor Study.
  - Topography of the area results in grades that were too severe.
  - Parcel segmentation (adjacent impacts) of routes included in the Fringe Area Road Master Plan is concluded to be too great to reasonably allow for future implementation.
- Follow current plats. Within the study area numerous residential plats have been recorded with the city and the county. The plats that pre-date the US 83 Corridor Study document individual lot layouts and the proposed local/collector street alignments. A primary assumption was that the study area collector routes derived through the US 83 Corridor Study should follow the recorded plat roadway to the extent reasonable. This assumption was initially followed for all platted areas within the study boundaries whether the developments were constructed or not. Within the study area there were several locations where the currently platted collector system provided conditions where a less than desirable alignment from a continuity or access perspective would be provided. As part of a second iteration of corridor analysis alternate preferred routes were identified for those locations in the study area where following an undeveloped plat roadway system resulted in concerns about adequately addressing the goals of providing an appropriate level of continuity.
- Right-of-way and roadway cross sections were established for the US 83 study area. The following cross sections and right-of-way criteria were employed:
  - Principal Arterial: Roadway cross section of four or six lanes with a divided roadway. A right-of-way width of 150 feet is recommended for these roadways.
  - Minor Arterial (Section Line Roads): Roadway cross section of two or four lanes with turn lanes. A right-of-way width of 120 feet is recommended for these roadways.
  - Collector: Roadway cross section of two lanes with turn lanes at US 83 intersections. A right-of-way width of 80 feet is recommended for these roadways.

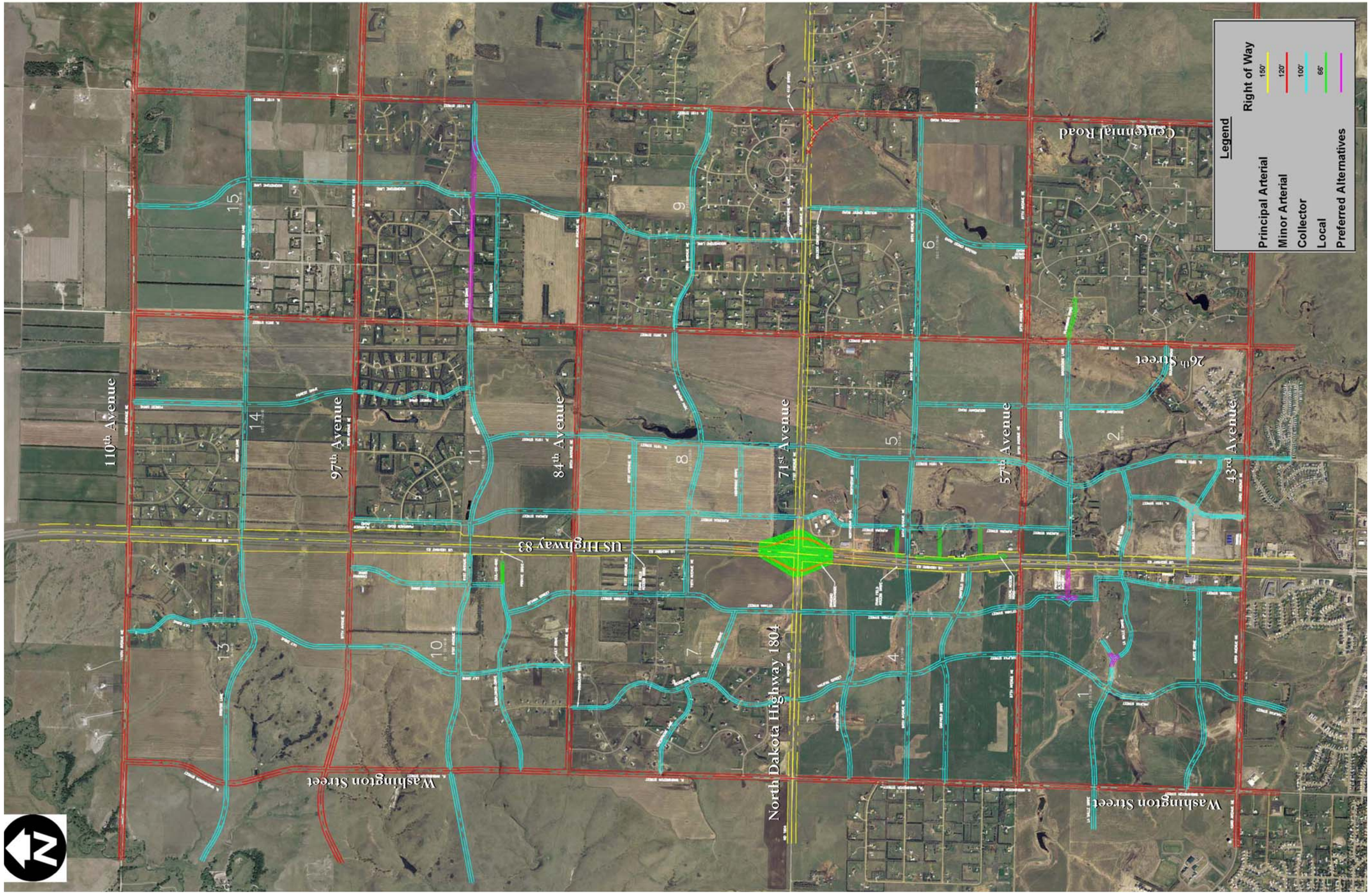


FIGURE 11 – PROPOSED US 83 STUDY AREA STREET NETWORK

IMPACTS OF BUILD NETWORK

Providing the arterial and collector system throughout the study area as documented in the previous section will be critical to maintaining reasonable traffic flow along the US 83 corridor. Without the adjacent north-south and east-west routes that provide alternates to US 83 for trips of two to four miles in distance and/or alternates to US 83 for at least a portion of even longer trips, the level of traffic forecasted for the US 83 corridor in 2030 would be even greater than the level being forecasted in this analysis. The semi-continuous collector and arterial network will allow many sub-regional trips to bypass the US 83 corridor to get between the origins and destinations. The result of bypassing the US 83 corridor is a lower level of 2030 traffic in the corridor than without the alternative routes.

Table 9 documents the level of traffic by US 83 segment that is diverted to the adjacent arterials and collectors. As can be observed through the information in the table, traffic volume in the US 83 corridor would be 1,500 to 12,000 vehicles per day higher without the collector and arterial network throughout the study area. Add this level of traffic to the corridor and the segment between 43rd Avenue and ND 1804 (71st Avenue) would exceed the capacity of even a 6-lane section.

TABLE 9: 2030 TRAFFIC FORECASTS WITH AND WITHOUT THE COLLECTOR AND ARTERIAL SYSTEM

US 83 Segment	2030 Average Daily Traffic		Difference
	Recommended Network	Existing Plus Committed Network	
I-94 to Century Avenue	72,100	72,100	0
Century Avenue to Calgary Avenue	55,400	59,400	4,000
Calgary Avenue to 43rd Avenue	45,400	53,400	8,000
43rd Avenue to 57th Avenue	45,000	57,000	12,000
57th Avenue to ND 1804 (71st Avenue)	25,700	33,700	8,000
71st Avenue/Hwy 1804 to 84th Avenue	18,300	21,300	3,000
84th Avenue to 97th Avenue	17,000	18,500	1,500
97th Avenue to 110th Avenue	14,200	14,200	0

Source: URS Corporation, Inc. 2006

ACCESS MANAGEMENT PLAN

The US 83 corridor is a key transportation corridor within Bismarck and Burleigh County and it also connects Bismarck to other North Dakota cities. In addition to serving an important transportation function, this corridor also serves as an access route to/from a primary commercial district within the city. US 83 is classified as a principal arterial and is intended to favor moving people and goods from one area to another over access to adjacent lands. As mentioned earlier, the US 83 corridor already has a high degree of access control. The access management recommendations for this study are listed below:

- Close the two of the three current private/field access points on US 83 when those parcels are redeveloped. These locations are displayed on Plates 4, 7, and 9 in the Appendix.
- Do not allow new private access points with the US 83 corridor and within the ND 1804 corridor. While 71st Avenue is not currently maintained by the NDDOT, in the 2030 Long Range Transportation Plan it is proposed to be an element of a north beltway connecting ND 1804 with 66th Street and ultimately to I-94. As a beltway the corridor's primary purpose would be to move goods and people across the northern portion of the metro area and would likely be classified as a principal arterial. Thus, as part of the overall planning process 71st Avenue should be addressed similar to US 83 and ND 1804 in that:
  - New access should be restricted to a minimum of quarter-mile spacing.
  - Requests for new private access points should not be granted.
  - Over time, existing private access points should be consolidated at common public access points or eliminated as requests for use changes occur.

  Within the US 83, ND 1804 and 71st Avenue corridors access to new developments or redevelopments should be provided on the minor cross streets.
- Maximum density (minimum spacing) of access points for each roadway classification are listed below:
  - Principal Arterial: Maximum density – quarter-mile spacing between access points and no private driveway access.
  - Minor Arterial (Section Line Roads): Maximum access density – eighth-mile spacing. Private drives would not be provided on new route segments, but current access points would likely not be recommended for closure unless their proximity would result in conflicts with major route junction operations and/or safety.
  - Collector: Maximum access spacing of eighth-mile. Private drives along collectors would be discouraged, but allowed if land access was not convenient from a local route.

US 83 CORRIDOR STUDY AREA SEGMENT AND INTERSECTION IMPROVEMENTS

Recommendations for the number of through travel lanes and intersection turn lanes are based on the forecasted peak hour traffic on both the US 83 mainline and each of the cross routes. These recommendations are focused on the US 83 corridor between Calgary Avenue and 110th Avenue, but the operations of US 83 intersections south of Calgary Avenue were also considered in developing these recommendations. Figure 12 displays the number of general purpose travel lanes for the recommended network. Based on the completed analysis, the following planning level corridor improvements are recommended:

- Expand the traffic signal cycle length from 90 to 120 seconds throughout the corridor. While this change will not dramatically improve operations for any one intersection when viewed in isolation, the change would result in corridor-wide operations improvements. Additionally, and probably more importantly, increasing the cycle length from 90 to 120 seconds will result in traffic progression improvements. The longer cycle length will provide for a wider progression bandwidth for both directions of travel along US 83.
- Extend the six-lane section on US 83 from Calgary Avenue to ND 1804 (71st Avenue). Through the operations analysis it was determined that through at least 2030 the intersections north of US 83/ND 1804 (71st Avenue) would operate at a LOS C or better with a four-lane US 83 cross section (assuming signalization of the one-mile routes).

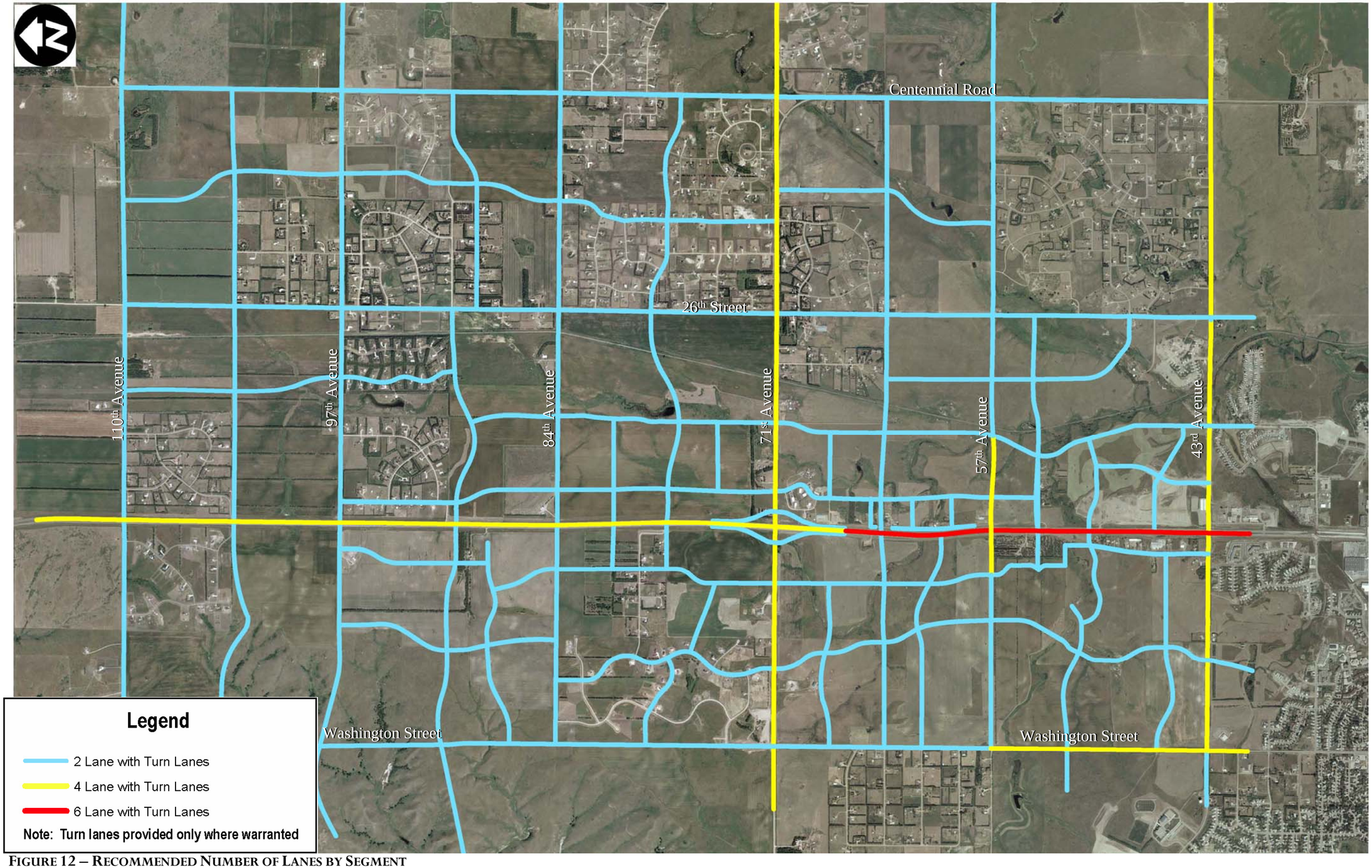


FIGURE 12 – RECOMMENDED NUMBER OF LANES BY SEGMENT

Typical intersection configurations for each roadway classification are listed below:

- US 83/Minor Arterial intersections: Left and right turn lanes should be provided on approaches to these intersections. Turn lanes should be built using NDDOT design standards, which reflect a minimum length of 330 feet, which is made up of a minimum of 50 feet for vehicle stacking and the remainder is for deceleration area. An additional taper length of approximately 240 feet is required to transition from the US 83 mainline through lane to the turn lane. Greater turn lane lengths may be required for higher volume intersections. Minor arterial routes include:
  - 43rd Avenue
  - 57th Avenue
  - ND 1804 (71st Avenue)
  - 84th Avenue
  - 97th Avenue
  - 110th Avenue
- US 83/Collector intersections: Left and right turn lanes should be provided on US 83 due to the high vehicle speeds along that corridor. As with the arterial system, turn lanes at intersections with collector routes should be to NDDOT design standards (more detail on the standards was provided in the previous bullet). Collector routes with junctions with US 83 include:
  - Calgary Avenue
  - Skyline Boulevard
  - LaSalle Drive
  - Brookside Drive
  - Oakfield Drive
  - 64th Avenue
  - 81st Avenue
  - 91st Avenue/Keith Drive
  - Kristen Lane
- Longer turn lanes may be required at higher volume intersections where stopped vehicles may queue beyond the standard left turn lane and taper length. In these conditions a deceleration lane length should be adequate to allow a vehicle to come comfortably to a stop prior to reaching the back of the expected queue.

- Specific intersection improvements beyond the typical are listed below:
  - US 83/43rd Avenue intersection: Widen 43rd Avenue to four lanes and provide dual left-turn lanes on the northbound and westbound approaches.
  - US 83/Skyline Boulevard intersection: Implement the recommended intersection lane configuration from the Wal-Mart traffic study.
  - US 83/LaSalle Drive intersection: Provide left and right turn lanes on LaSalle Drive. These turn lanes are needed due to the higher traffic resulting from adjacent commercial/retail developments.
  - US 83/64th Avenue intersection: Provide left and right turn lanes on 64th Avenue. These turn lanes are needed due to the higher traffic volumes associated with adjacent commercial/retail developments.
- Replace the at-grade signalized intersection at US 83/ND 1804 (71st Avenue) with an interchange. As an at-grade intersection, US 83/ND 1804 (71st Avenue) would operate at LOS D even with dual left turn lanes on each of the approaches. While LOS D operations may be tolerable/reasonably acceptable in the central city, through 2030 this intersection will be on the edge of the city and LOS D operations would likely not be acceptable. Upgrading the junction to an interchange would result in LOS B or better operations at the ramp terminal intersections. The six-lane US 83 mainline should begin/end at the south ramps of this interchange. The six-lane US 83 mainline would provide a safer environment for the southbound merge movement on US 83 between the on-ramp and the 64th Avenue intersection. Including the interchange in the corridor design concept would require elimination of the initially proposed US 83 access points at US 83/Northstar Drive and US 83 Highridge Drive. These proposed intersections would be too close to the interchange connections with US 83 to allow safe operations.

As shown in Figure 13, there are several interchange concepts that could reasonably be accommodated at the US 83/ND 1804 (71st Avenue) junction. The basic diamond interchange is the most common interchange type in North Dakota, however, the other interchange types may be a better fit with the current land uses. Additional evaluation of the specific interchange concept should be conducted as a first step toward implementation.

TRAFFIC SIGNAL COORDINATION

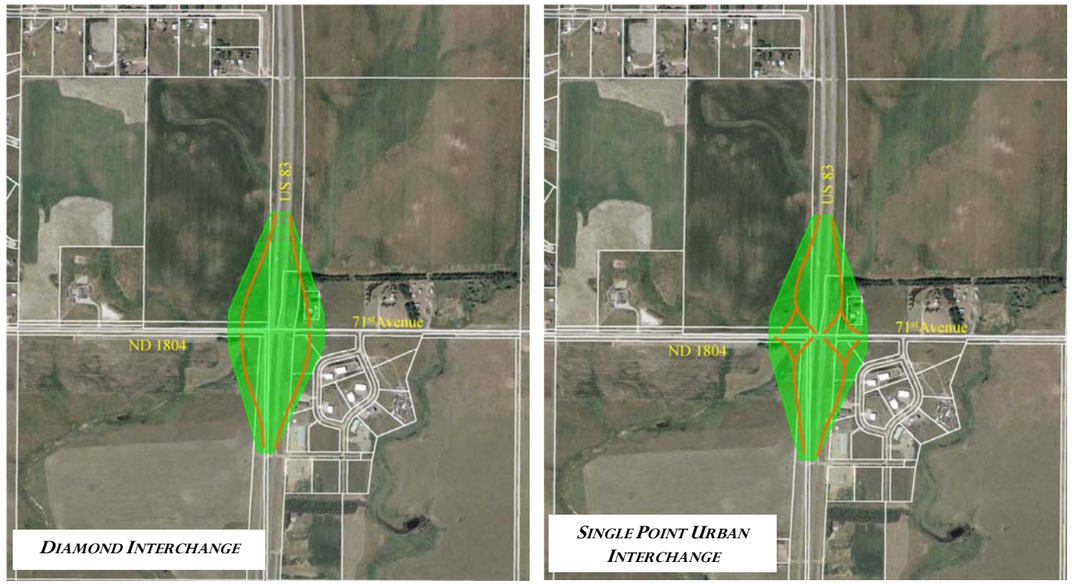
Traffic signal coordination is another key element that affects the throughput of the US 83 corridor. The number of traffic signals (i.e., signal density) plays a large role in coordinating traffic signals through the corridor. Increasing the number of traffic signals in the corridor has a detrimental effect on maintaining a high level of through traffic flow in the corridor. Maintaining cross route stop sign control at all presently unsignalized intersections, however, will not be acceptable as the area adjacent to the corridor develops. Thus, the goal for recommendations on signal density in the corridor will require striking an acceptable balance (but not necessarily equal) between accommodating access along the corridor and moving vehicles through the corridor.

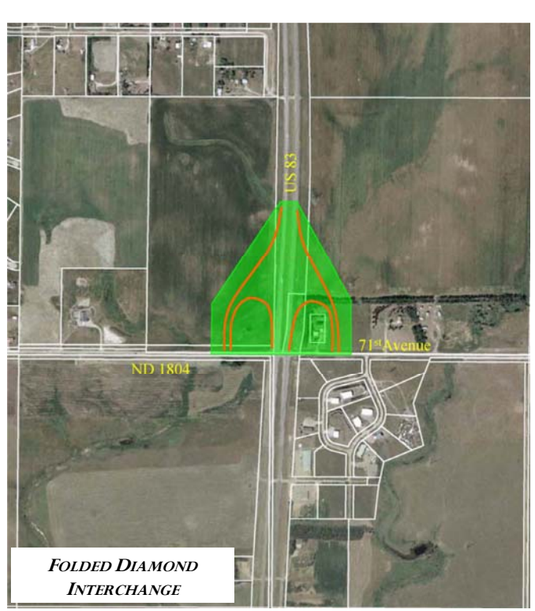
The ability for a vehicle to travel through multiple intersections without stopping, called progression, results from coordinated traffic signal timing along the corridor. The signal density (number of signals per mile) plays a key role in whether good/reasonable progression is obtained. The goal from this study is to determine a signal density and timing that allows vehicles to travel at least half of the corridor length without stopping, once they have entered the corridor. A detailed analysis of progression was conducted using unique ranges of signal density through the corridor, including:

- ¼ to ½ mile spacing south of ND 1804 (71st Avenue) to reflect the more urban density of development activity.
- ½ to one mile spacing north of ND 1804 (71st Avenue) to reflect the more suburban and/or rural density of development activity.

Based on the analysis results, the following recommendations are made regarding traffic signal control for the US 83 corridor:

FIGURE 13: INTERCHANGE ALTERNATIVES FOR US 83/ND 1804 (71ST AVENUE)





- North of 71st Avenue (ND 1804): One mile traffic signal spacing. The level of traffic on the collector routes is not so high as to result in excessive delay with two-way stop sign control. Establishing one-mile signal spacing results in the greatest opportunity to establish progression through this section of the corridor, while maintaining reasonable cross route traffic operations.
- South of 71st Avenue (ND 1804): Half mile traffic signal spacing. By 2030, traffic operations in the southern segment of this portion of the corridor are going to be marginal at best, even with a six-lane mainline US 83. Allowing traffic signals at each of the quarter mile access points would compound the issue
- Traffic signals should be installed only after meeting the applicable MUTCD traffic signal warrants.
- As development continues to occur through the US 83 corridor, the number of traffic signals can be minimized by ensuring the north-south collector routes (i.e. Halifax Street/Ottawa Street west of US 83 and Aurora Street/19th Street east of US 83) are completed concurrently with the development. These adjacent collector routes provide alternates for moving traffic between the signalized cross routes that connect to US 83.

FINDINGS OF THE TRAFFIC OPERATIONS ANALYSES

The results of the signalized and unsignalized intersection capacity analyses for the AM and PM peak hour are summarized in Tables 10 and 11. The 2030 Build condition analyses include the geometric and traffic signal improvements discussed in the previous sections. These tables also provide a comparison to Existing and 2030 No-build conditions. These tables only include the US 83 intersections between Calgary Avenue and 110th Avenue.

There are intersections that are projected to operate at LOS D or worse even with the proposed geometric and traffic signal timing modifications. The traffic volumes in the AM peak hour result in more intersections operating at LOS D or worse (i.e. high southbound directional volume associated with commuter traffic and little or no commercial development traffic). Traffic volumes along US 83 are more balanced in the PM peak hour.

The ramp junctions associated with the US 83/ND 1804 (71st Avenue) interchange are projected to operate at LOS C or better.

TABLE 10: SUMMARY OF 2030 BUILD TRAFFIC OPERATIONS - MORNING (AM) PEAK HOUR

Intersection	Scenario [1]	Overall	Intersection Approach [2]			
			EB	WB	NB	SB
US 83/Calgary Avenue	Existing	A	A	C	A	A
	2030 NB	F	B	D	C	F
	2030_B	E	C	D	C	F
US 83/43rd Avenue	Existing	B	B	C	A	B
	2030 NB	F	F	F	D	F
	2030_B	E	F	E	C	E
US 83/Skyline Boulevard	2030 NB	E	- -	C	A	F
	2030_B	A	- -	D	A	A
US 83/LaSalle Drive [3], [4]	2030 NB		F	F		
	2030_B	B	D	D	C	A
US 83/Brookside Lane [3]	Existing	n/a	- -			
	2030 NB		- -	F		
	2030_B		- -	F		
US 83/57th Avenue [3], [4]	Existing	n/a				
	2030 NB		F	F		
	2030_B	E	E	E	D	D
US 83/Oakfield Drive [3]	2030 NB		F	- -		
	2030_B		F	- -		
US 83/64th Avenue [3]	Existing	n/a				
	2030 NB		F	F		
	2030_B	B	B	D	B	B
US 83/71st Avenue	Existing	B	A	B	B	A
	2030 NB	D	C	F	B	B
	2030_B	A / A	A / A	A / A	- / C	C / -
US 83/76th Avenue [3]	Existing	n/a				
	2030 NB		F	F		
	2030_B		F	F		
US 83/81st Avenue [3]	2030 NB		C	F		
	2030_B		B	F		
US 83/84th Avenue [3], [4]	2030 NB		F	F		
	2030_B	A	C	D	A	A
US 83/91st Avenue/Keith Drive [3]	Existing	n/a				
	2030 NB		B	E		
	2030_B		B	E		
US 83/97th Avenue [3], [4]	Existing	n/a				
	2030 NB		E	F		
	2030_B	B	C	D	A	A
US 83/Kristen Lane [3]	Existing	n/a				
	2030 NB		B	D		
	2030_B		B	D		
US 83/110th Avenue [3], [4]	Existing	n/a				
	2030 NB		E	D		
	2030_B	A	C	D	A	A

Notes:
(1) 2030 NB = Year 2030 No-Build Condition; 2030 B = Year 2030 Build Condition
(2) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
(3) Unsignalized intersection
(4) Traffic signal provided for the Build scenarios.
* = Approach delay is projected to exceed 100 seconds.

TABLE 11: SUMMARY OF 2030 BUILD TRAFFIC OPERATIONS - AFTERNOON (PM) PEAK HOUR

Intersection	Scenario [1]	Overall	Intersection Approach [2]			
			EB	WB	NB	SB
US 83/Calgary Avenue	Existing	B	A	C	B	B
	2030 NB	F	B	C	F	F
	2030_B	C	C	D	C	B
US 83/43rd Avenue	Existing	B	B	B	A	B
	2030 NB	F	F	F	F	F
	2030_B	C	D	D	B	C
US 83/Skyline Boulevard	2030 NB	C	- -	C	D	A
	2030_B	B	- -	D	A	B
US 83/LaSalle Drive [3], [4]	2030 NB		F	F		
	2030_B	B	D	C	A	B
US 83/Brookside Lane [3]	Existing	n/a	- -			
	2030 NB		- -	F		
	2030_B		- -	F		
US 83/57th Avenue [3], [4]	Existing	n/a				
	2030 NB		F	F		
	2030_B	C	C	C	C	D
US 83/Oakfield Drive [3]	2030 NB		F	- -		
	2030_B		F	- -		
US 83/64th Avenue [3]	Existing	N/a				
	2030 NB		F	F		
	2030_B	B	C	D	A	B
US 83/71st Avenue	Existing	B	B	B	B	B
	2030 NB	C	C	D	D	B
	2030_B	A / B	A / A	A / B	- / B	C / -
US 83/76th Avenue [3]	Existing	n/a				
	2030 NB		D	F		
	2030_B		D	F		
US 83/81st Avenue [3]	2030 NB		C	F		
	2030_B		C	F		
US 83/84th Avenue [3], [4]	2030 NB		F	F		
	2030_B	A	C	D	A	A
US 83/91st Avenue/Keith Drive [3]	Existing	n/a				
	2030 NB		D	E		
	2030_B		D	E		
US 83/97th Avenue [3], [4]	Existing	n/a				
	2030 NB		E	F		
	2030_B	A	D	C	A	A
US 83/Kristen Lane [3]	Existing	n/a				
	2030 NB		C	C		
	2030_B		C	C		
US 83/110th Avenue [3], [4]	Existing	n/a				
	2030 NB		C	D		
	2030_B	A	C	C	A	A

Notes:
(1) 2030 NB = Year 2030 No-Build Condition; 2030 B = Year 2030 Build Condition
(2) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
(3) Unsignalized intersection
(4) Traffic signal provided for the Build scenarios.
* = Approach delay is projected to exceed 100 seconds.

RAILROAD CROSSINGS

The recommended arterial and collector system for the US 83 study area includes crossings of the Dakota, Missouri Valley and Western (DMVW) Railroad at the following locations:

- 43rd Avenue (Arterial) – At-grade crossing currently exists.
- Brookside Lane (Collector).
- 57th Avenue (Arterial).
- 64th Avenue (Collector) – At-grade crossing currently exists.
- 71st Avenue (Arterial) – At-grade crossing currently exists.
- 76th Avenue (Collector).
- 84th Avenue (Arterial) – At-grade crossing currently exists.
- Keith Drive (Collector).
- 97th Avenue (Arterial) – At-grade crossing currently exists.
- Kristen Drive (Collector).
- 110th Avenue (Arterial) – At-grade crossing currently exists.

Crossings at the identified locations result in a railroad crossing approximately every half-mile through the corridor study area.

The DMVW railroad line through this area is a low-volume track, carrying less than one train per day. Thus, it is unlikely that any of the identified crossings would warrant, at least through 2030, a grade separated crossing.

Determination as to whether a crossing is ultimately located along the listed routes will involve discussion between the City of Bismarck, Burleigh County, and the DMVW Railroad. The decision process should not be limited to reviewing the merits of a specific location, but should be completed as part of a comprehensive discussion of each of the existing and any proposed crossings through the county. Through this discussion an overall county master plan of where crossings should be placed to provide land access, to promote economic development, and to provide for reasonable emergency access to various current and proposed development areas should be developed. The focus of the US 83 Corridor Study relative to rail crossings has been to:

- Identify where crossings should be provided to support the land development concept.
- Provide a hierarchy of priorities as to which crossings should be addressed in the relatively near future and which crossings are lower priorities in the overall plan.

To accomplish this portion of the corridor study work, a set of guidelines for establishing the hierarchy has been developed, and are outlined below:

1. A higher priority should be placed on providing crossings along the section line roads/arterial corridors. Section line road/arterials are the primary feeder corridors between the regional facilities such as US 83, ND 1804 and I-94. Thus, they should provide continuity through the study area, which will require crossing of the railroad. Section line/arterial routes include 43rd Avenue, 57th Avenue, 71st Avenue, 84th Avenue, 97th Avenue and 110th Avenue. Of the section line/arterial crossings recommended, only 57th Avenue would need to be added, other crossings would likely require upgrading, but an at-grade crossing exists today.
2. Half-mile collectors will be critical support corridors for emergency access and egress from adjacent development areas. Thus, they should be considered next in the overall importance for crossings. These routes include Keith Drive and Kristen Drive.
3. Quarter-mile collectors. Within the study area a crossing of the DMVW Railroad at Brookside Lane is included in the recommendation and it represents the only quarter-mile route crossing proposed. Brookside Lane is located directly north of the Wal-Mart commercial development between 43rd Avenue and 57th Avenue. The primary assumption associated with recommending the crossing was that the Wal-Mart anchored retail development will be a substantial trip generator and the primary service area would include the residential areas east of 26th Street. Including the continuous collector route along Brookside Lane would provide a support route to 57th Avenue (proposed as a two-lane corridor) and 47th Avenue (proposed as a four-lane corridor) between the high-intensity retail development along US 83 and the residential area.

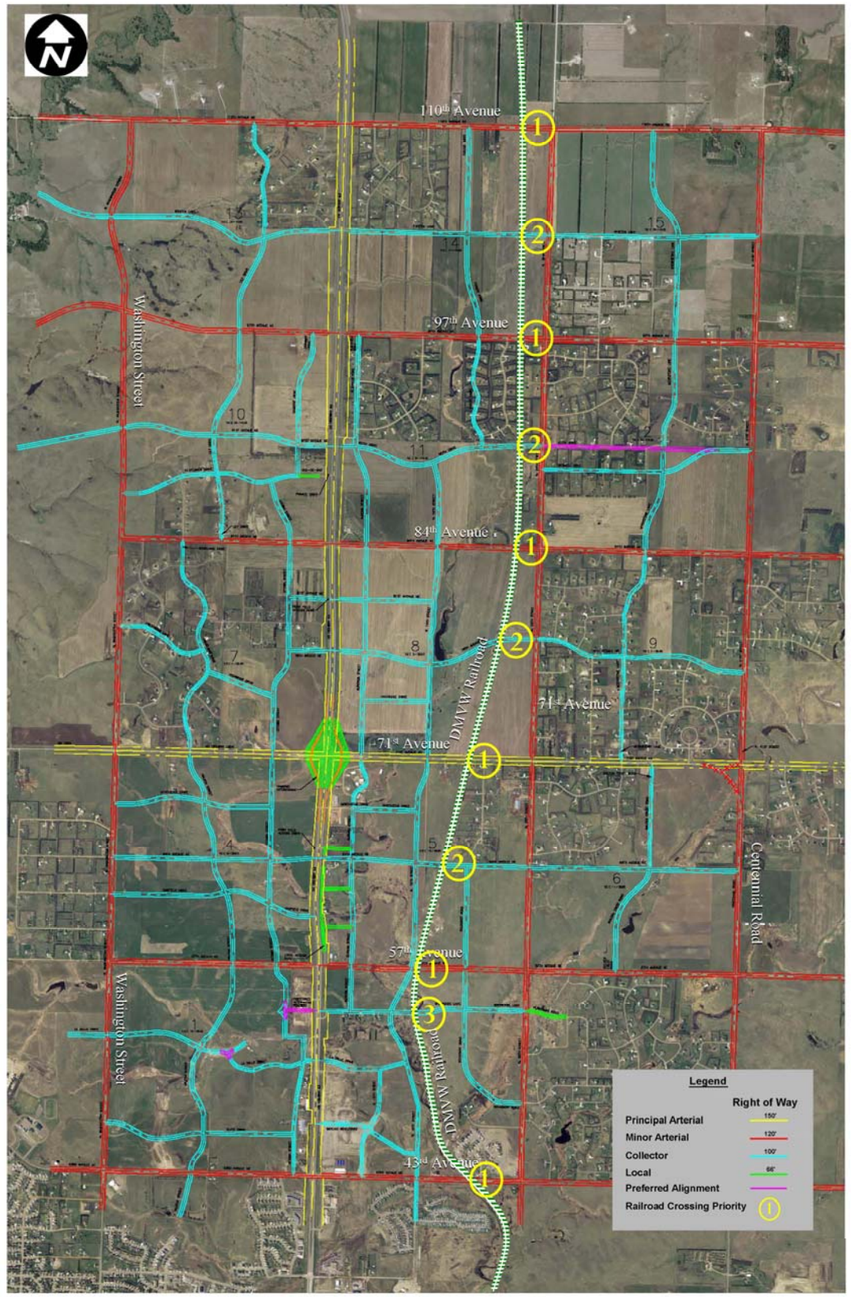
The recommended locations for crossings of the DMVW Railroad are displayed in Figure 14. Included in the figure are the priority placed on development of each of the recommended crossings.

As with roadway intersections, traffic control at railroad crossings should also be considered as a part of an overall engineering study. The range of control alternatives for roadway/railroad traffic junction has been incorporated into the Manual on Uniform Traffic Control Devices (MUTCD). The manual includes concept of passive (stop and yield signs) and active (flashing beacons, lights, warning arms, etc.) control. The recommended control, which is outside the scope of this planning study, will be a function of the train volume, vehicle volume and estimated vehicle operating speed.

The DMVW Railroad line through the study area currently carries a relatively low volume of traffic; less than one train per day on average. The combination of train volume, roadway vehicular volume and estimated train and roadway vehicle speeds represents conditions where Stop control on the roadways would not be recommended. In general, Stop control for a railroad crossing is applicable in low train volume, low roadway vehicle volume, and multiple track conditions. While today most of the roadway volumes are low, through the 2030 planning period traffic volume on each of the roadways included in the recommended plan will be considerably higher than today.

As part of a detailed engineering assessment for any of the roadway routes that include a railroad crossing, the feasibility and need to incorporate active control devices should be assessed.

FIGURE 14: RECOMMENDED DAKOTA, MISSOURI VALLEY AND WESTERN RAILROAD CROSSINGS



Development Guidelines

The US 83 study area has a significant amount of undeveloped land with many areas proposed for development. In addition, with the types and intensities of development occurring in the corridor area, many of the currently developed lower density areas are primed for redevelopment. As part of the efforts of conducting the US 83 Corridor Study, there were extensive discussions with staff and the public regarding the role US 83 plays, or should/could play, in the fabric of the Bismarck/Burleigh County community. Descriptions of the corridor role included:

- Regional connection between Bismarck and outside the metropolitan area.
- Commercial corridor for the north end of the community, similar to the role that Bismarck Expressway plays on the south end.
- Freight movement corridor as US 83 provides access to I-94.
- Commuter route between rural/suburban residential areas and the Capitol complex, downtown office activity centers and downtown medical facilities.

The intent of the overall land use concept for the US 83 study area is to provide a general idea as to the type and intensity of development within the study limits. It is not intended to provide detailed information regarding the layout/platting pattern of a particular development. As the corridor is considered to be a gateway to Bismarck, it should reflect positively on the Bismarck community. The US 83 Corridor Study has been identified as the process in which the idea of establishing the look of the corridor is to be initiated. To that end, one of the project tasks was to develop a set of design guidelines for development within the corridor area. The design guidelines are intended to be a blueprint of ideas and general concepts of how the parcels within the corridor could be developed to support the definition of a gateway corridor. Elements included in this section are:

- Design guidelines: Design principles provided in a narrative and pictorial format describing ideas of the feel, look, and character intended to be provided in the area.
- Concept plans for selected nodes: The intent of the design guidelines is not to complete a microscale concept design for the entire study area. The detailed design should be left to land owners and developers to select within the general parameters of the design guidelines, subdivision regulations and the zoning ordinance. Selected nodes include:
  - ND 1804 neighborhood commercial corridor.
  - Washington Street/43rd Avenue neighborhood commercial and residential node.
  - ND 1804 industrial node.

Design Guideline Principles

The purpose of this section is to document the general principles that can be applied in defining the ideas of the desired look and feel of the gateway corridor. The principles are intended to very broadly describe ideas for the areas, not be a set of rigid standards. Application of the principles will require interpretation based on the individual site characteristics, site development potential, the surrounding circulation system, adjacent land use and development patterns, and the goals of the individual area plans.

The guidelines have been developed through defining a series of principles, which are outlined below:

- Principle 1: Define the character of the major corridors.
- Principle 2: Encourage concentrated mixed-use developments.
- Principle 3: Promote context sensitive solutions.
- Principle 4: Create meaningful places.
- Principle 5: Maintain circulation networks.

Principle 1: Define the Character of the Major Corridors

The character of a major corridor is typically defined by the width of the right-of-way, the intensity of the streetscape treatment such as streets, street and pedestrian level lighting, landscaping, street furniture and the number of access points. The US 83 corridor reflects the following characteristics:

- ***Auto-Oriented:*** Traditionally, auto-oriented corridors have been characterized as sterile routes providing ingress/egress points to large surface parking lots in front of larger, typically single story buildings setback from the roadway. Access to/from the parking areas may be provided from a frontage road adjacent to the major route or directly from a site driveway to the major route. As defined, the vast majority of the persons patronizing the adjacent developments arrive by automobile.

  Streets and roadways with less intense streetscaping and relatively wide right-of-ways generally characterize the auto-oriented corridor. Streetscape treatment generally include relatively narrow sidewalks (6 feet wide) and higher street level lighting with minimum pedestrian level lighting. Most often, at major intersections the streetscape intensity expands to a more moderate treatment with well-marked and wide crosswalks, some pedestrian level lighting, wayfinding signage, and other street amenities. As a result, the intersections become the focal point with the segments between the intersections geared more to moving traffic.

Example of a traditional auto-oriented street with median plantings

  Within the study area characteristics of an auto-oriented corridor can be seen along most of US 83 and sections of 43rd Avenue.

  For the US 83 corridor, the concept of an auto-oriented street can softened considerably through making what can be characterized as relatively minor adjustments to the traditional concept. These are intended to allow for a similar, or even greater, intensity of adjacent development, but are focused on improving the aesthetics of the corridor for auto travelers and pedestrians. An added benefit is that the adjustments have the potential to also improve pedestrian safety through better separation of pedestrian and auto traffic. The proposed auto-oriented corridor associated with the US 83 gateway is characterized by the following:

- More extensive streetscaping along the segments connecting the intersections.
- Backage roads that are setback from the major street by approximately ¼ mile. Relative to a directly adjacent frontage road, backage roads provide the potential for development on both sides of the route.
- The majority of the off-street parking would continue to be located in front of adjacent buildings, but the orientation of the building would be such that parking is shielded from view of US 83 or other adjacent major route.
- Along selected corridors, buildings would be located closer to the roadway right-of-way to provide a greater feeling of activity.
- Wider sidewalks/multi-use paths of up to approximately 10 feet adjacent to, but set back from, the roadway.

AUTO-ORIENTED CONCEPT ENVISIONED FOR ROUTES IN THE US 83 CORRIDOR

- ***Transitional:*** Often characterized as a smaller scale than an auto-oriented corridor, these corridors serve to provide a transition between auto-oriented uses and pedestrian-friendly uses. This characteristic sometimes occurs along the same corridor. Development along a transitional corridor generally consists of strip center development, which tends to be oriented to vehicles, but is also pedestrian friendly. In the study area, this type of street can be seen along certain sections of 43rd Avenue and portions of Washington Street located south of Century Avenue.

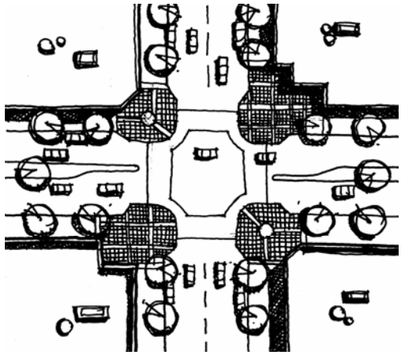
EXAMPLE OF TRANSITIONAL STREET CHARACTER - WITH PARKING, SIDEWALK, AND BOULEVARD PLANTINGS

Amenities associated with a street of this type of generally include on-street parking, a narrow planting strip/boulevard, a sidewalk (6 feet), and a planting buffer up to the right-of-way.

Off-street parking for commercial uses along a transitional street would continue to be located in front of the buildings, but the orientation of the building should be such that larger portions of the parking are shielded from view of the roadway.

PRINCIPLE 2: ENCOURAGE CONCENTRATED MIXED-USE DEVELOPMENTS

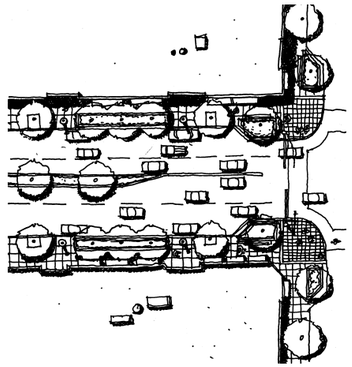
The intent of the development guidelines is to promote orderly development in the study area. Throughout the study area, concentrated mixed-use and multi-use developments will be strongly encouraged since they provide land use flexibility, promote pedestrian activity, and reduce the need for individual development surface parking. Mixed-use and/or multi-use developments generally result in increased pedestrian activity as patrons walk between multiple errand destinations accessed in a single vehicle trip.



USES AT CORNERS CREATE PEDESTRIAN ACTIVITY

Large single-use and single story buildings (over 50,000 square feet) on large parcels should be discouraged or minimized. If larger homogeneous uses are proposed, liner shops (shallow storefronts designed to line the edge of a larger building or parking lot) should be encouraged.

While reducing the transportation impacts associated with land development should be a consideration in all projects, mixed-use developments generally provide a combination of activity types that are complementary to transit use. Thus, when considering mixed-use development, mixed modes of travel (transit, pedestrian, bicycle and auto) should also be considered. To encourage non-auto modes, bus stops should be located near development parcels, especially public and semi-public uses and gathering places (post offices, plazas, parks, etc.). Incorporating sidewalks adjacent to the corridors will also support pedestrian activity, enhance community focal points and to provide accessibility.



BUILDING TO STREET RIGHT-OF-WAY AND PROVIDING SIDEWALKS ENHANCE THE PEDESTRIAN EXPERIENCE

Ideally in a true mixed-use development, ground floor uses should support higher volumes of pedestrian traffic with office and residential uses on the upper floors. While this type of development product is not very prevalent outside of downtown Bismarck, the concept may have some marketability in the study area. Should mixed-use developments be pursued, it is likely that it would more successful if it were concentrated along major transportation routes or at major intersections, rather than spread throughout the study area. In selected nodes adjacent to pedestrian corridors, placing buildings adjacent to the transportation

SINGLE USE BUILDING WITH STREETSCAPING IMPROVEMENTS

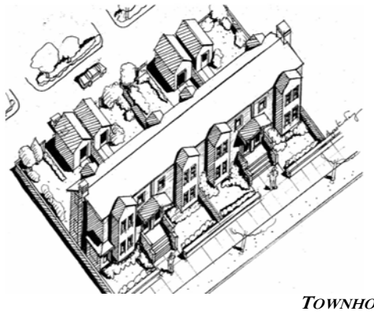
right-of-way and directly adjacent to sidewalks has the potential to increase pedestrian connection to the building activity.

In neighborhood commercial areas such as the intersections of Washington Street/43rd Avenue and the ND 1804/Washington Street, the retail land uses should be focused on serving the needs of the adjacent residential and proposed office developments and the surrounding neighborhoods. Restaurants, cafes, convenience stores, and small offices are examples of uses that work well in neighborhood commercial. If possible, residential units over ground floor use should be encouraged. To increase the pedestrian amenities, neighborhood commercial node development plans should include plazas and pedestrian refuge areas.

PRINCIPLE 3: PROMOTE CONTEXT SENSITIVE SOLUTIONS

Based on land area, the majority of current uses in the study area are agriculture, open space or conservation areas. Most of the developed area is located south of 43rd Avenue. The built form in areas south of 43rd Avenue tends to have varied architectural style, a mixture of natural stone and man-made building materials, and a combination of muted and earth tone colors. While these design elements may not provide all of the design variety desired, it is recommended that new developments consider the current adjacent built forms and features. Maintaining complementary design types helps enhance a functional environment and create a continued physical attraction to users. As an alternate, developers may incorporate a regional architectural motif into new developments. If none of these design elements are available the following are examples of treatments that could address the area's design requirements.

APARTMENT BUILDINGS



TOWNHOMES

PRINCIPLE 4: CREATE MEANINGFUL PLACES

Meaningful places are found among traditional commercial development patterns and are generally more prevalent in areas with a mixture of uses and pedestrian scale environments. Newer development areas that are sensitive to the surrounding development patterns have been successful at creating meaningful places. The following images display some typical design elements that have been used successfully to fulfill this principle and could be applied in new development proposals.

BUILDINGS WITH ENHANCED STREETSCAPING AND EXTERIOR AMENITIES (IN THIS CASE AWNINGS) PROVIDE ANCHORS

OUTDOOR CAFÉ CREATES ACTIVITY

Creating meaningful places involves adopting the built form characteristics, including:

- **Mix of Building Heights:** Mixing building heights helps to increase density without overwhelming adjacent lower density developments such as single-family neighborhoods. The mixture of heights assists in providing a seamless transition from the commercial to the adjoining residential uses. A mixture of building heights also creates a more urban environment and a pleasant image. In some commercial nodes, new buildings may be higher than two stories to establish landmarks and provide focal interest.
- **Building Massing and Façade:** Massing and façades of new buildings should be articulated to create visual shapes and increase aesthetic qualities. Articulation of the buildings massing can include staggered building components and accentuated or recessed entryways. A monotonous building massing and façade would typically be unattractive for many investors and in the gateway area the condition should be avoided.

  Façade amenities could include arcades, canopies, awnings, special window reveals and frames, unique details and ornamentation. The façade amenities can enhance the building appearance and provide shelter for pedestrians. Adding simple features such as dormers could increase visual variety.

ONE STORY BUILDING WITH SIMPLE EXTERIOR TREATMENTS/STREETSCAPING

- **Building Transparency:** Building transparency is a measure of how open to the outside that a building feels and is generally tied to the amount of glass incorporated into the pedestrian level design. The amount of building transparency can influence the street level pedestrian friendly characteristics. Buildings with more than 50 percent of their exterior area made up of glass generally provide people with a positive connection to the outside, even while inside the structure. Conversely, providing more glass on the exterior at ground level is generally found to improve the connectivity with pedestrian flow.
- **Signage**: Business signage in a development provides landmarks for branding the area, wayfinding for travelers and accessibility to and from properties. The signage scale should be compatible to the surrounding building height.

EXAMPLE OF DUAL FUNCTION SIGNAGE

EXAMPLE OF FRANCHISE SIGNAGE THAT IS CONTEXT SENSITIVE

EXAMPLE OF SIGNAGE ADVERTISING MULTIPLE BUSINESSES

- **Building Materials:** Building materials can go a long way in defining the importance that an area represents in the community. For the gateway corridor, materials should express permanence, vibrancy, and be inviting. Materials should be limited to brick, stone, architectural concrete or precast concrete. Manufactured steel façade buildings and plain concrete surfaces should be excluded from the gateway corridor.

EXAMPLE OF EARTH TONE COLORS BUILDINGS

EXAMPLE OF CONCRETE WITH ARCHITECTURAL INTEREST

- **Landscaping:** The use of plantings provides several benefits within a development including providing interest, landmarks for the area, shade, buffers between uses, stormwater management, and screening. Effective use of plantings can maintain safety for all and enhance the character of the development.

EXAMPLE OF LANDSCAPE SCREENING BETWEEN PARKING AND A MAJOR STREET

EXAMPLE OF PARKING LOT PLANTINGS

- **Lighting:** Lighting provides safety, enhances the architectural features and improves the overall development image. Various levels of lighting should be employed to include street, pedestrian and building lighting.

EXAMPLE OF PEDESTRIAN LEVEL LIGHTING

EXAMPLE OF PARKING LOT LIGHTING

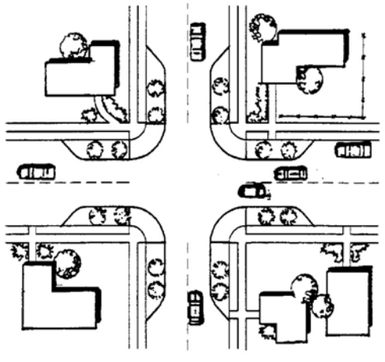
EXAMPLE OF PARKING LOT LIGHTING

EXAMPLE OF STREET LIGHTING AT INTERSECTION

PRINCIPLE 5: MAINTAIN CIRCULATION NETWORKS

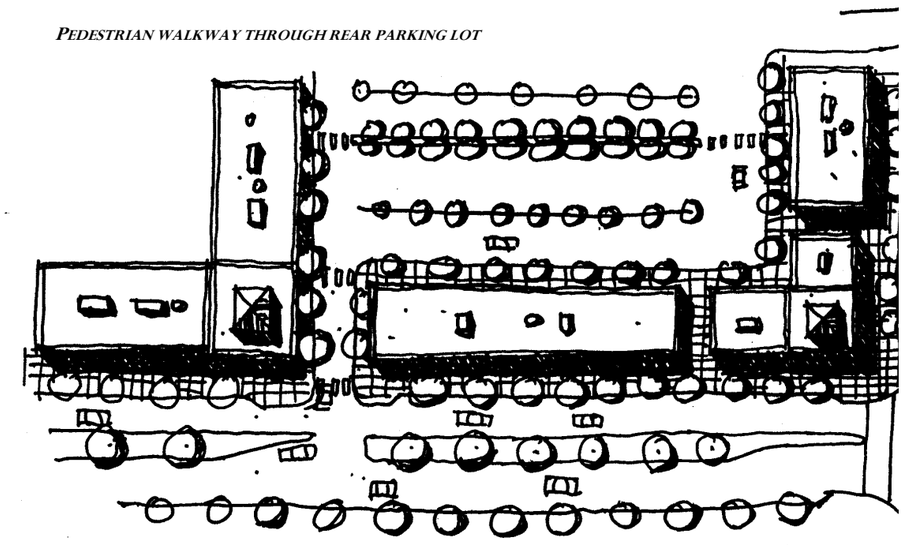
A safe circulation network is crucial to ensuring that commercial districts remain successful. As development occurs and pedestrian and auto traffic are intermingled, safety for all users must be considered. Proper integration of street design, land use and building form can reduce auto-to-auto and auto-to-pedestrian/bicyclist conflicts. Traffic calming devices such as neck-downs and bulbouts help slow traffic and improve pedestrian safety at intersections. Related circulation system elements that should be considered in the design guidelines include:

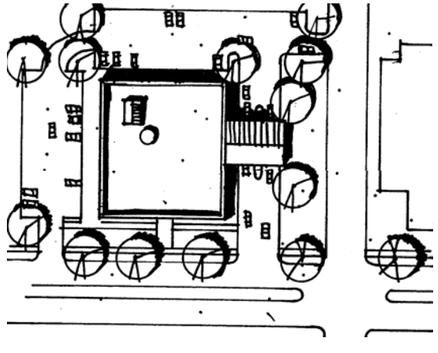
- Internal parking should be landscaped to soften the appearance, provide shade and address development related stormwater issues.
- Parking lots along the lot perimeter should be screened from the sidewalk and street with hedges or low walls consisting of materials similar to adjacent buildings.
- When feasible, parking area circulation and location should allow for separation of pedestrian flow and vehicle circulation patterns to reduce conflict.



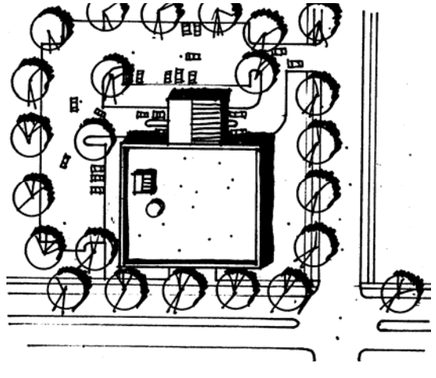
EXAMPLE OF A NECKDOWN

PEDESTRIAN WALKWAY THROUGH REAR PARKING LOT



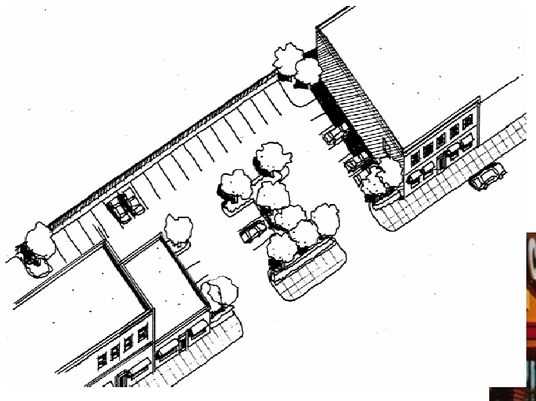


DRIVE-THOUGH ACCESS CROSSING MAIN SIDEWALK – UNDESIRABLE



DRIVE-THROUGH PLACED AT REAR OF BUILDING - DESIRABLE

SIDE PARKING WITH LANDSCAPING



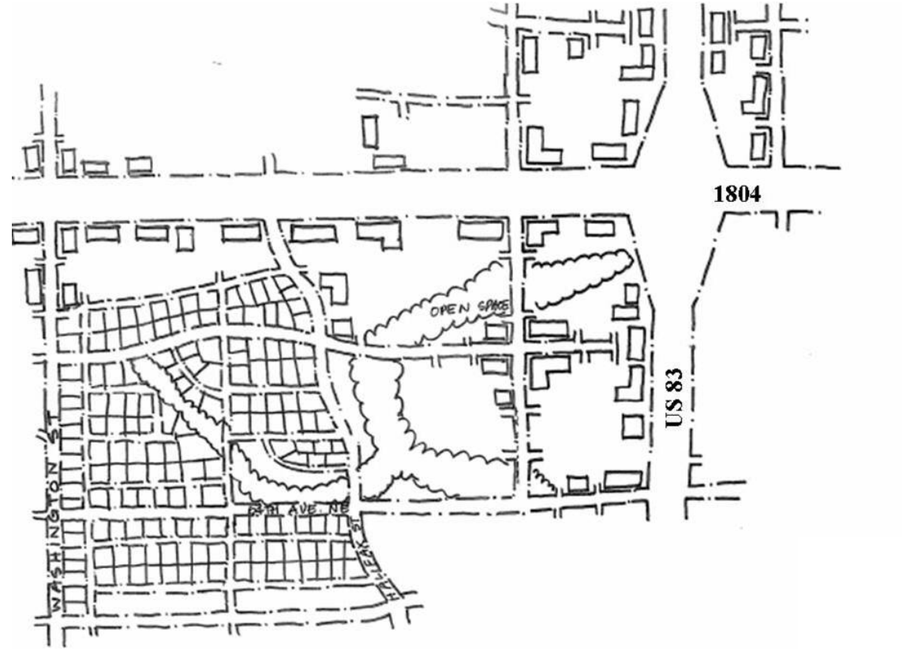
WIDE SIDEWALK AND STREET FURNISHINGS

CONCEPTUAL SUB-AREA PLANS

ND 1804 CORRIDOR CONCEPT PLAN

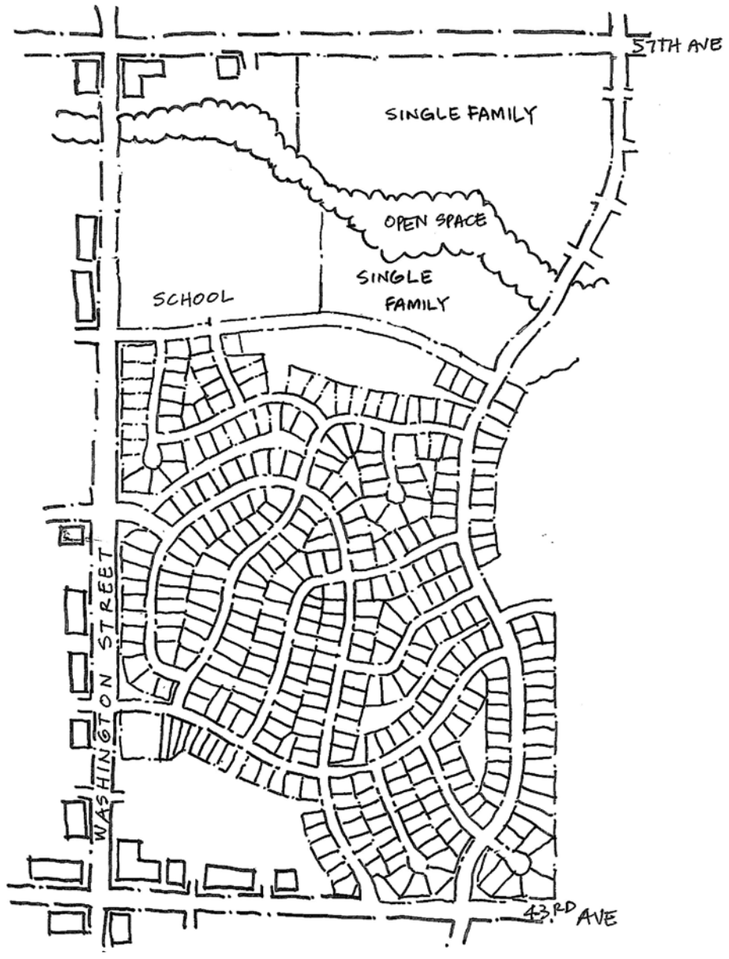
This sub-area plan covers the ND 1804 corridor between Washington Street and US 83. Proposed uses include a neighborhood commercial development at the Washington Street/ND 1804 intersection, infill mixed-use along ND 1804 and commercial development along the western side of US 83. It is anticipated that the junction of US 83/ND 1804 will be improved to an interchange to provide safety and traffic circulation efficiency. Green space is reserved along the natural drainage, steep slopes and areas identified in the Bismarck Park and Recreation District's Parks and Open Space Plan. Similarly, residential development is identified for areas in the southeastern quadrant of the ND 1804/Washington Street sub-area plan. Access along ND 1804 between US 83 and Washington Street would be limited to quarter mile spacing, as is displayed in the following subarea concept plan.

ND 1804 CORRIDOR: US 83 TO WASHINGTON STREET



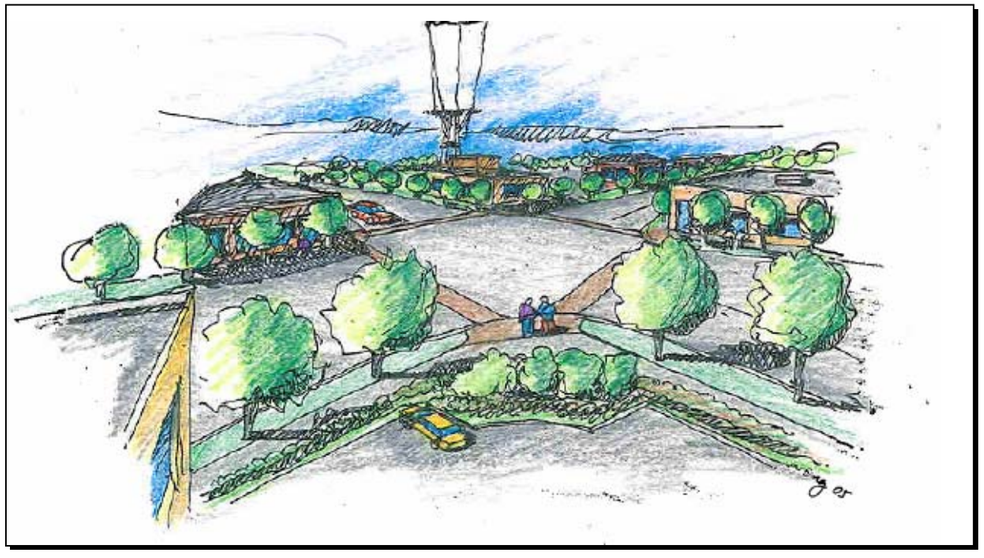
WASHINGTON STREET/43RD AVENUE SUB-AREA PLAN

This subarea plan focuses on the area between 43rd Avenue and 57th Avenue along Washington Street. It is anticipated that neighborhood commercial development will occupy the areas at the intersections of Washington Street/43rd Avenue and Washington Street/57th Avenue. Residential development will likely make up the building form along portions of the eastern side of Washington Street, while mixed-use development is planned for the western edge. The Bismarck School District has purchased a parcel along the east side of Washington Street between Canada Avenue and 57th Avenue. Areas of steep slopes and natural drainage should be reserved for parks and open space as identified in the Bismarck Parks and Recreation District's Parks and Open Space Plan.



WASHINGTON STREET CORRIDOR: 43RD AVENUE TO 57TH AVENUE

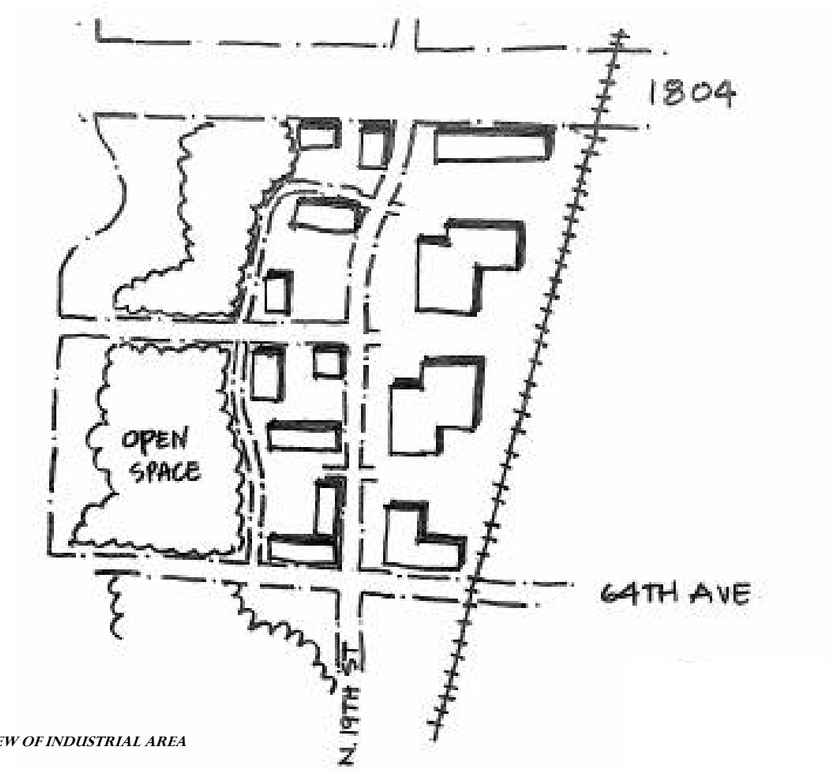
VIEW OF STREETSCAPE ALONG WASHINGTON STREET



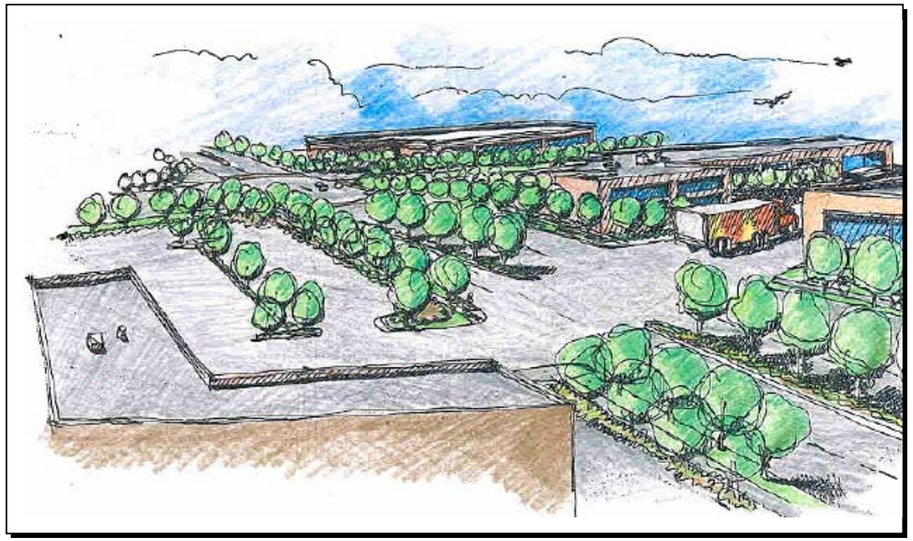
VIEW OF STREET INTERSECTION – WASHINGTON STREET/57TH AVENUE

71ST AVENUE INDUSTRIAL DEVELOPMENT SUB-AREA PLAN

This sub-area plan occupies the area west of the Dakota, Missouri Valley and Western Railroad between 71st Avenue and 64th Avenue. It is anticipated that industrial uses will be developed adjacent to the railroad with a potential railroad spur to the buildings. Road access will be along 19th Street, which is anticipated to be a landscaped corridor. Additionally, mix-use development will occur along the western portion of 19th Street. Green space and natural drainage will be preserved adjacent to the mix-use development.



VIEW OF INDUSTRIAL AREA



71ST AVENUE INDUSTRIAL CORRIDOR

BENEFITS OF DEVELOPMENT GUIDELINES

When successfully implemented, the development guidelines identified above and embodied in the sub-area plans can provide positive returns on the public and private investment and can sustain the economic growth of the corridor. Development guidelines benefits include the following:

- **Provide standard and uniform urban design treatments:** A standard set of urban design elements that addresses the development and physical character of the corridor and the surrounding development districts can reduce conflicts between design elements. The corridor could benefit from an established set of applicable standards to guide new development and redevelopment of specific parcels.
- **Catalyst for new development:** Initiation of the process of implementing the corridor vision through preparation of a set of development guidelines has the potential to attract new development to the area. The actions provide a catalyst that many developers need to launch plans that they may have. As the guidelines will likely raise the bar for the quality and character of development in the corridor, they can assist in directing development to particular areas of the community.
- **Ensure meaningful reinvestment:** With the development guidelines providing a blueprint for the area, existing businesses are more likely to reinvest in improving the physical features of their businesses. Redevelopment and reinvestment into existing developed parcels has been observed in other communities following establishing development guidelines because current property owners can see the overall plan for additional commercial, industrial and residential opportunities and competition in the study area.

- **Increase safety and security:** The development guidelines and the urban design elements such as pedestrian lighting, traffic calming, and treatment of the various streets in the study area will increase safety and security for pedestrians and drivers alike.
- **Create a pleasant urban environment:** Implementing the development guidelines will help in creating a pleasant urban environment in key areas and provide distinctive functions along the US 83 corridor. It will also improve the overall character of the study area, enhance the quality of life and attract new investment.

Land Use Implementation

The adoption of this plan will provide a shared basis for decision-making by city and county officials, community residents and existing and potential developers, and will aid city/county staff in ensuring that each individual project fits within a larger shared vision. The following sections contain the recommended implementation strategies.

Comprehensive Plan Designations

Gateway Corridor District

Although the entire study area will develop over time as municipal services are extended, the first step in the process should be to designate a Gateway Corridor District along US 83. The district should encompass areas north of Calgary Avenue through 110th Avenue, extending approximately a half mile east and west of US 83. Land uses within this corridor will encompass a range of uses: commercial, office, light industrial, low-density residential, high-density residential, open space, and a range of mixed-use combinations.

Neighborhood Commercial Nodes

In order to create opportunities for commercial uses and provide activity centers for community residents outside of the gateway corridor district, neighborhood commercial nodes should be designated at several intersections. Candidate locations are shown in the land use concept plan and include the intersections of:

- 43rd Avenue NE/Washington Street.
- ND 1804/Washington Street.
- US 83/97th Avenue.
- US 83/84th Avenue.
- 71st Avenue /Centennial Road.

Potential uses include lower-density office and smaller-scale retail centers that are focused on providing services for the adjacent residential areas. The CA Commercial District and the RT Transitional District may be the most appropriate

Zoning and Other Ordinance Changes

If desired, the guidelines could be codified into ordinance standards, or could simply be referenced in the zoning ordinance.

Mixed Use

The term mixed-use generally includes a range of integrated uses within a single structure, with ground-floor commercial or office uses and residential or office uses on upper floors. Mixed use can also be represented by a variety of uses in separate but related buildings within a single development parcel or a block. The city currently does not have zoning districts designed specifically for mixed-use, although the PUD, Downtown Core (DC) and Downtown Fringe (DF) districts allow a variety of residential uses, from single-family to multi-family, in conjunction with retail, office and institutional uses.

In order to promote an attractive, vital environment with a high degree of interrelationship among uses, a mixed-use district should typically include the following elements:

- Standards and criteria to ensure selected land uses are compatible.
- Requirements for a minimum level of diversity in larger projects – for example, developments of more than 2 acres (or a similar threshold) in size must include more than one land use or housing type.
- Requirements for a minimum percentage of open space in larger projects. Five to 10 percent of the parcel area is a typical acceptable range for open space, which would allow for public plazas or other amenities. Within the gateway corridor, stream valleys should be protected and enhanced as open space in mixed-use or commercial developments. Open space should be defined as urban or natural/recreational areas; consistent with the Park and Recreation District's Parks and Open Space Plan.
  - *Urban Open Space* – Urban open space, public or private, is categorized as areas in an urban environment that are accessible by all persons and may contain improvements such as walls, benches, landscaping, fountains, walkways, etc. Urban open spaces typically provide focal points to a district or development. Examples of urban open space are squares, parks, courtyards, greenbelts and plazas.
  - *Natural or Recreational Open Space* – These areas are open spaces that preserve existing natural and cultural features, and other sensitive areas such as wetlands, creeks, floodways, and wildlife habitat. Due to its delicate environment and to preserve its natural value, greater flexibility and creativity in design of adjacent developments are encouraged. Natural or recreational open spaces should have limited improvements and should contain only passive type activities such as walkways, trails, and scenic overlooks.
- Requirements for a minimum level of intensity in larger projects, expressed through a minimum floor area ratio, density or height. For example:
  - Minimum floor area ratio (FAR) of 1.0.
  - Minimum height of 1.5 or 2 stories.
  - Minimum density of 10 to 15 units per acre on lots fronting collector or arterial streets.

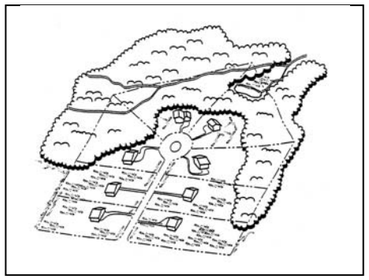
The elements that will aid in providing for mixed use flexibility that should be addressed in the community include:

- Flexibility in development standards to encourage small-scale mixed-use buildings compatible with surrounding residential areas.
- Design standards to ensure a pedestrian-oriented environment and de-emphasizing the appearance of parking relative to building facades. The principles and development guidelines in the US 83 Corridor Study offer a starting point.
- Design standards that regulate building materials, to ensure that attractive and high-quality materials predominate, as discussed in the Development Guideline section of this report. Materials standards could be used to prohibit certain materials, such as sheet metal or bare concrete, or to encourage or require materials such as masonry.

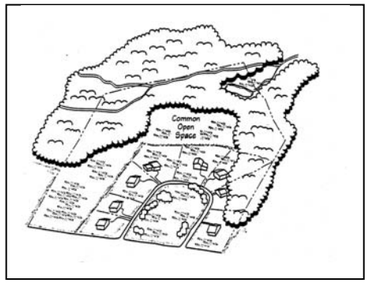
CONSERVATION DESIGN ("CLUSTER") DEVELOPMENT

Conservation design, sometimes called 'cluster development' is a technique for open space preservation on a parcel-by-parcel basis. In a conservation subdivision, houses are clustered on relatively small lots, while the remainder of the site is protected as open space. Essentially, conservation design concentrates allowed density on the most suitable portions of a site, while protecting sensitive natural features and, in some cases, productive farmland. Advantages of conservation design include:

- Greater design flexibility in siting houses and other development features such as roads and utilities. Frequently the length of roads and utility runs can be reduced, and the amount of site clearance minimized.
- Preserving scenic views and reducing the visual impact of new development by maintaining landscaped buffer areas along roads.
- Providing housing units with direct visual and physical access to common open space.
- Creating environmental corridors by connecting open space between adjacent properties.
- Allowing for continuation of agricultural uses, where these can be adequately buffered from nearby residential uses.
- Allowing active and passive recreational use of common open space by residents and/or the public.



Conventional development, above, consumes the entire parcel with house lots, while conservation design, below, protects natural features and provides residents with common recreational areas.



Conservation design could be used within the gateway corridor to protect the stream valleys that wind through the corridor, or to provide neighborhood parks or playfields for residential neighborhoods. Protected open space in a conservation subdivision is typically placed under a conservation easement, to ensure that it remains undeveloped. It can be managed by a homeowners' association, land trust or (if used as public parkland) by a government agency.

The general ideas promoted in conservation design would be allowed through the current PUD designation, but not in any other residential district. It is recommended that the concepts/ideals of conservation design be considered as an option in one or more residential districts. Through allowing the concept to influence conventional lot layout, additional flexibility can be provided in order to protect natural resources or provide open space amenities. At a minimum, conservation design should be considered within the US 83 Corridor Study project area.

SIGN REQUIREMENTS

The city currently does not regulate signage in the zoning ordinance. Signs are regulated as part of the Building Regulations (Chapter 4-04) of the City Code. Size and area limits for signs apply only to signs within residential districts and the central business district (CBD). Placing reasonable limitations on sign size and height, and on the number of signs per building or property, can upgrade the appearance of a commercial corridor, and can prevent or alleviate the visual clutter that frequently occurs when signs are unregulated. The city should consider standards for signs within the gateway corridor, and other commercial or mixed use corridors as appropriate. Sign standards could include the following:

- Provisions for projecting signs in mixed use or commercial districts (similar to what is currently done within the CBD).
- Size limitations for wall and roof signs, consistent with the environment in which they will be viewed (i.e. highway, local street or sidewalk).
- Height limitations for pole signs, consistent with their environment.
- Limitations on the size and spacing of off-premises advertising signs, which are generally restricted to regional highways, not developed commercial corridors.
- Prohibition of certain sign types that have been found to be particularly distracting to motorists, such as signs that give off an intermittent or rotating beam of light or give the illusion of movement through other mechanisms. Examples of ordinances restricting these types of signs can be found in numerous communities and the concern is also addressed at the state level in Florida. The basic premise of the statute in Florida is the Highway Beautification Act and the Federal Highway Beautification Act. Through the state statute, signs that provide the illusion of movement are prohibited. Other locations, such as Bemidji Township in Minnesota restrict these types of signs to commercial districts and a Special Use Permit must be obtained. Other communities where animated signs are prohibited include Boulder, Colorado; Ann Arbor, Michigan; and Columbus, North Carolina. Example language that could be considered is provided in the Appendix.
- Incentives for the use of attractive ground-level signage (monument signs) that relate in design, materials and colors to the principal buildings on their sites.
- Requirements for signage plans on large sites with multiple buildings or uses. Signage plans specify compatible and integrated styles and a common palette of materials and colors for multiple signs on a single site.

One question to be researched is whether the city can require the elimination or phase-out of signs that would no longer conform to new sign regulations. Chapter 24-17 of the North Dakota Century Code regulates advertising adjacent to the state highway system. According to §24-17-05, compensation must be paid for removal of signs that were "lawfully erected and maintained under state law." Further legal and background research is needed as to whether existing signs were lawfully erected under the state regulations in effect at that time, and whether amortization (phasing-out of nonconformities) rather than compensation could be used to remove them.

If compensation is required, the city may wish to look into the potential for exchange – granting sign permits in other more appropriate locations in exchange for removal of nonconforming signs.

LANDSCAPING STANDARDS

The current landscaping and screening standards in the Bismarck's Zoning Ordinance are generally quite thorough. The standards apply to all commercial, industrial, institutional or multi-family buildings with more than four units, and to all parking areas, and would therefore apply to most mixed-use or commercial developments within the gateway corridor. Additional recommendations for enhancing these standards are:

1) To require street trees in all residential developments (the ordinance is somewhat unclear on this point).
2) To require ground plantings (turf, groundcover, low shrubs, etc.) in setback areas between parking and buildings or between sidewalks and buildings.
3) To require that any streetscape improvements along the US 83 corridor be consistent with the standards and guidelines of the corridor study, as well as the city's streetscape guidelines.

LIGHTING STANDARDS

Site lighting regulations in the gateway corridor district could help minimize nighttime lighting conflicts between adjacent uses (such as office adjacent to residential). Site lighting typically includes the following requirements:

- Maximum light standard/fixture height – Examples of height limits are provided in the Appendix.
- Standards for shields to prevent glare and light pollution.
- Maximum lighting levels in foot-candles, typically measured at property boundaries. Example lighting level guidelines for various uses are documented in the Appendix.
- Prohibited Lighting and Fixtures - Prohibited lighting may include flashing, colored or obstructive lighting; neon lights except for signage; and searchlight/laser light source for advertising/entertaining (unless permitted for a short period of time).
- Lighting standard exemptions - may include seasonal decorations; emergency lighting; nighttime street construction and repair; and lighting of official government flags.
- Lighting fixture maintenance - includes immediately repairing or replacing any malfunctioning or damaged light fixture with a new fixture similar to the damaged or malfunctioning items.

APPENDIX

EXAMPLE SIGN ORDINANCE DETAIL

POSSIBLE ORDINANCE SECTION - ANIMATED SIGNS

No sign shall be permitted which is animated by means of flashing, scintillating, blinking or traveling lights.

Definition - ANIMATED SIGN. A sign employing actual motion or the illusion of motion. Animated signs, which are differentiated from changeable signs as defined and regulated by this code, include the following types:

- *Electrically activated. Animated signs producing the illusion of movement by means of electronic, electrical or electro–mechanical input and/or illumination capable of simulating movement through employment of the characteristics of one or both of the classifications noted below:*
  - *Flashing. Animated signs or animated portions of signs whose illumination is characterized by a repetitive cycle in which the period of illumination is either the same as or less than the period of nonillumination. For the purposes of this ordinance, flashing will not be defined as occurring if the cyclical period between on–off phases of illumination exceeds 4 seconds.*
  - *Patterned illusionary movement. Animated signs or animated portions of signs whose illumination is characterized by simulated movement through alternate or sequential activation of various illuminated elements for the purpose of producing repetitive light patterns designed to appear in some form of constant motion.*
- *Environmentally activated. Animated signs or devices motivated by wind, thermal changes or other natural environmental input. Includes spinners, pinwheels, pennant strings, and/or other devices or displays that respond to naturally occurring external motivation.*
- *Mechanically activated. Animated signs characterized by repetitive motion and/or rotation activated by a mechanical system powered by electric motors or other mechanically induced means.*

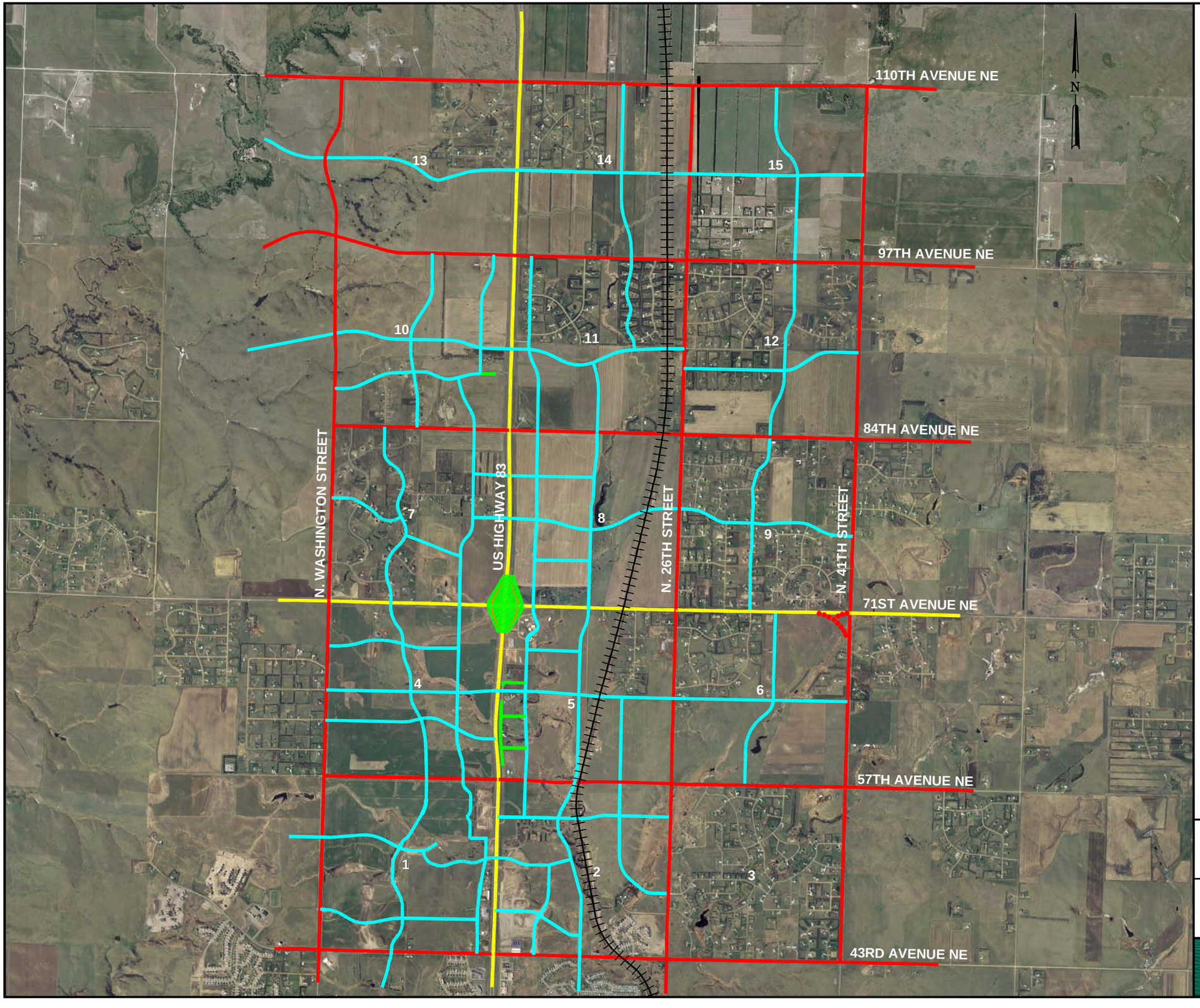
LIGHTING STANDARDS – DETAIL

Listed below is additional detail for the lighting standards section:

- Maximum standard/fixture height – i.e. 30 feet for street and area lighting (parking lots and driveways: pole mounted or wall mounted); pedestrian level lighting (12 feet to 18 feet high), bollard lighting (up to 3 feet high). Maximum height requirements exclude sports complex lighting.
- Standards for shields to prevent glare and light pollution. No source of glare should be visible from any street or adjacent property. Light spillover from one parcel to another can be prevented using shields, hoods or fences to control light projection.
- Maximum lighting levels in foot-candles, typically measured at property boundaries. For example:
  - Automotive Sale – 30 foot candles.
  - Banks/ATMs – 30 foot candles.
  - Parking Areas – 10 foot candles.
  - Civic/Institutional – 10 foot candles.
  - Convenience Store/Gas Station – 10 foot candles.
  - Parking Area – 10 foot candles.
  - Canopy – 35 foot candles.
  - Office Uses – 10 foot candles.
  - Industrial – 15 foot candles.
  - Retail/Commercial/Shopping Center – 10 foot candles.

Appendix

US 83 Study Area Street Network Detail Sheets



US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

LEGEND

- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- COLLECTOR
- LOCAL ROADS

DRAFT STREET ALIGNMENTS

Bismarck-Mandan Metropolitan Planning Organization

URS

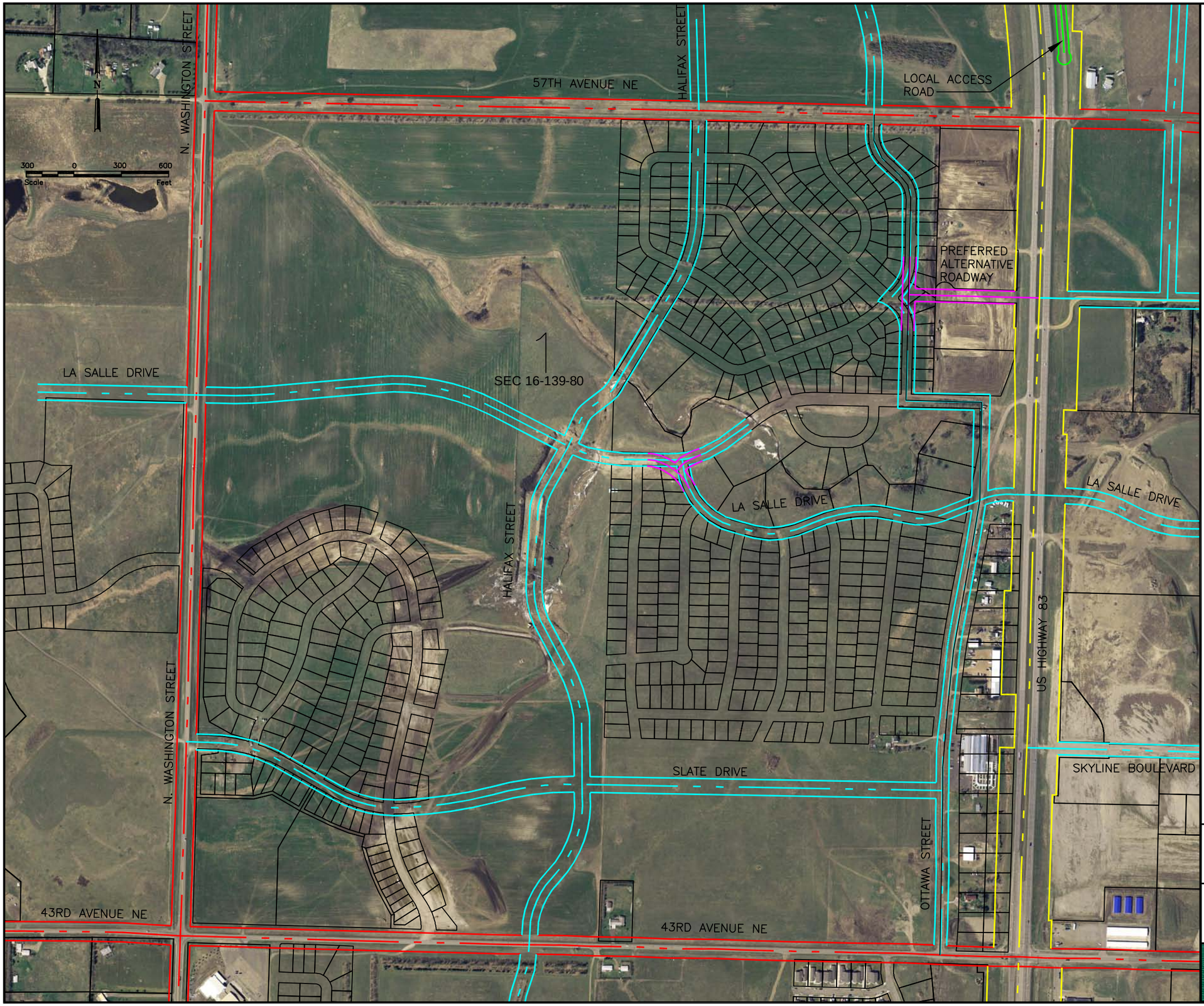
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

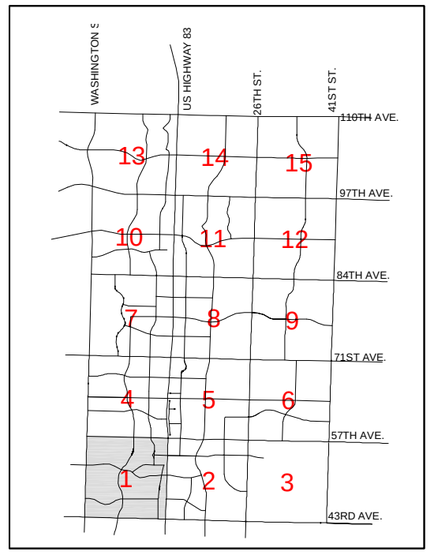
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 1





Legend

	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan
Metropolitan Planning Organization

URS

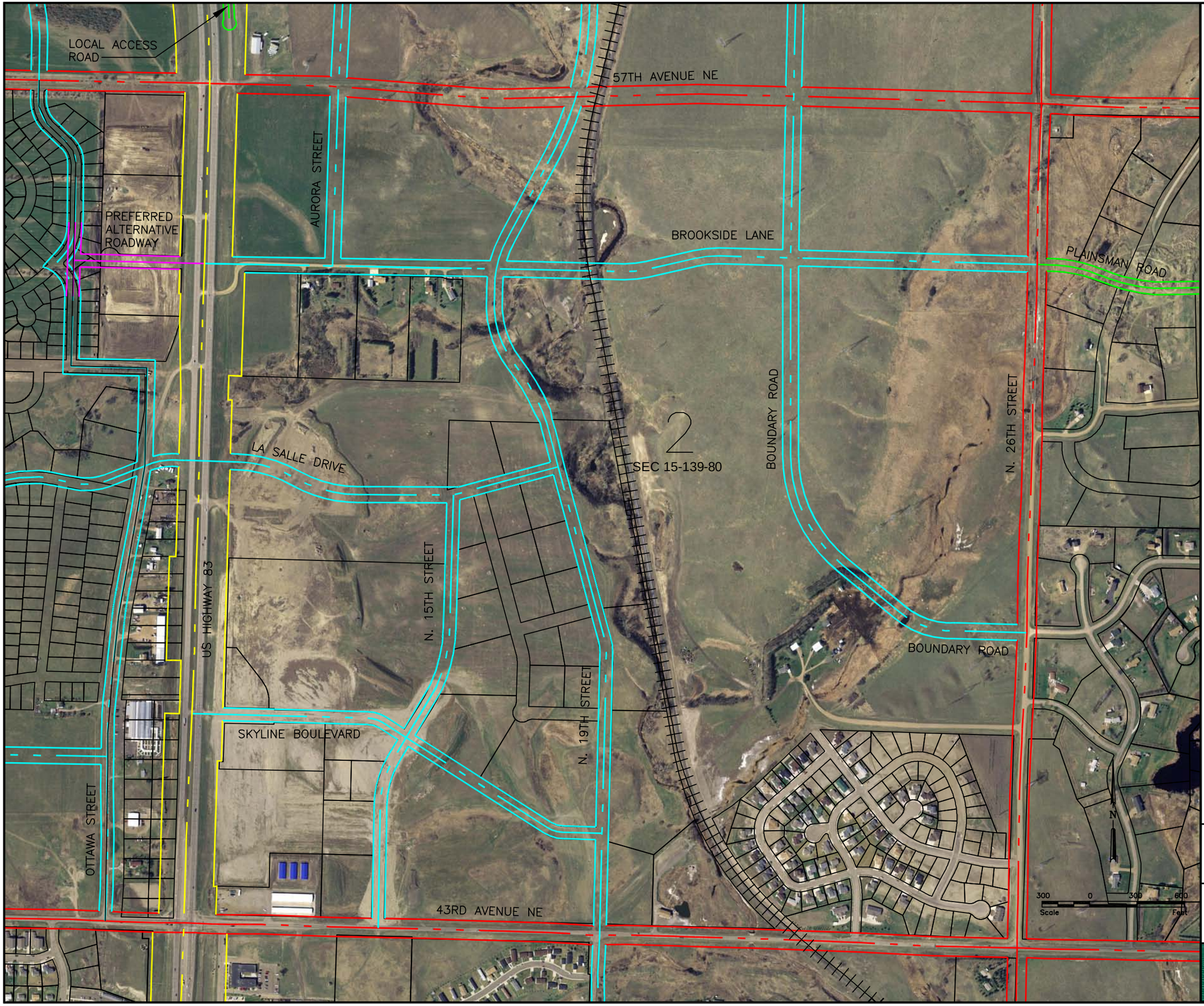
Drawn by	Date
MRS	2-7-05
Checked by	Scale
ENG	AS SHOWN

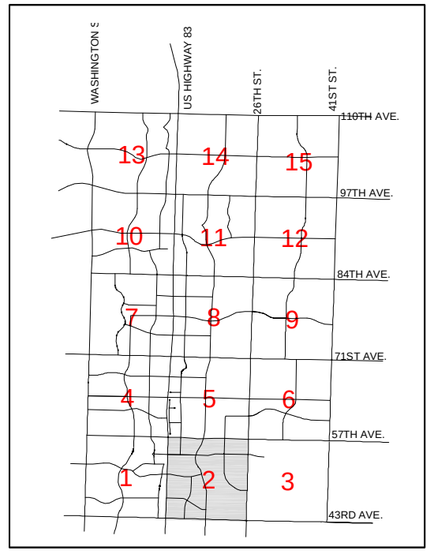
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 2





Legend

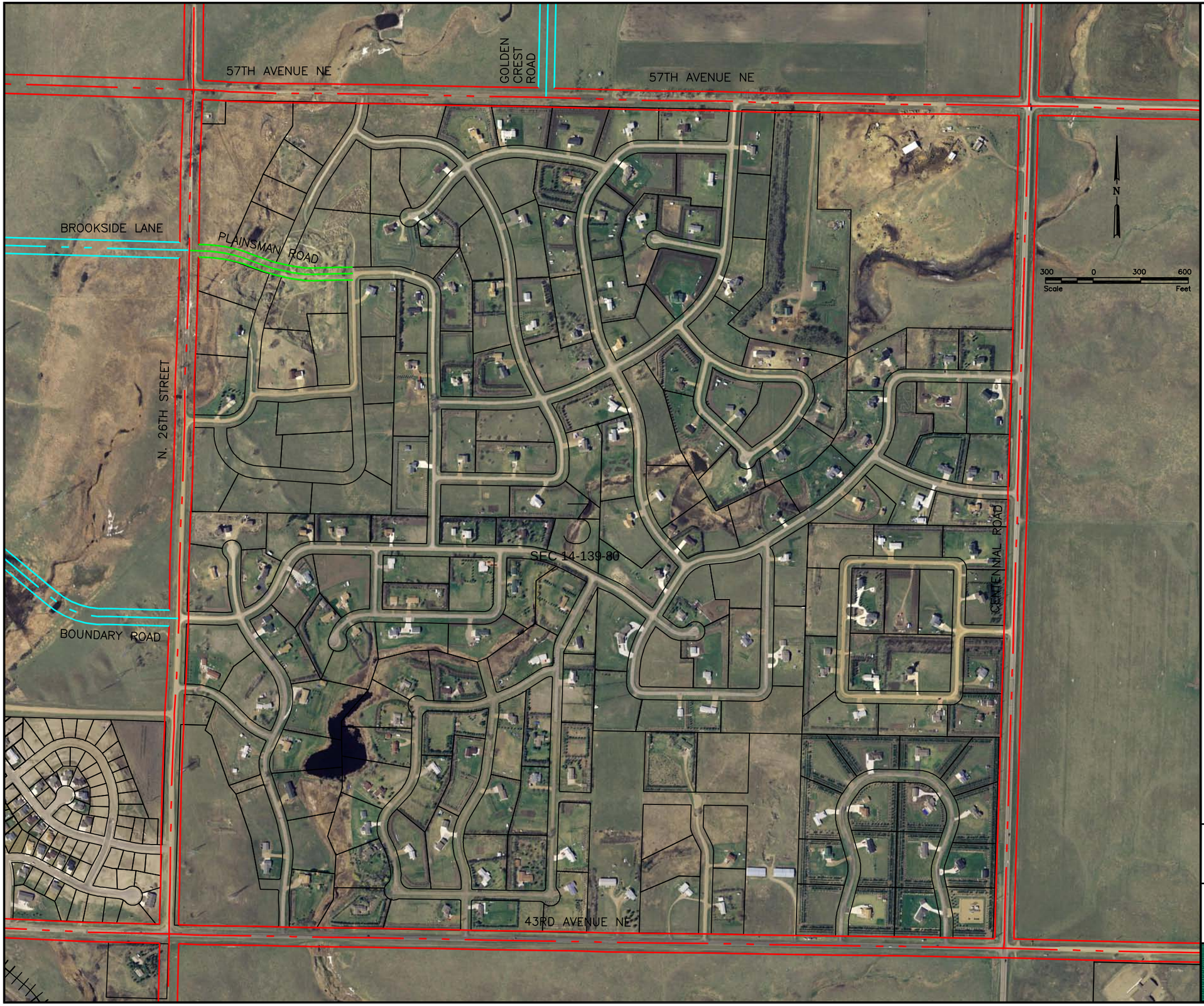
	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

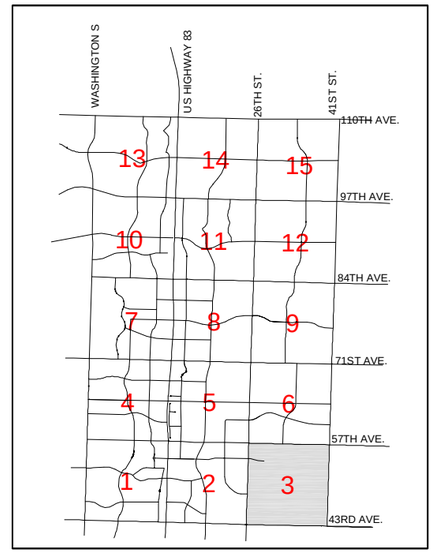
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300



US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 3



Legend

	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan Metropolitan Planning Organization

URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

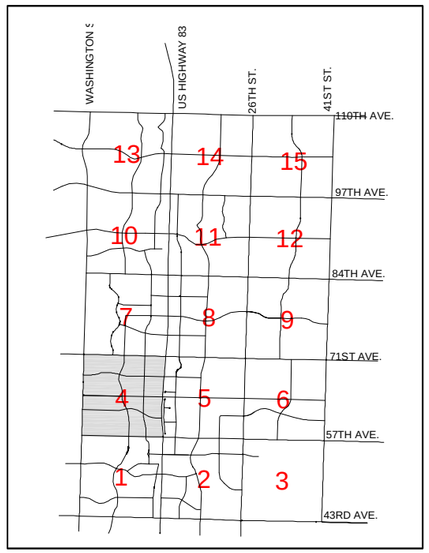
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 4

ND HIGHWAY 1804
NORTHSTAR DRIVE
HALIFAX STREET
DIAMOND INTERCHANGE
NORTHSTAR DRIVE
OTTAWA STREET
FARM FIELD ACCESS DRIVE
64TH AVENUE NE
SEC 9-139-80
64TH AVENUE NE
N. WASHINGTON STREET
OAKFIELD DRIVE
US HIGHWAY 83
57TH AVENUE NE
HALIFAX STREET
OTTAWA STREET
LOCAL ACCESS ROAD
N. WASHINGTON STREET
300 0 300 600
Scale Feet



Legend

	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan Metropolitan Planning Organization

URS

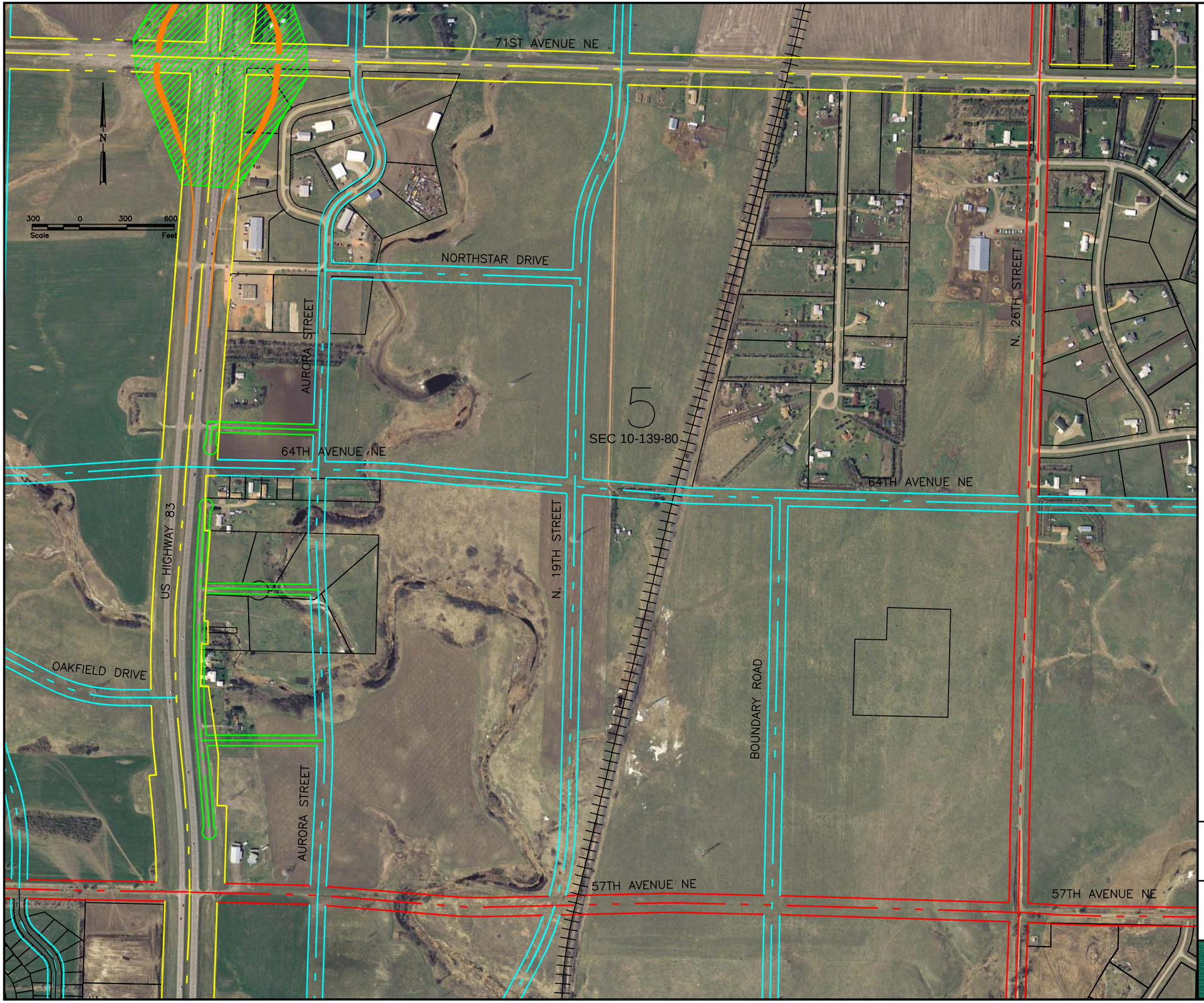
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

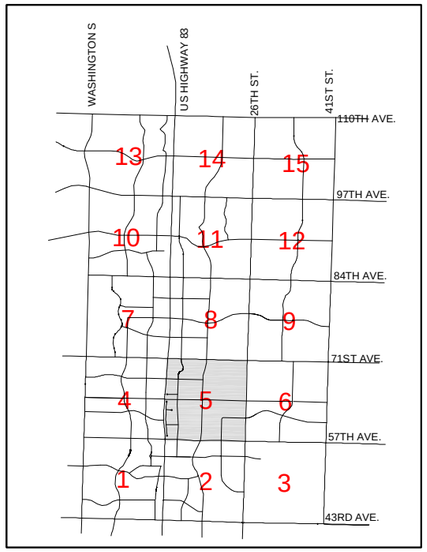
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 5





Legend

	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan Metropolitan Planning Organization

URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

MOONSTONE LANE

N. 41ST STREET

71ST AVENUE NE

N. 26TH STREET

GOLDEN CREST ROAD

64TH AVENUE NE

SEC 11-139-80

GOLDEN CREST ROAD

CENTENNIAL ROAD

57TH AVENUE NE

N

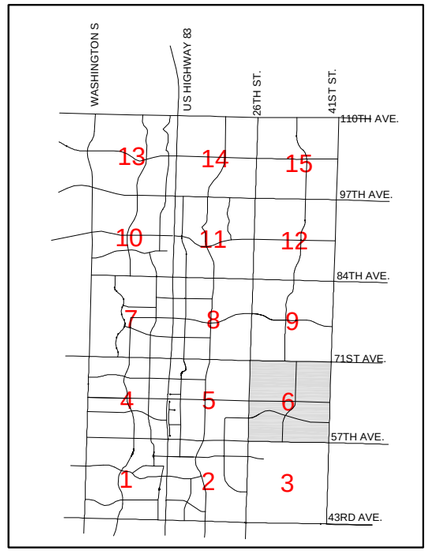
300 0 300 600

Scale Feet

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 6



Legend

	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

URS

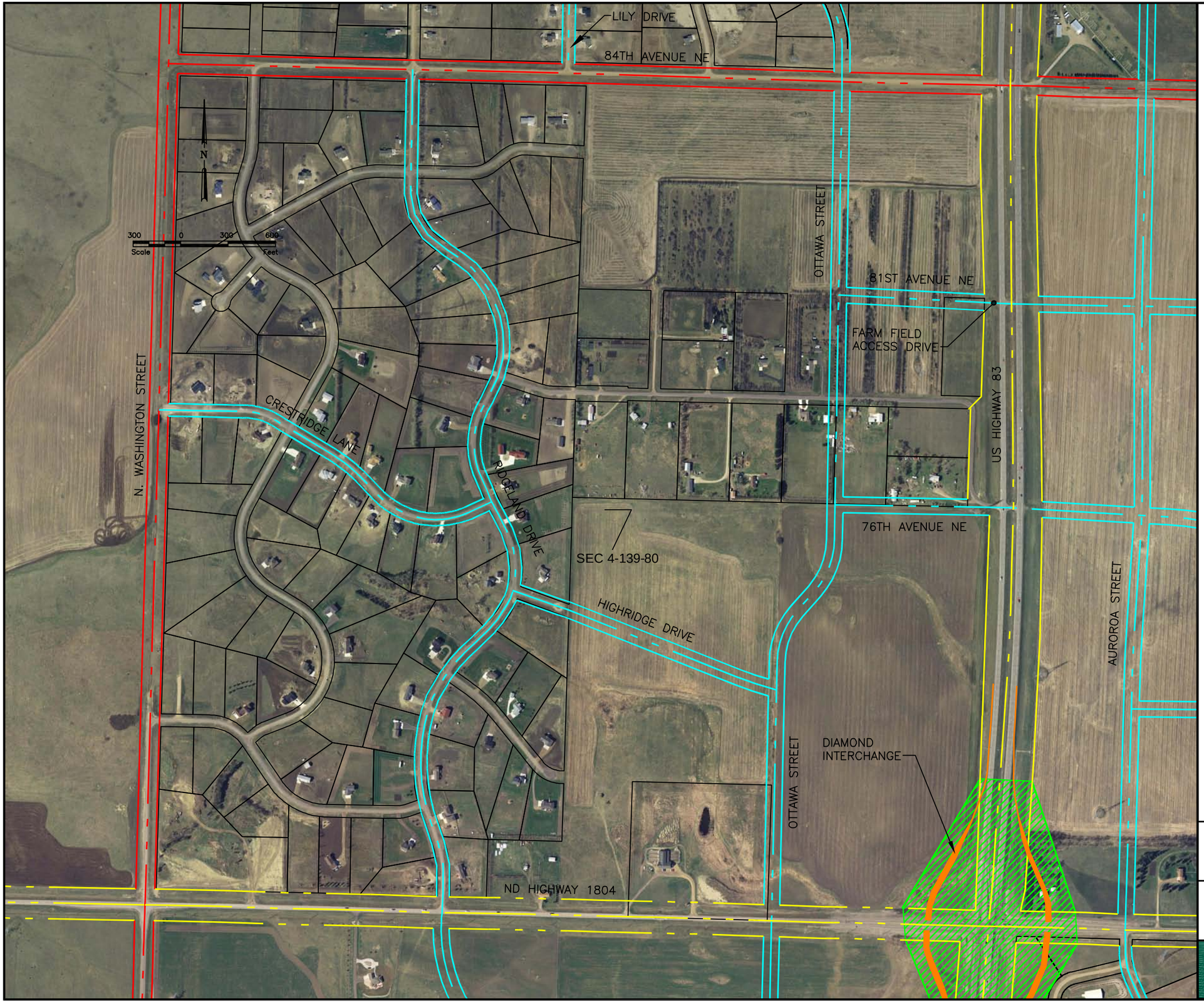
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

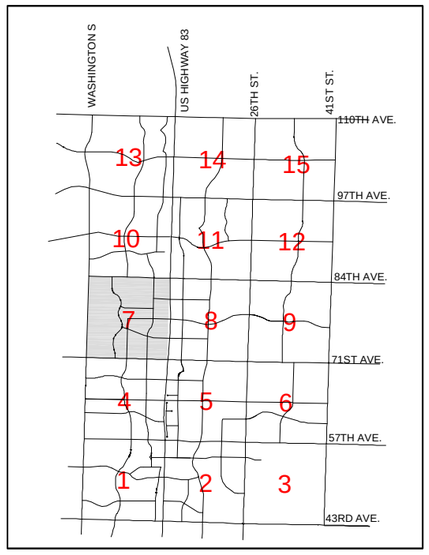
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 7





Legend

	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

URS

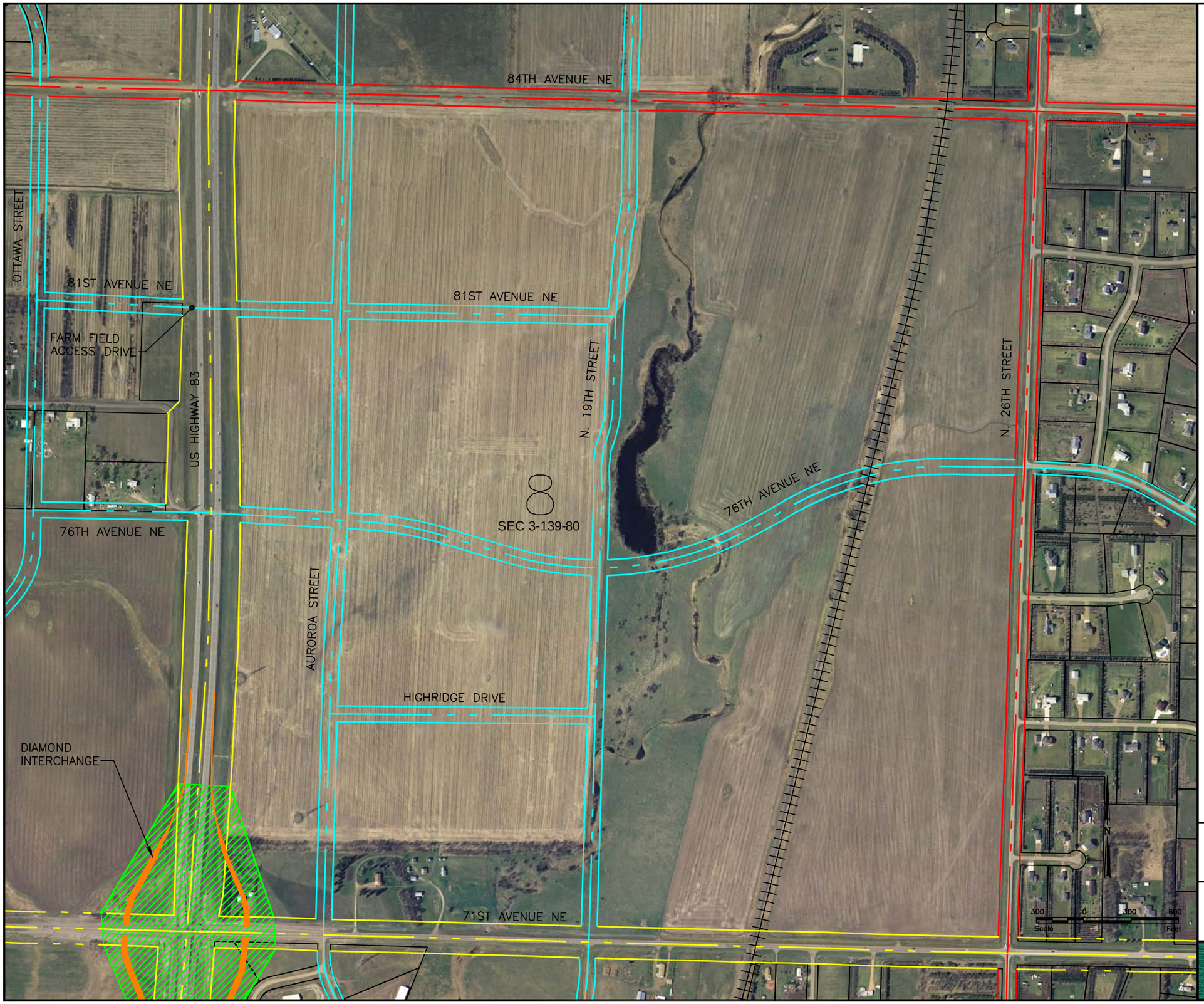
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

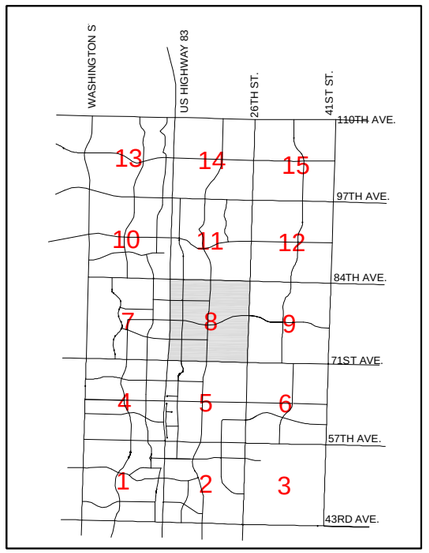
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 8





Legend

	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan Metropolitan Planning Organization

URS

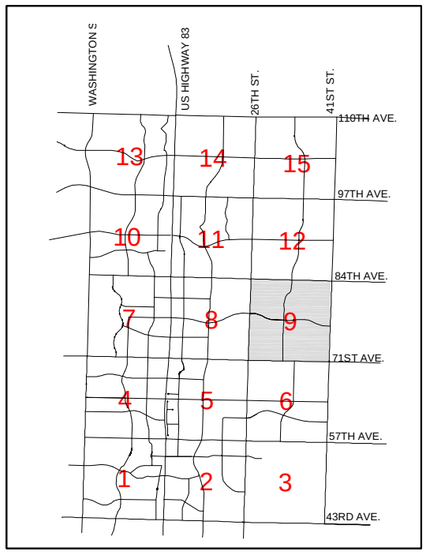
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 9



Legend

	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

URS

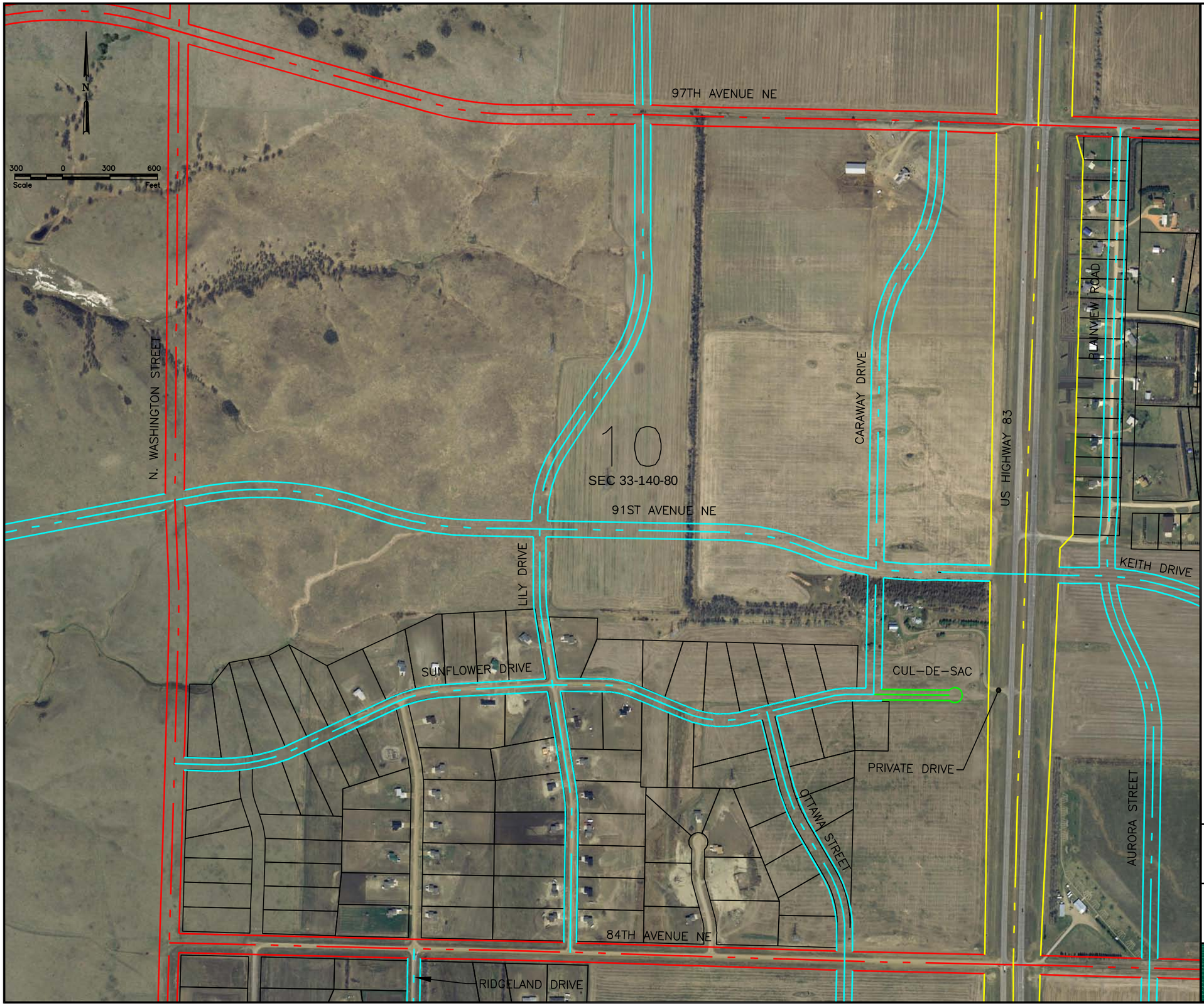
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

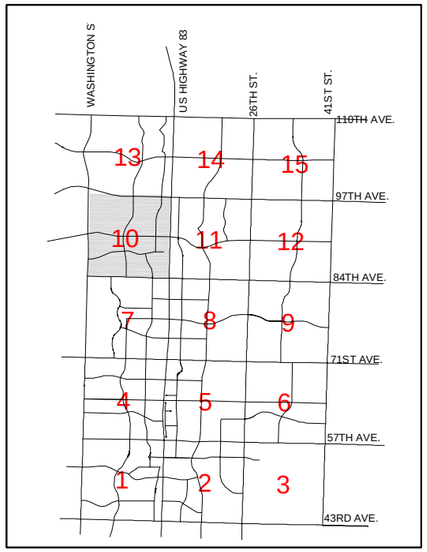
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 10





Legend

	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan
Metropolitan Planning Organization

URS

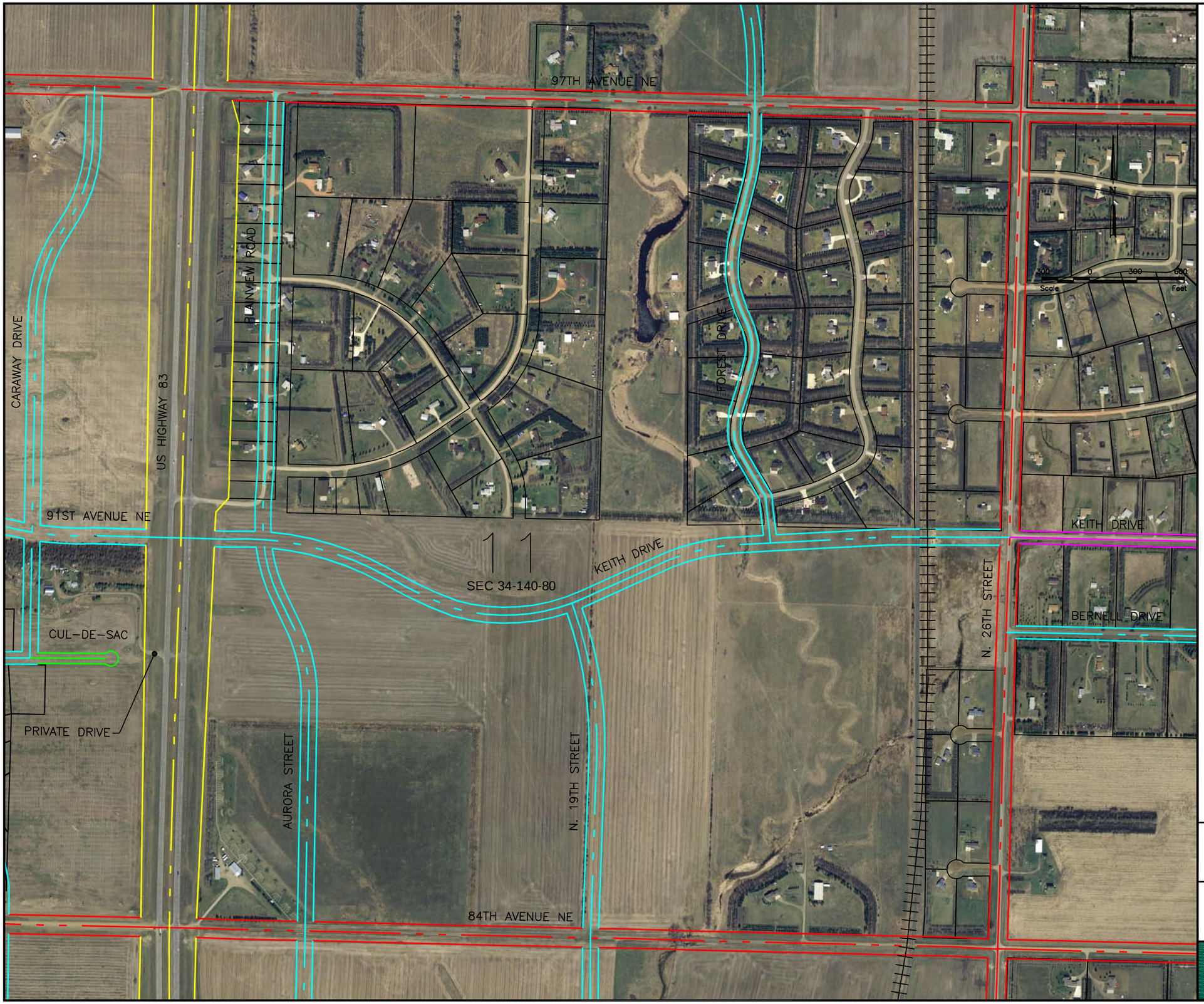
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

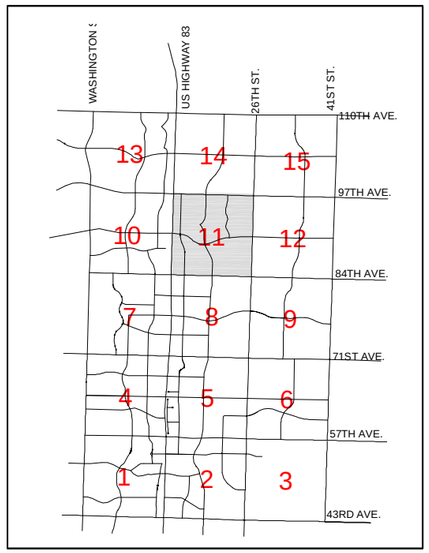
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 11





Legend

	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

URS

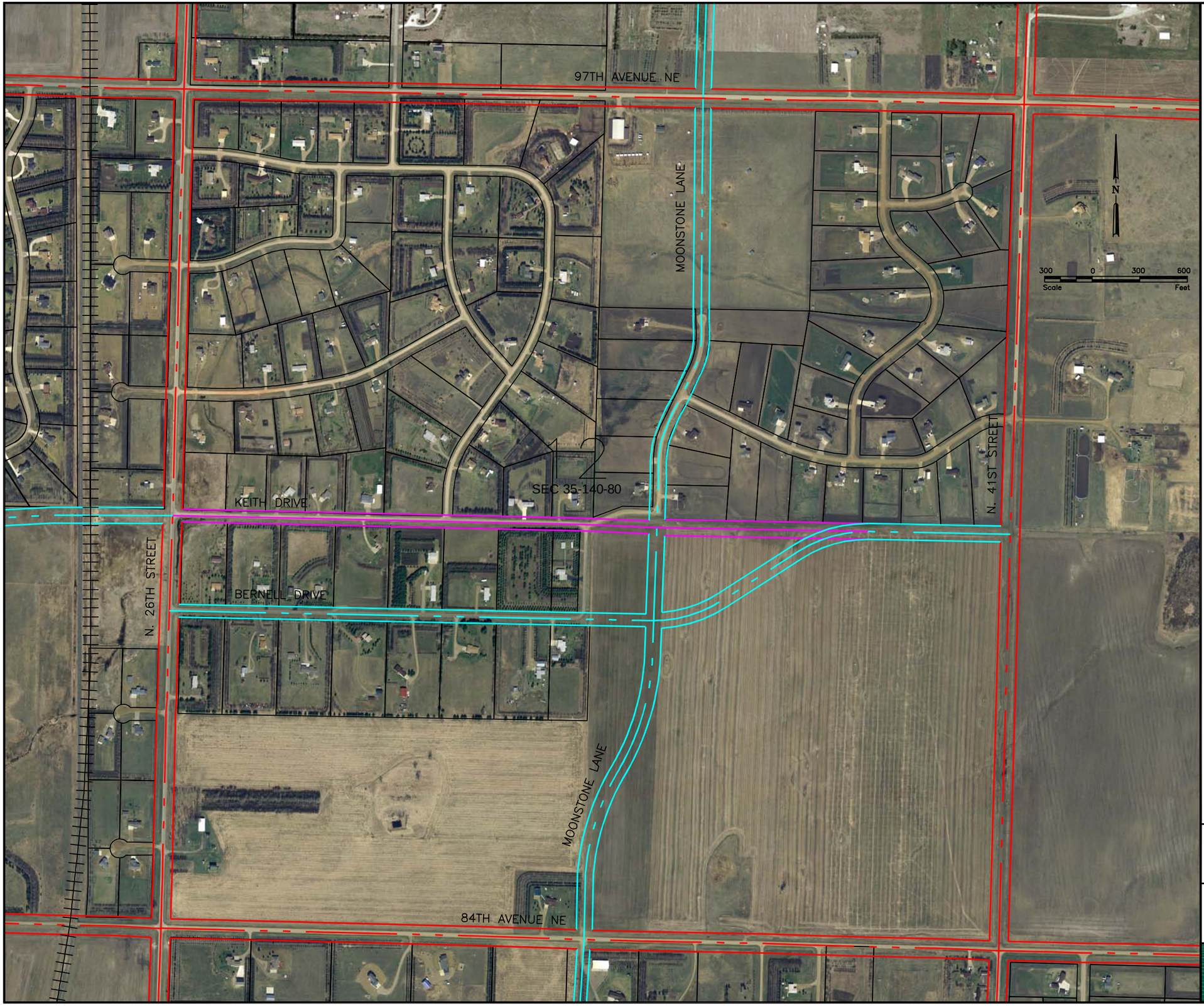
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

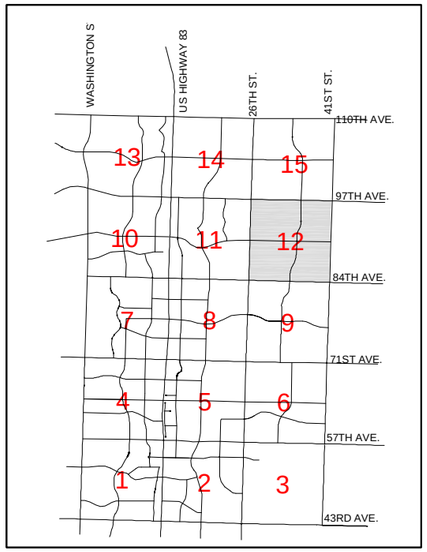
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 12





Legend

	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

URS

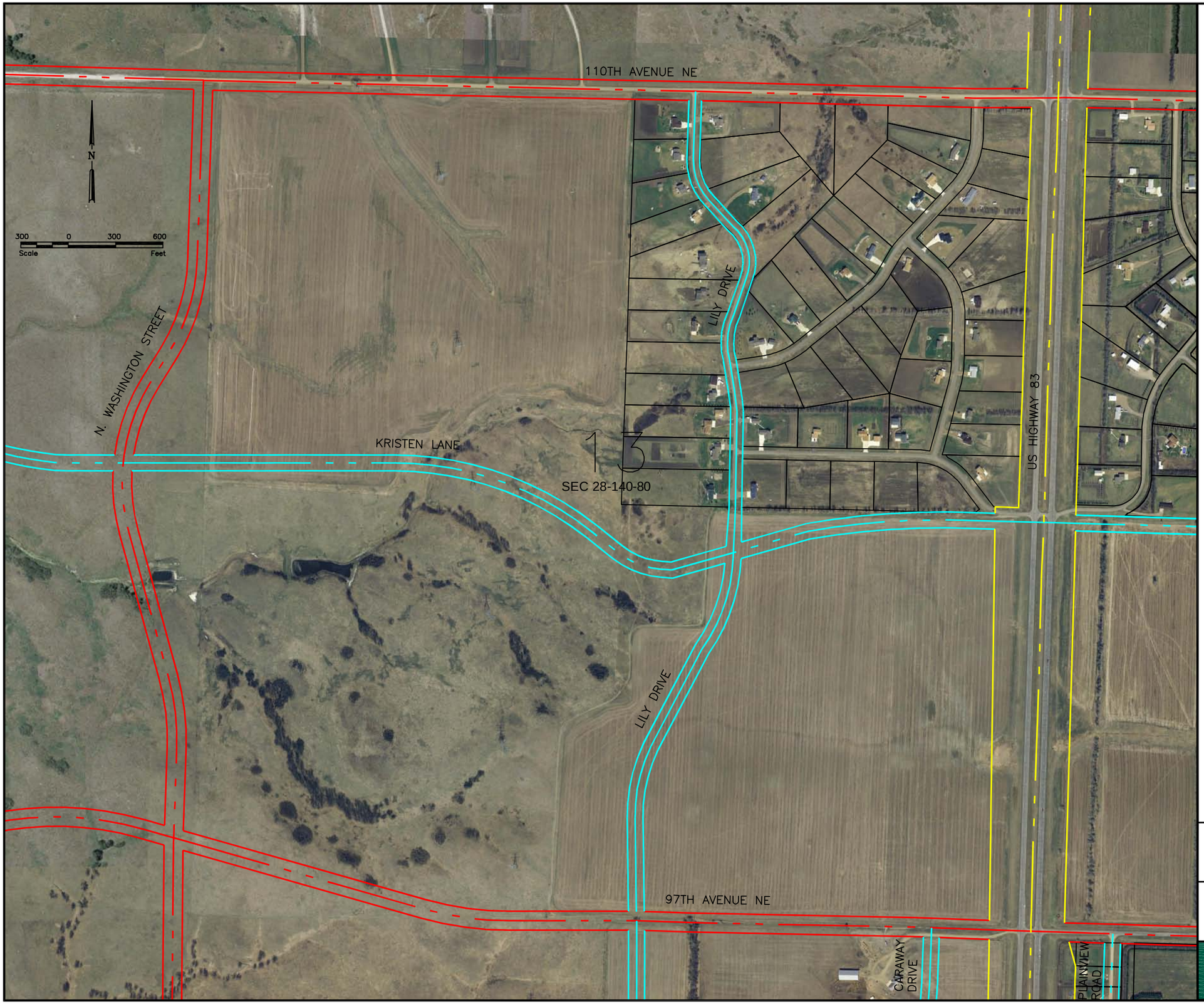
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

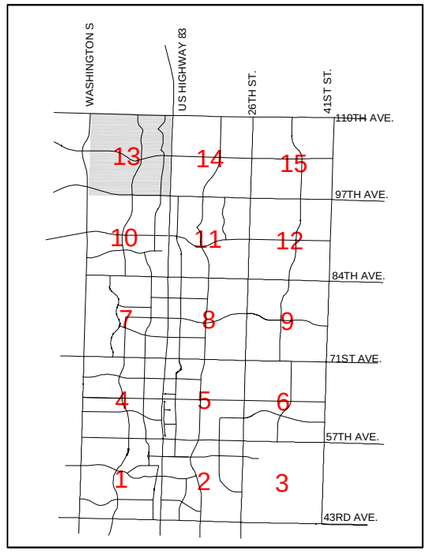
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 13





Legend

	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

URS

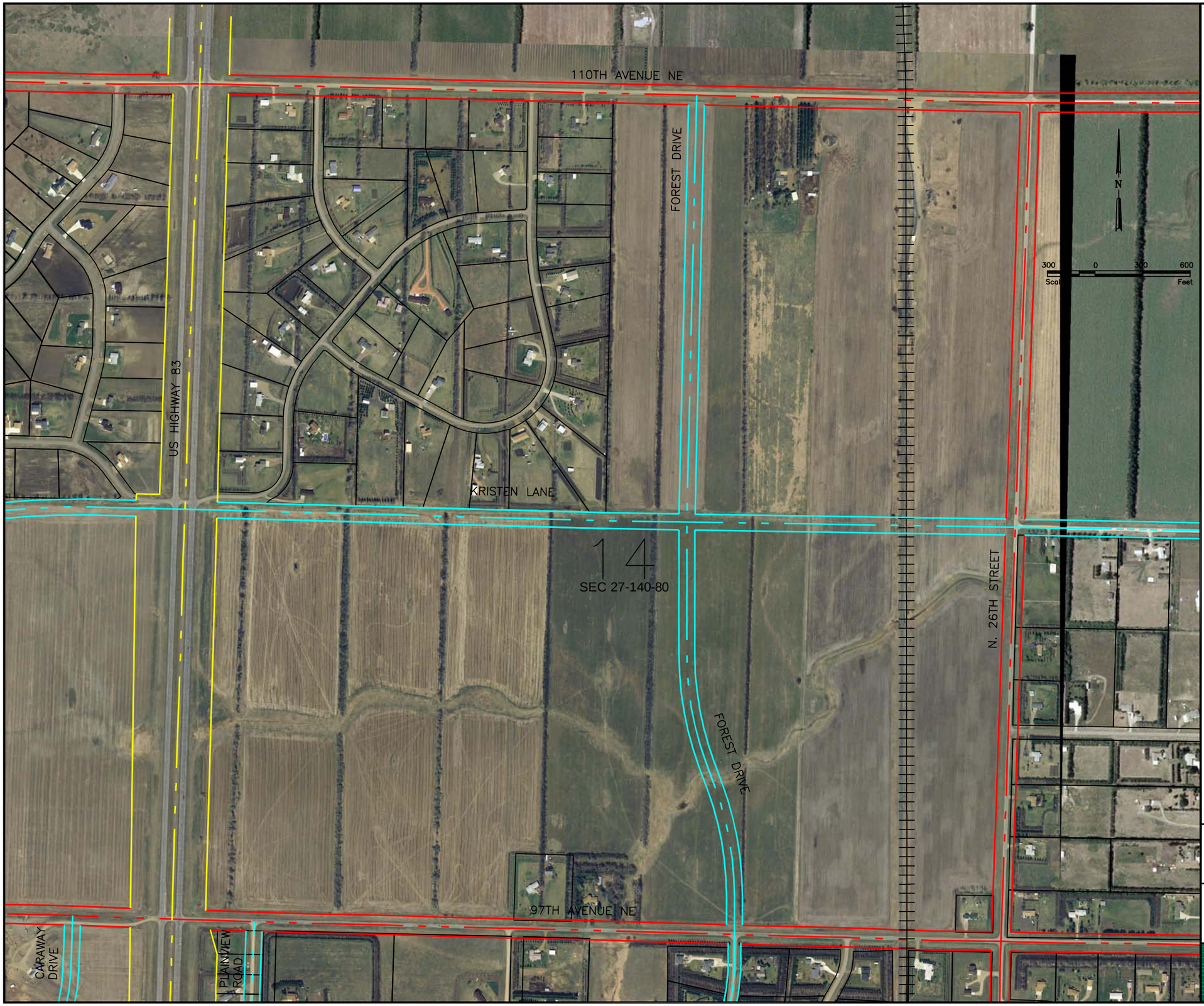
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

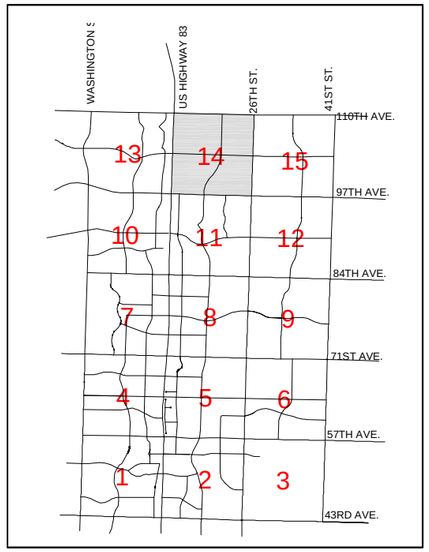
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 14





Legend

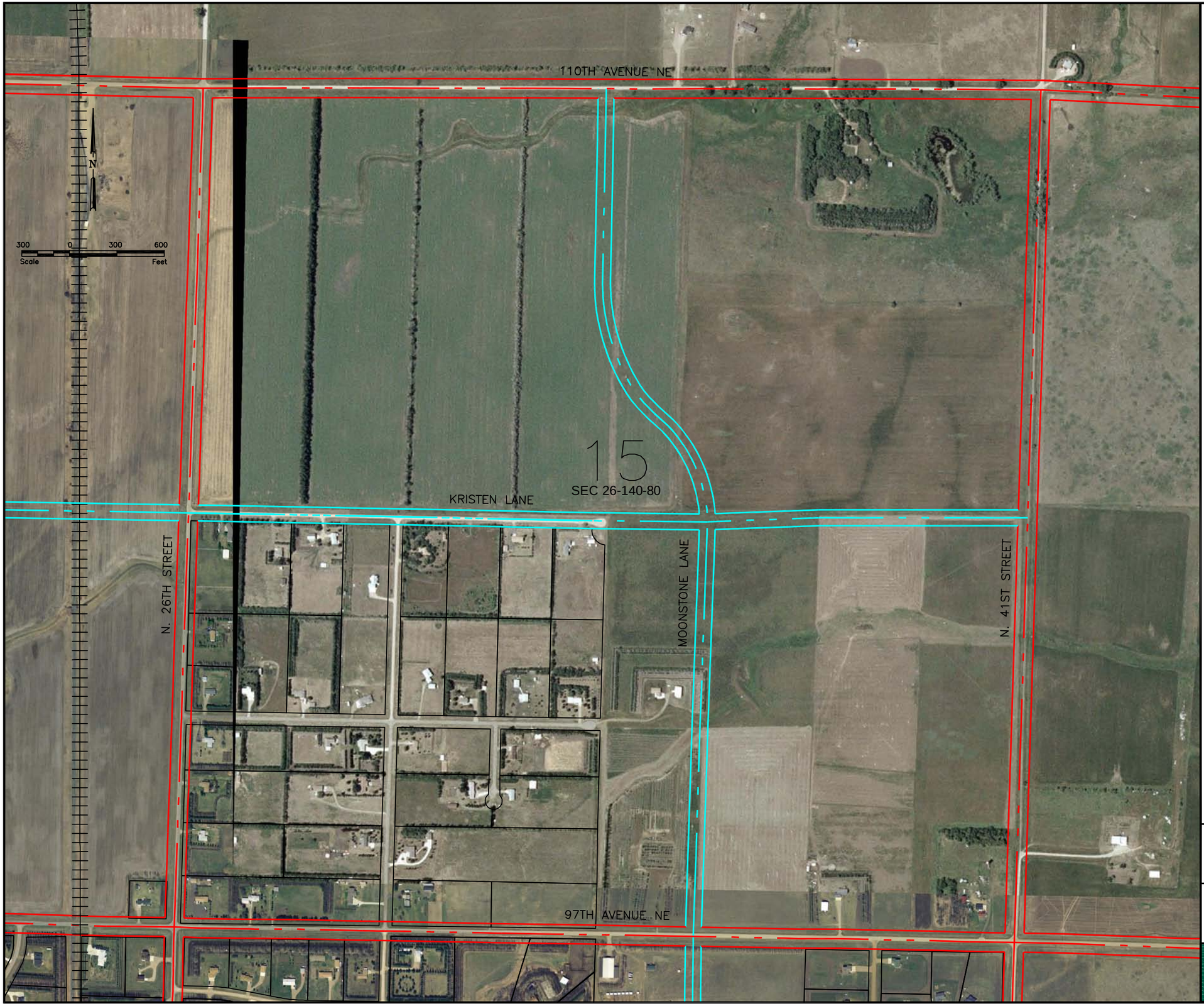
	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	AS SHOWN

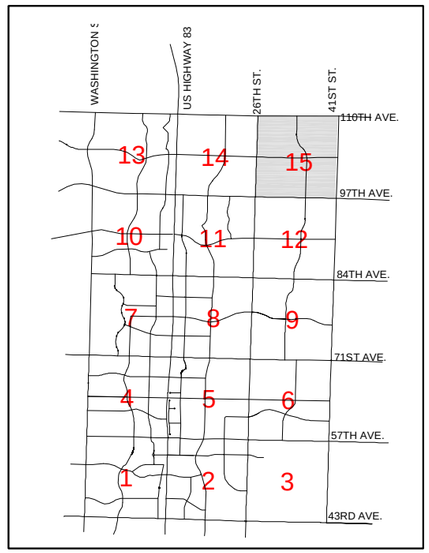
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300



US 83
CORRIDOR STUDY
BISMARCK, NORTH DAKOTA

DRAFT STREET ALIGNMENTS

Panel 15



Legend

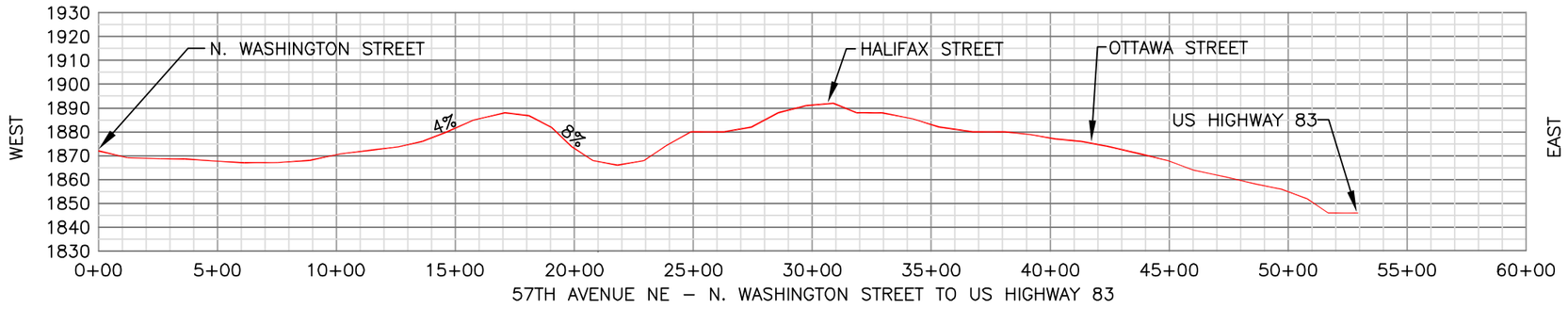
	Right of Way
Principal Arterial	150'
Minor Arterial	120'
Collector	100'
Local	66'
Preferred Alternatives	

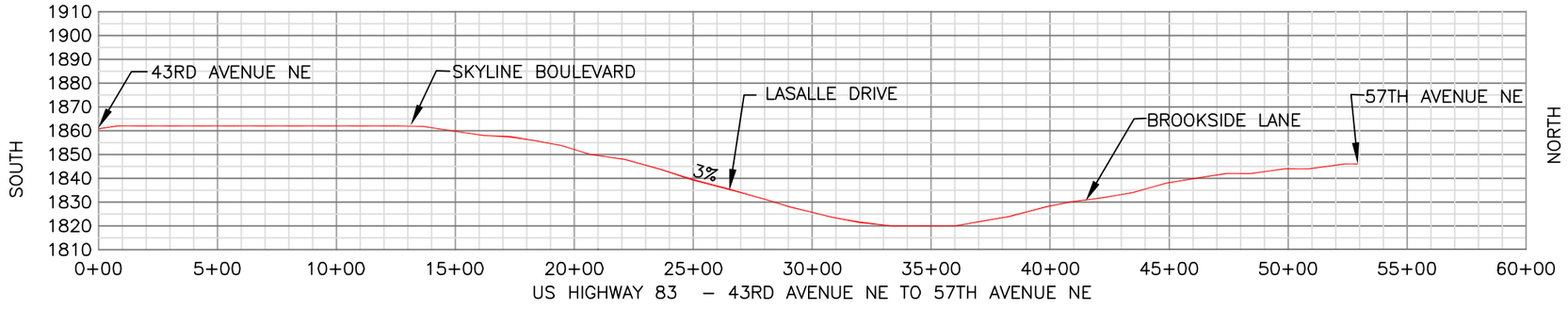
Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

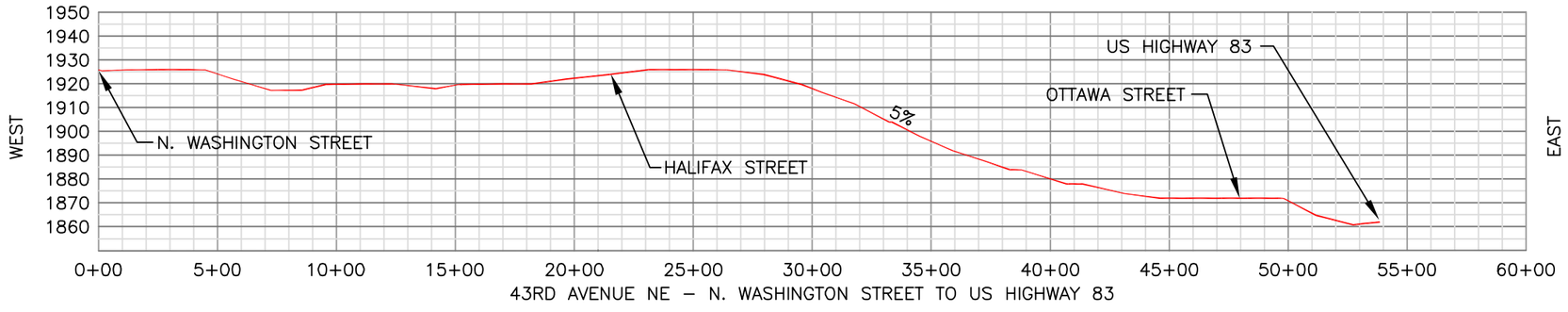
URS

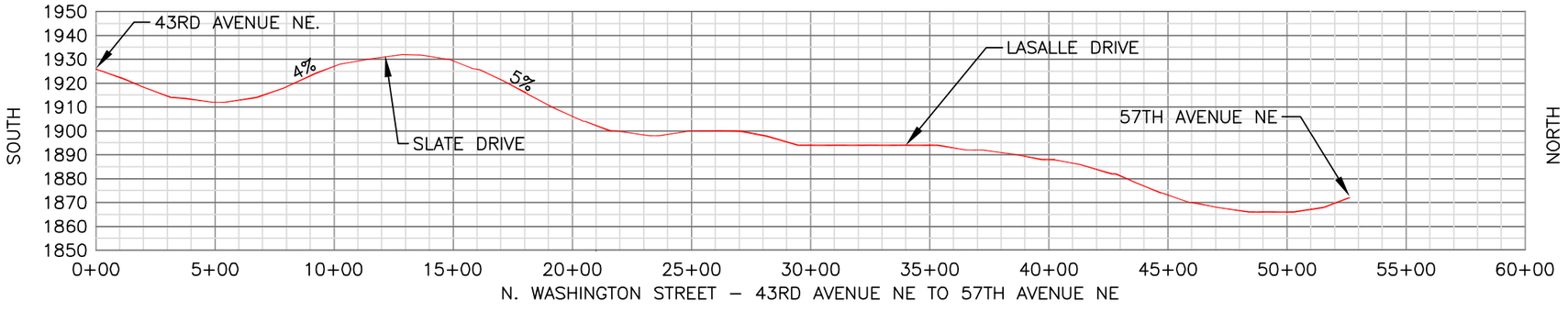
Drawn by	Date
MRS	2-6-07
Checked by	Scale
ENG	AS SHOWN

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





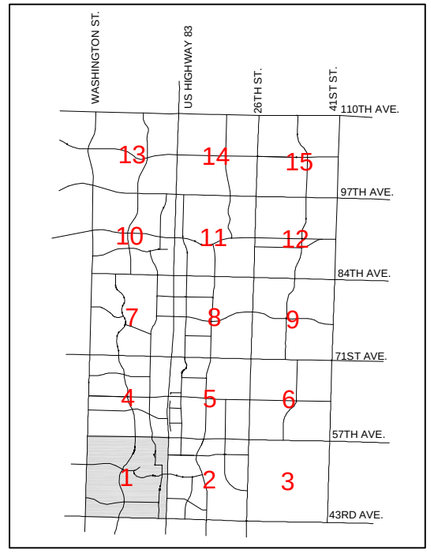




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 1



ARTERIAL ROADWAYS

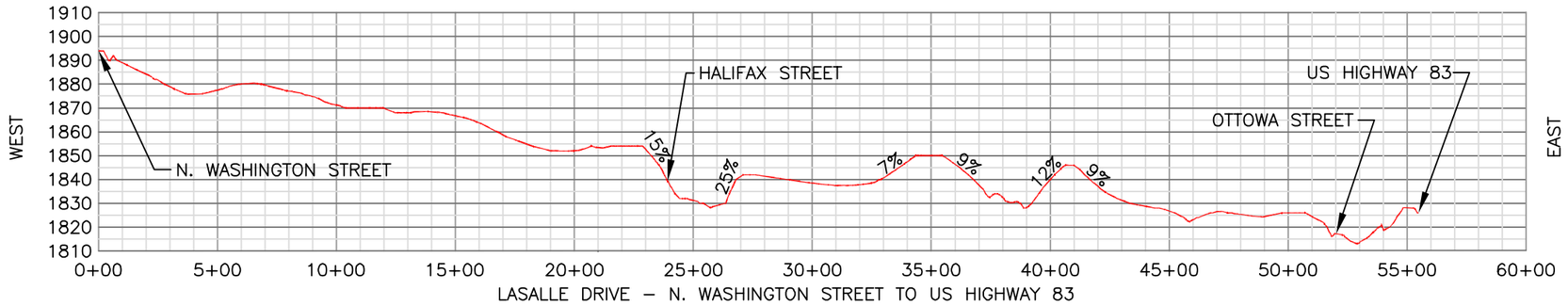
PROPOSED STREET PROFILES

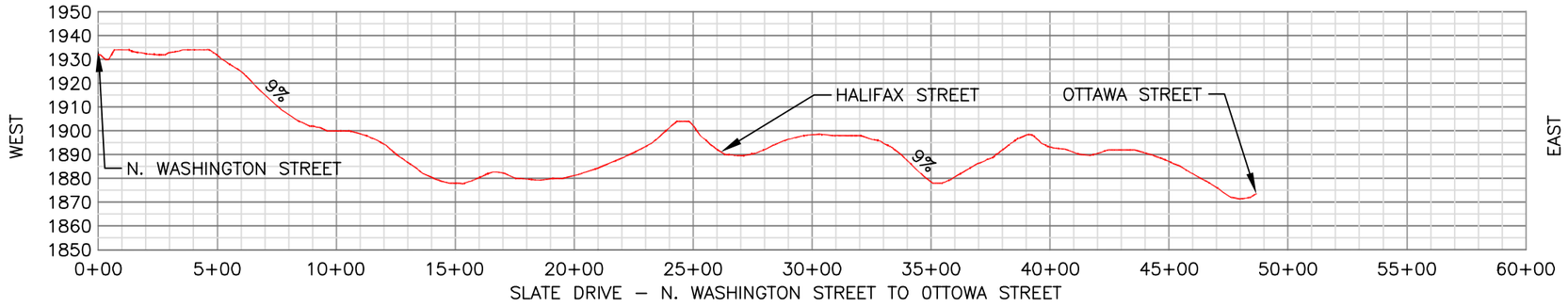
Bismarck-Mandan Metropolitan Planning Organization

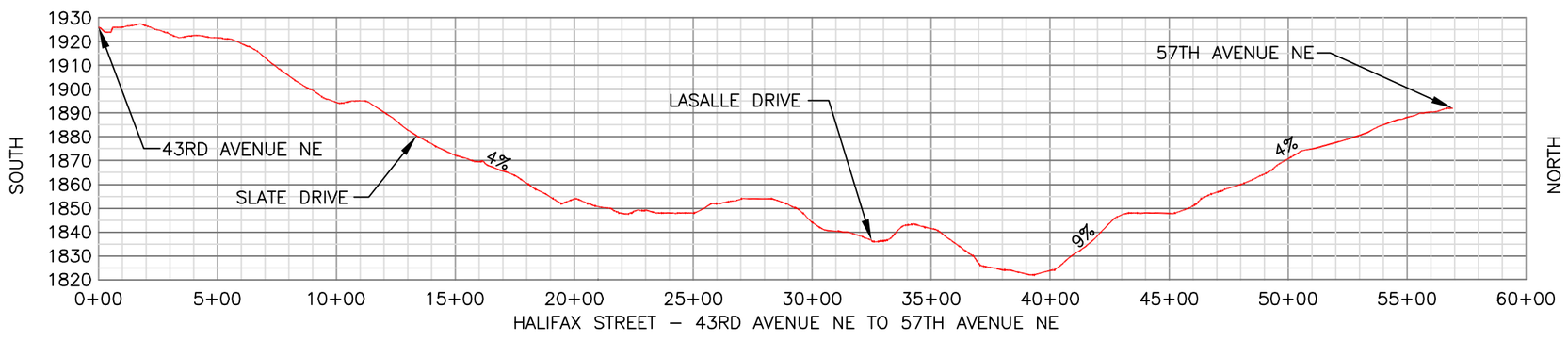
URS

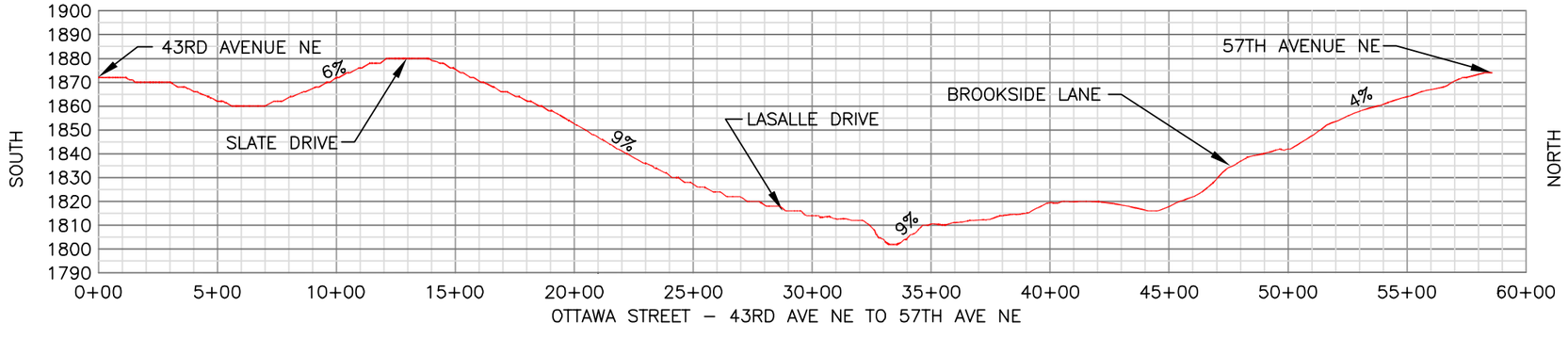
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





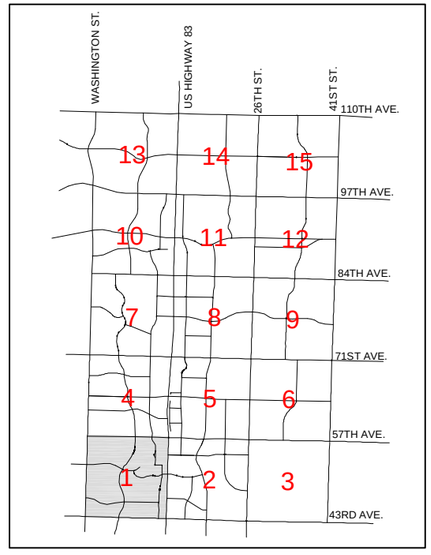




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 1



COLLECTOR ROADWAYS

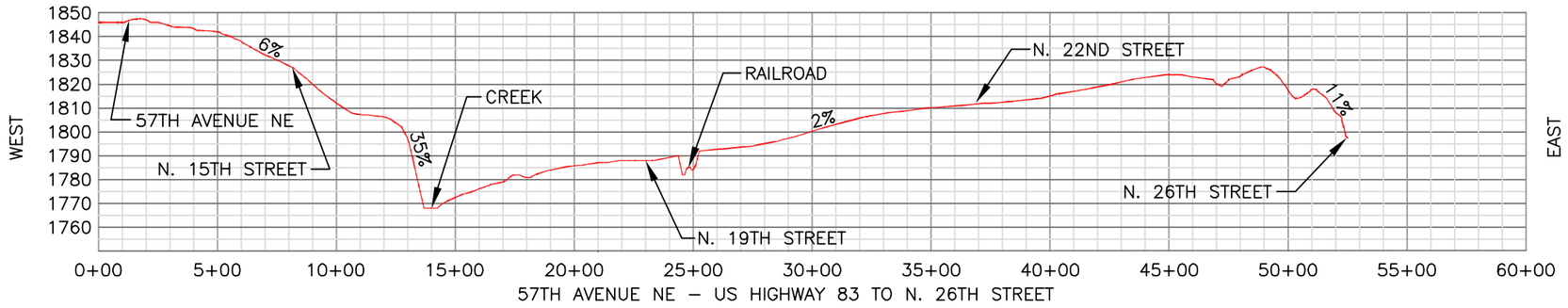
PROPOSED STREET PROFILES

Bismarck-Mandan Metropolitan Planning Organization

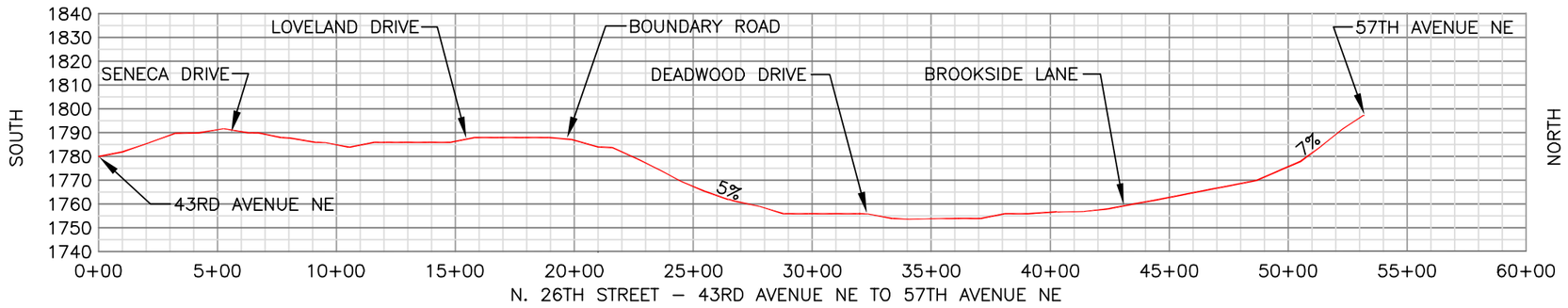
URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

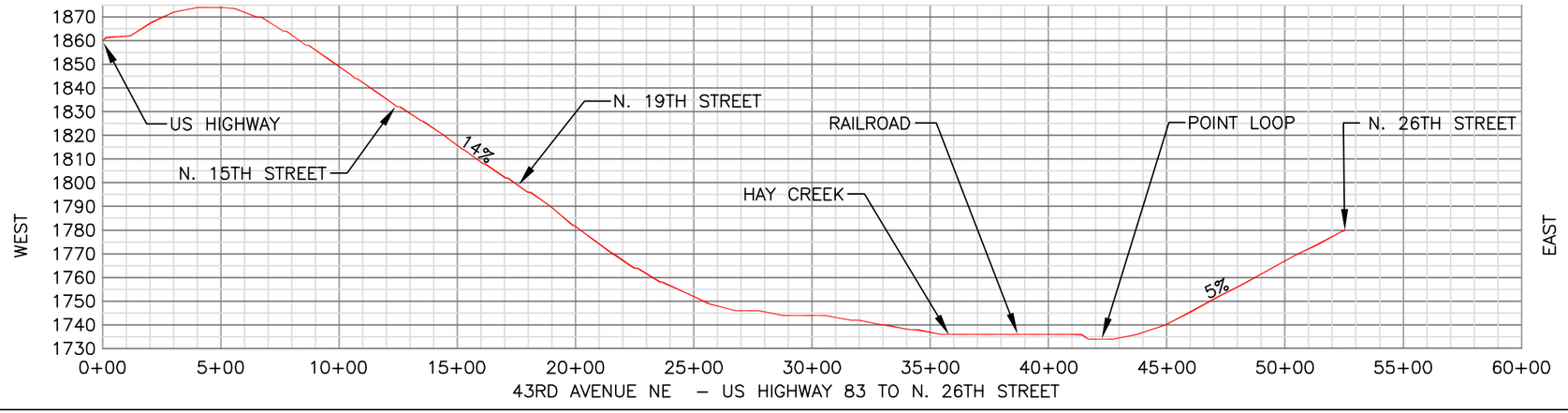
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300



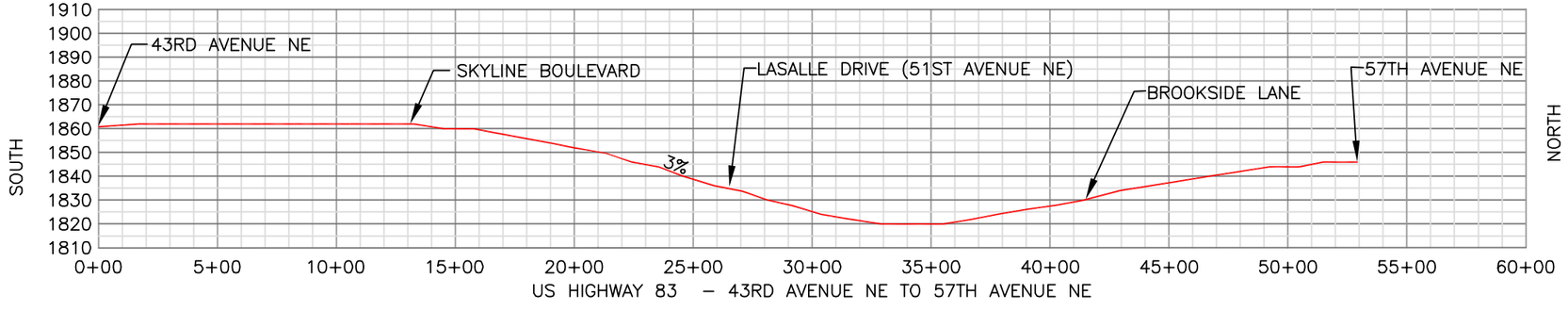
57TH AVENUE NE – US HIGHWAY 83 TO N. 26TH STREET



N. 26TH STREET – 43RD AVENUE NE TO 57TH AVENUE NE



43RD AVENUE NE – US HIGHWAY 83 TO N. 26TH STREET

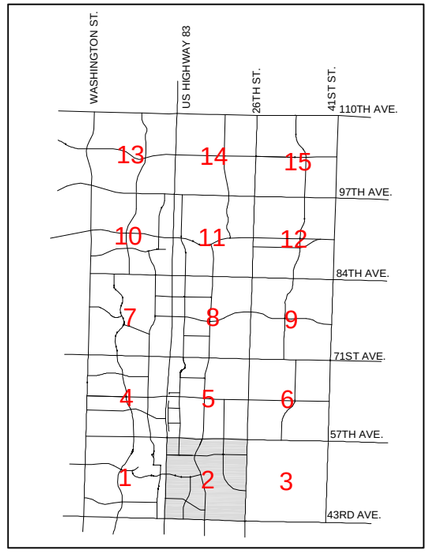


US HIGHWAY 83 – 43RD AVENUE NE TO 57TH AVENUE NE

US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 2



ARTERIAL ROADWAYS

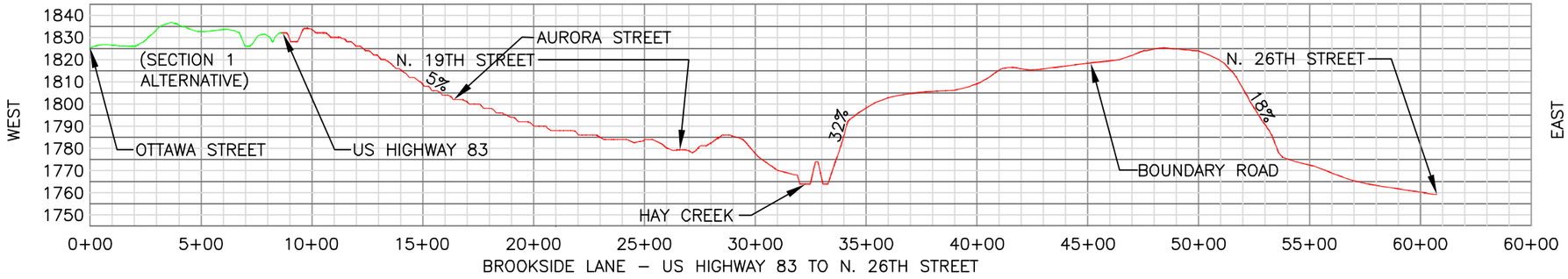
PROPOSED STREET PROFILES

Bismarck-Mandan Metropolitan Planning Organization

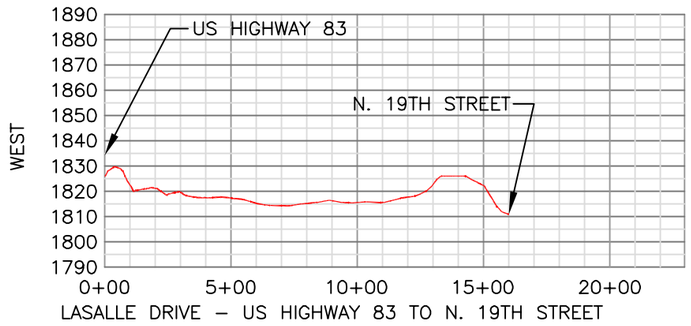
URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

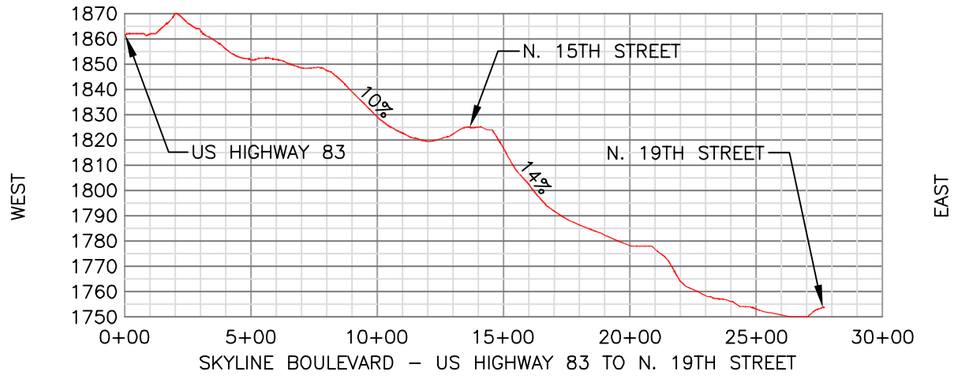
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300



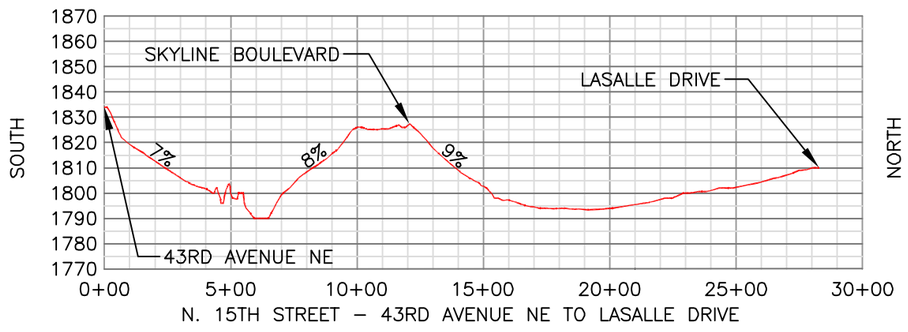
BROOKSIDE LANE – US HIGHWAY 83 TO N. 26TH STREET



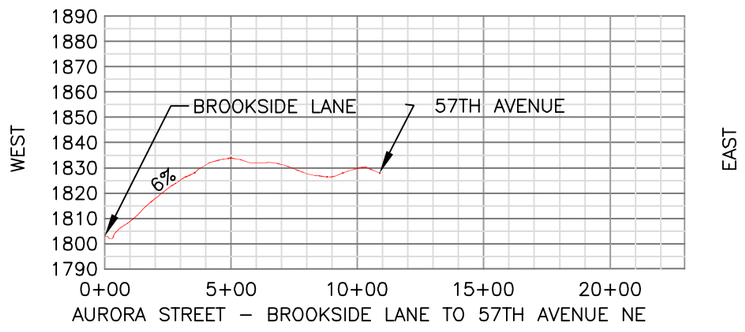
LASALLE DRIVE – US HIGHWAY 83 TO N. 19TH STREET



SKYLINE BOULEVARD – US HIGHWAY 83 TO N. 19TH STREET



N. 15TH STREET – 43RD AVENUE NE TO LASALLE DRIVE

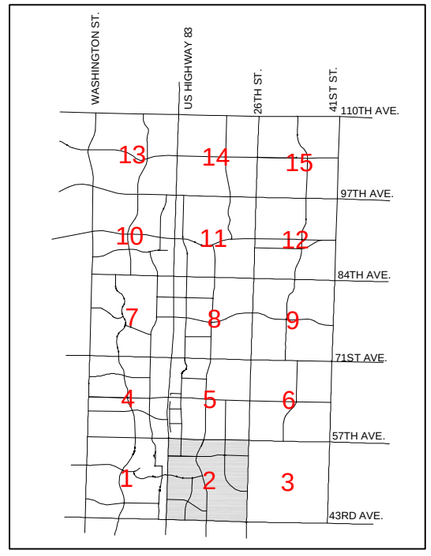


AURORA STREET – BROOKSIDE LANE TO 57TH AVENUE NE

US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 2



COLLECTOR ROADWAYS

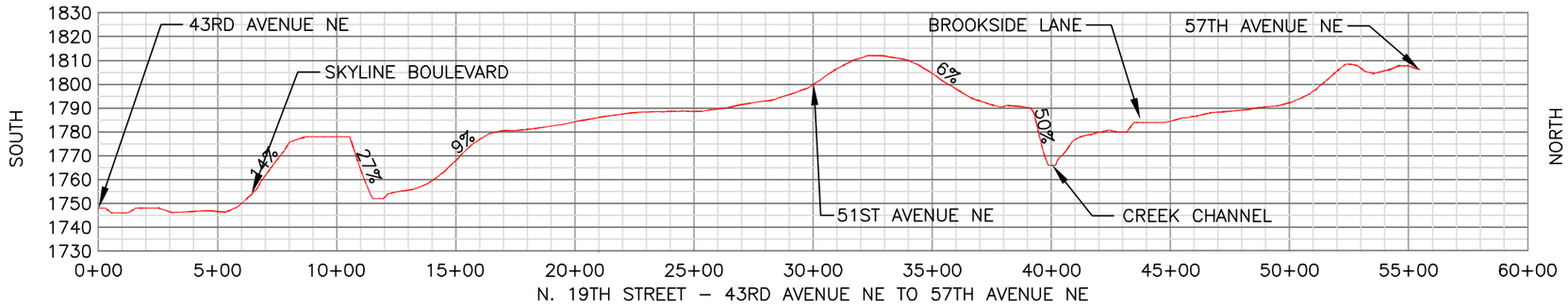
PROPOSED STREET PROFILES

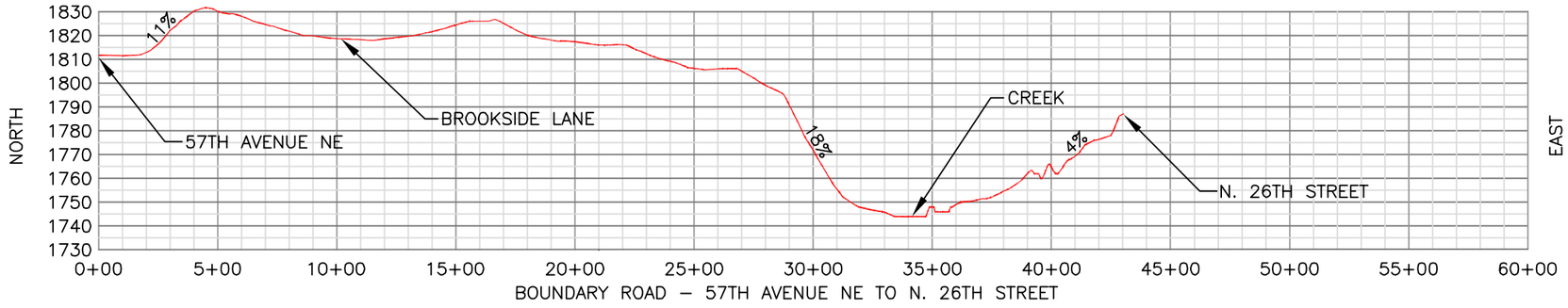
Bismarck-Mandan Metropolitan Planning Organization

URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

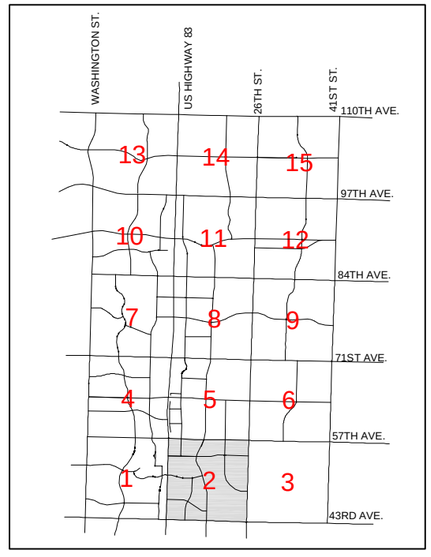




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 2



COLLECTOR ROADWAYS

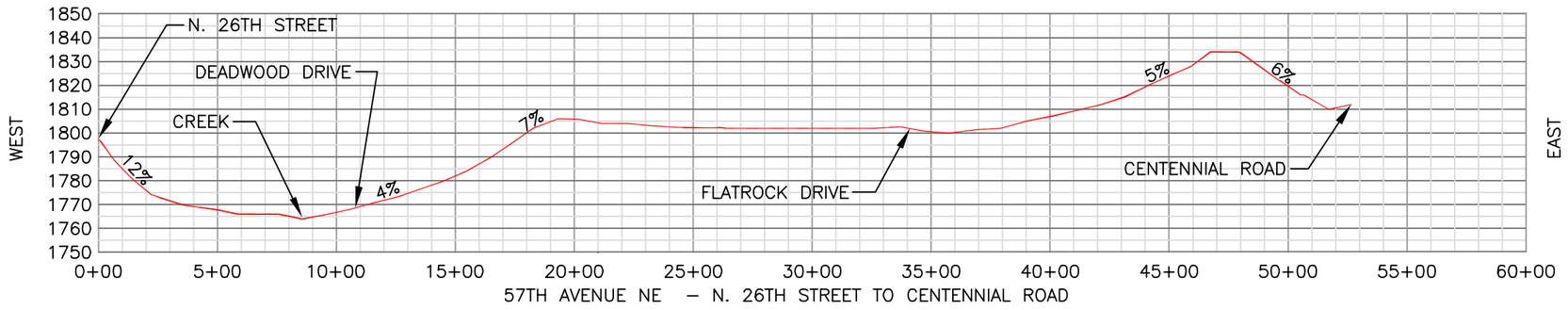
PROPOSED STREET PROFILES

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

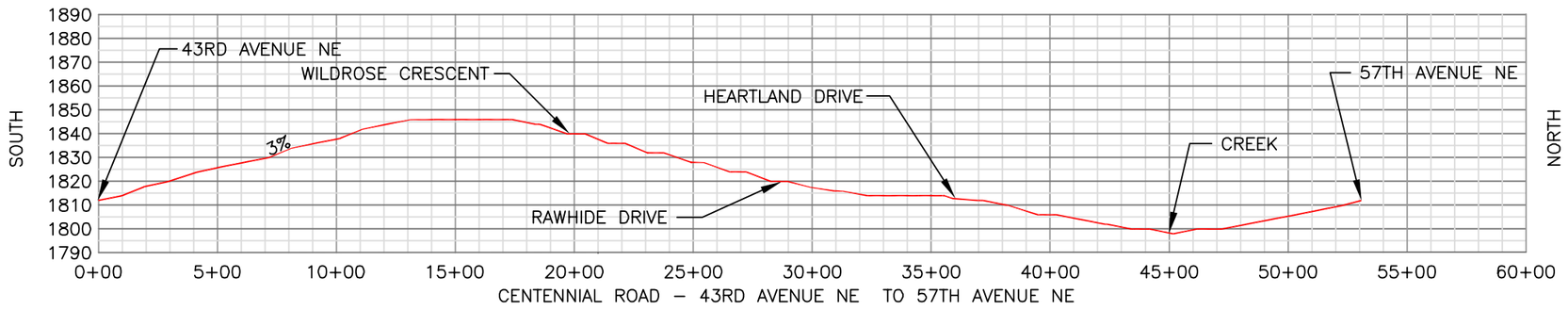
URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

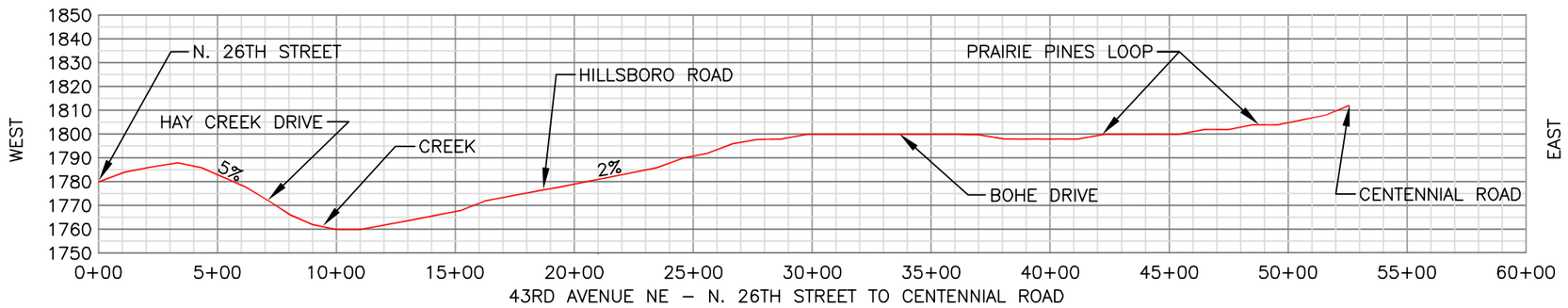
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300



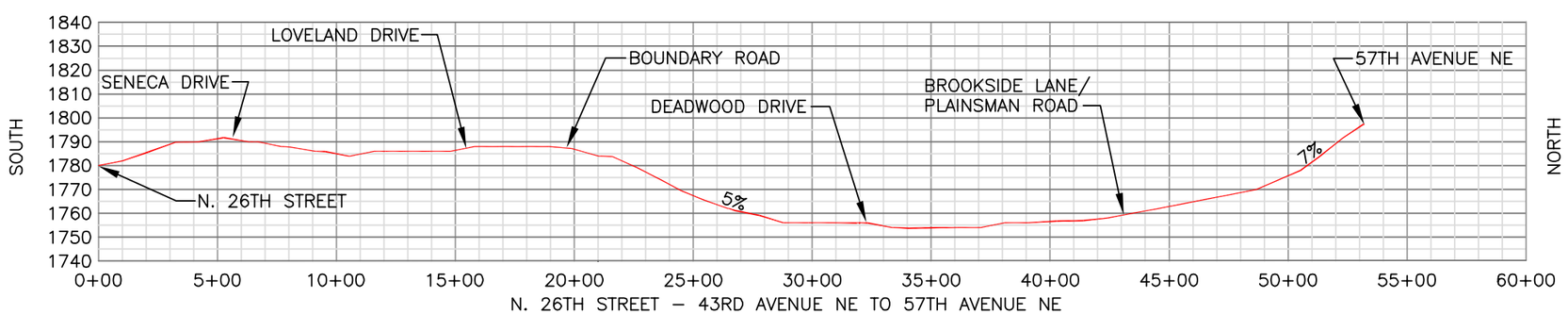
57TH AVENUE NE – N. 26TH STREET TO CENTENNIAL ROAD



CENTENNIAL ROAD – 43RD AVENUE NE TO 57TH AVENUE NE



43RD AVENUE NE – N. 26TH STREET TO CENTENNIAL ROAD

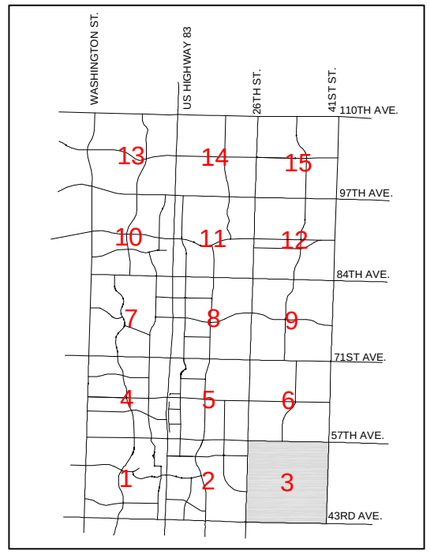


N. 26TH STREET – 43RD AVENUE NE TO 57TH AVENUE NE

US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 3



ARTERIAL ROADWAYS

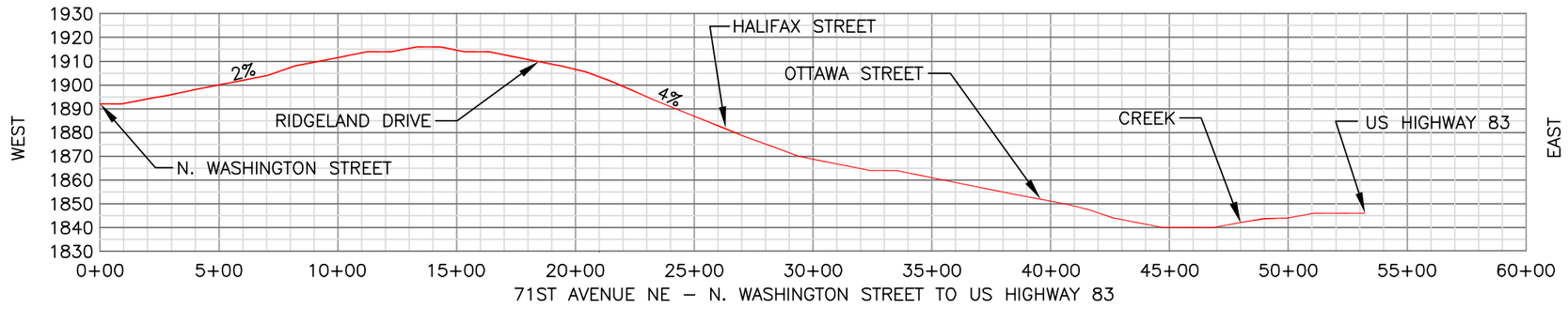
PROPOSED STREET PROFILES

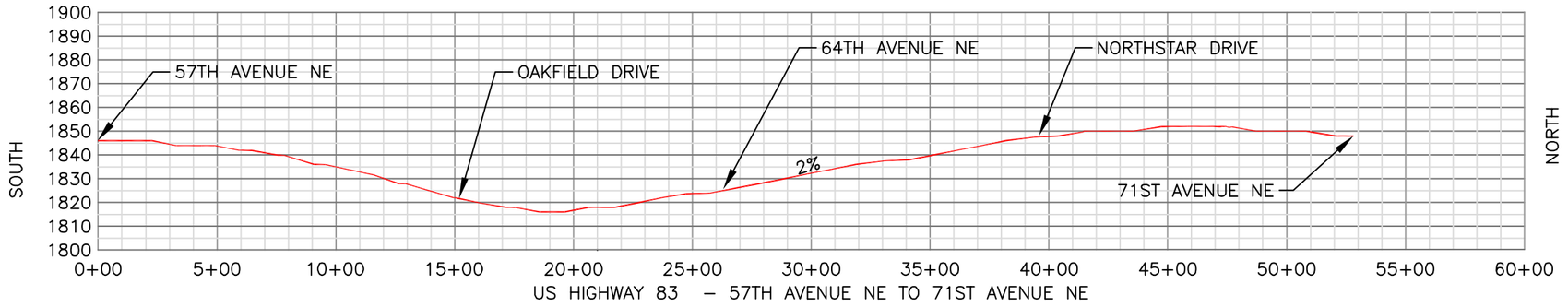
Bismarck-Mandan Metropolitan Planning Organization

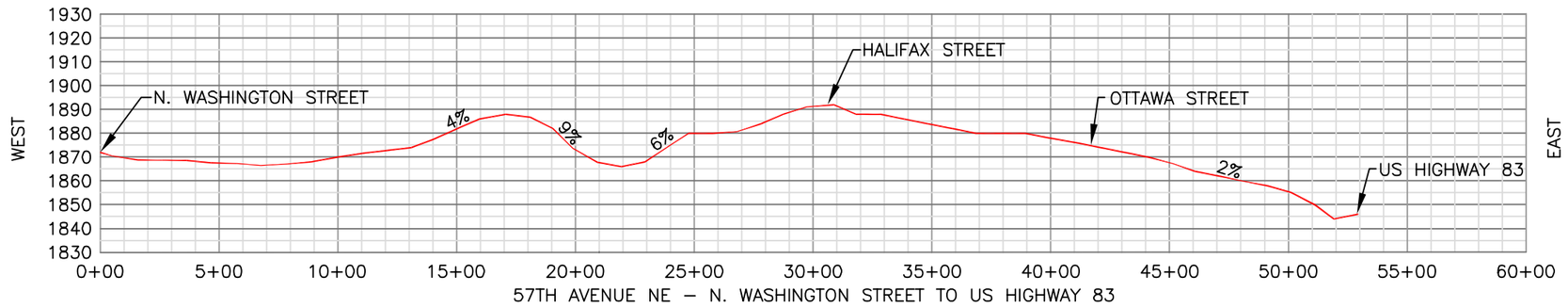
URS

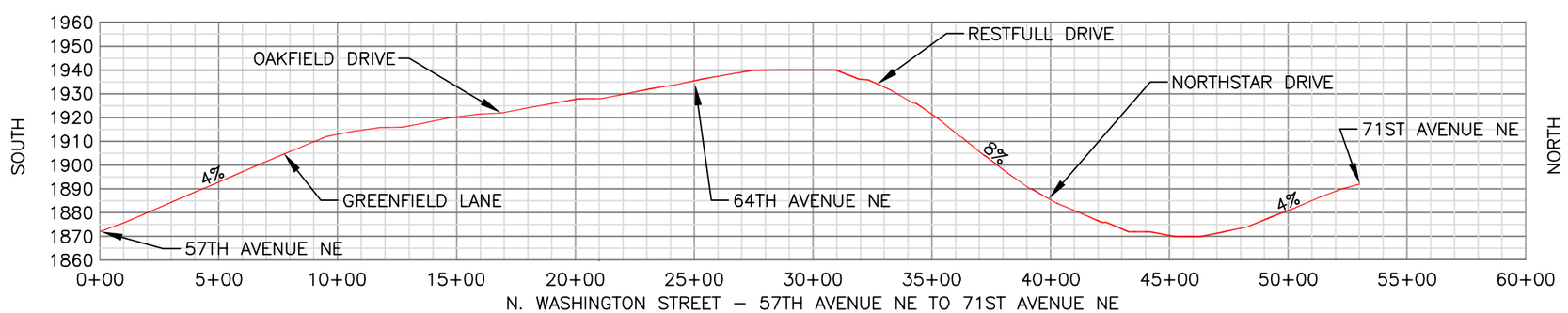
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





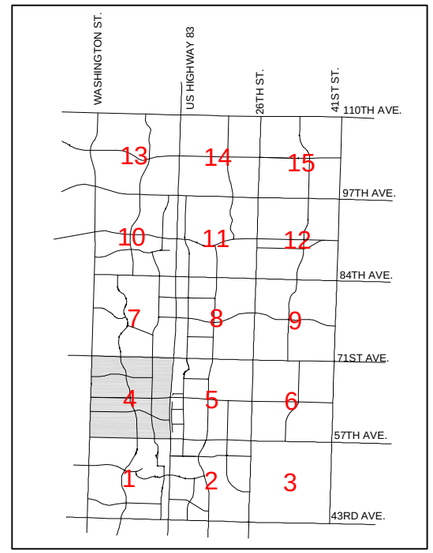




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 4



ARTERIAL ROADWAYS

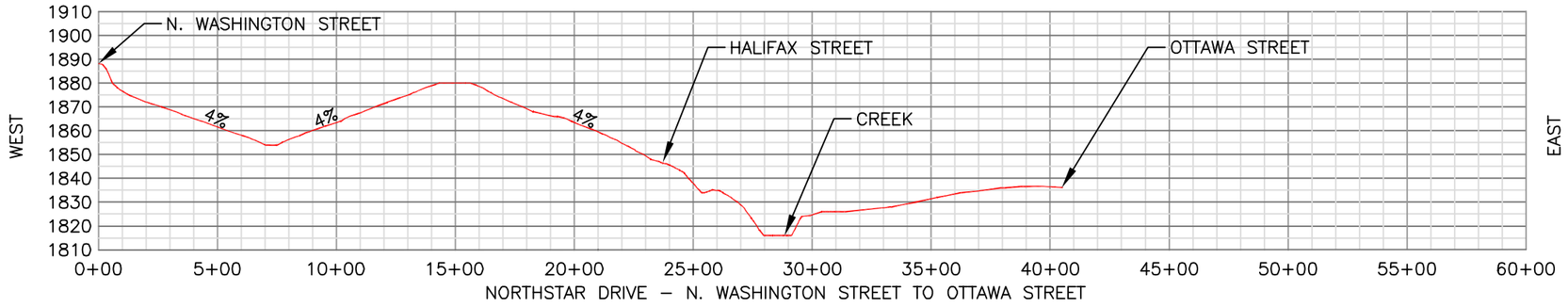
PROPOSED STREET PROFILES

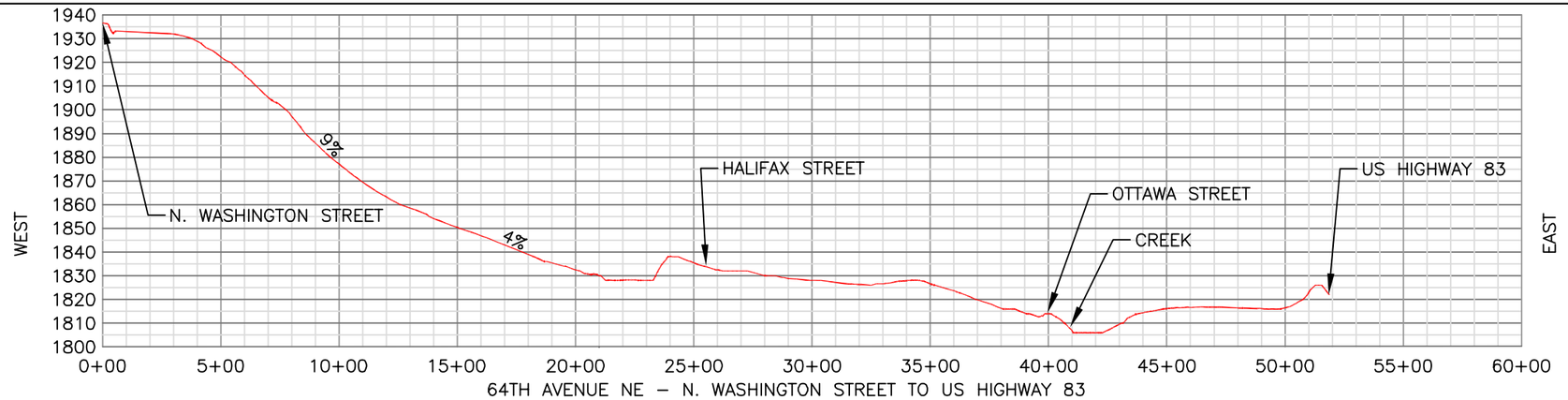
Bismarck-Mandan Metropolitan Planning Organization

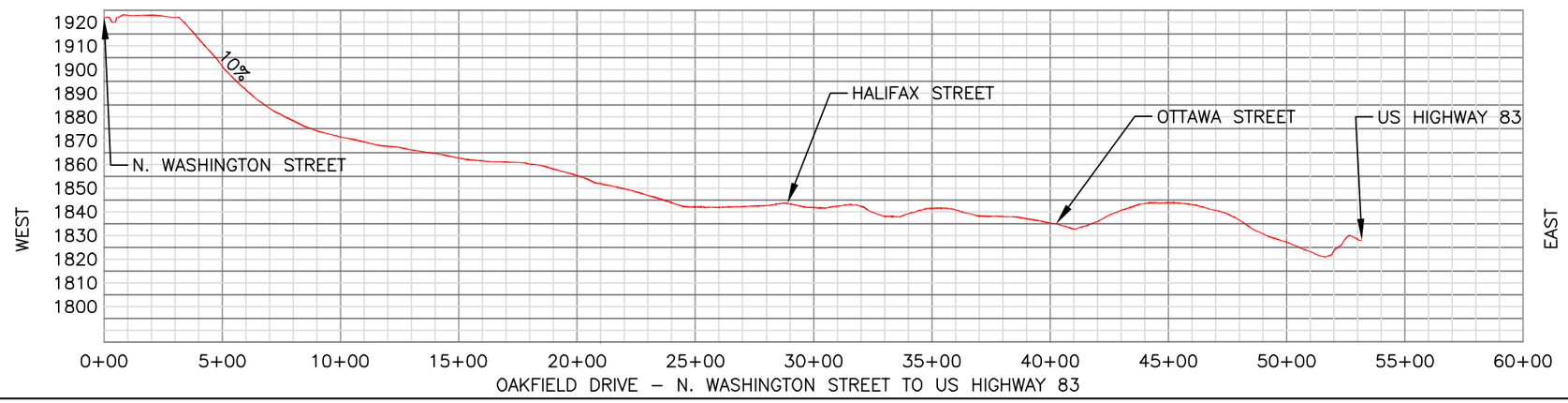
URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300



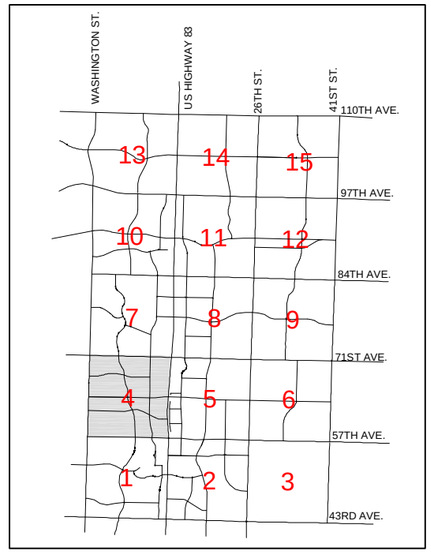




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 4



COLLECTOR ROADWAYS

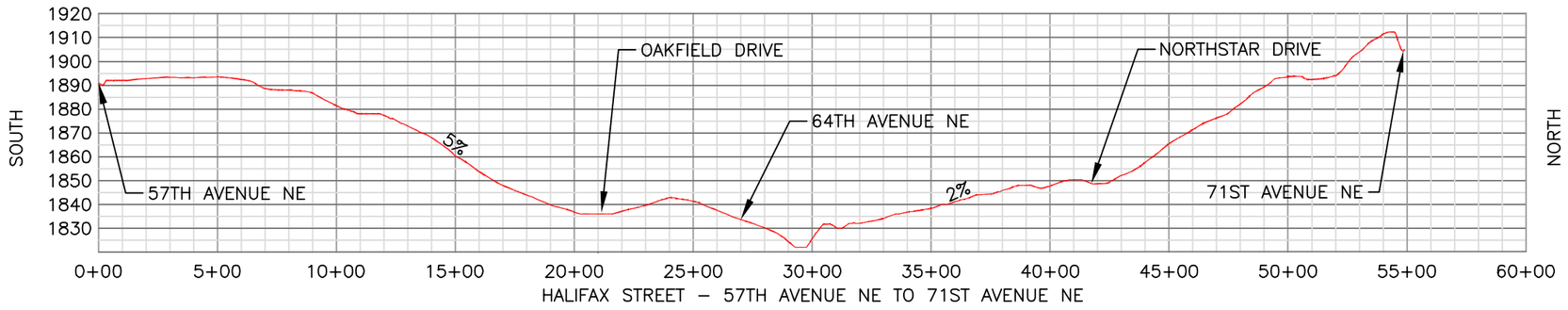
PROPOSED STREET PROFILES

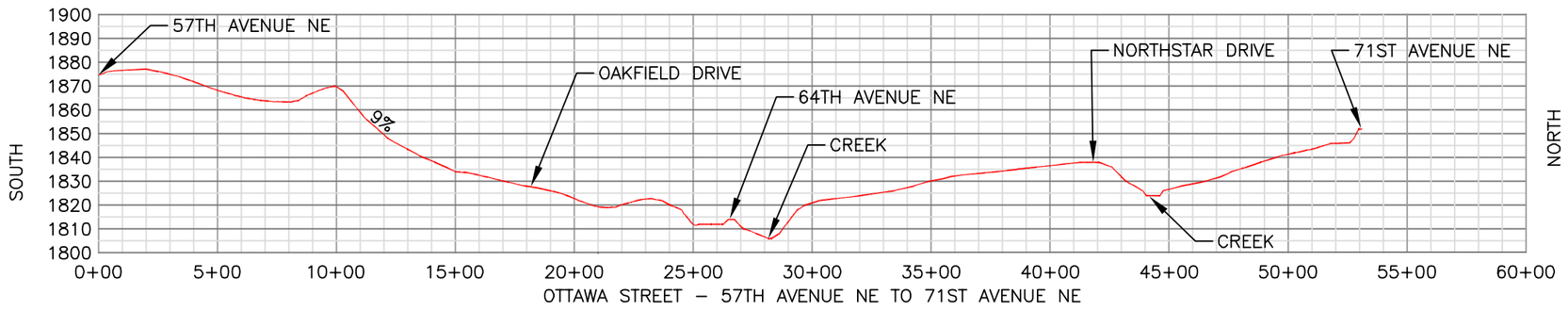
Bismarck-Mandan Metropolitan Planning Organization

URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

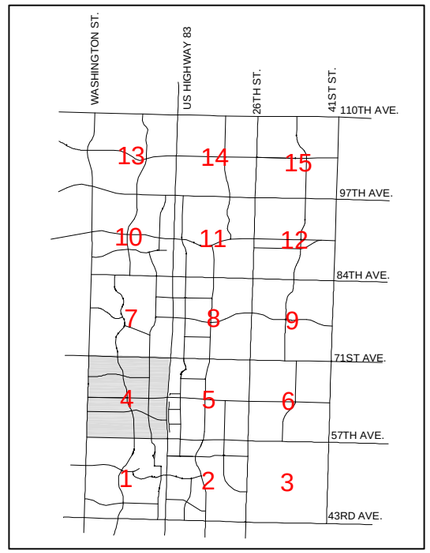




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 4



COLLECTOR ROADWAYS

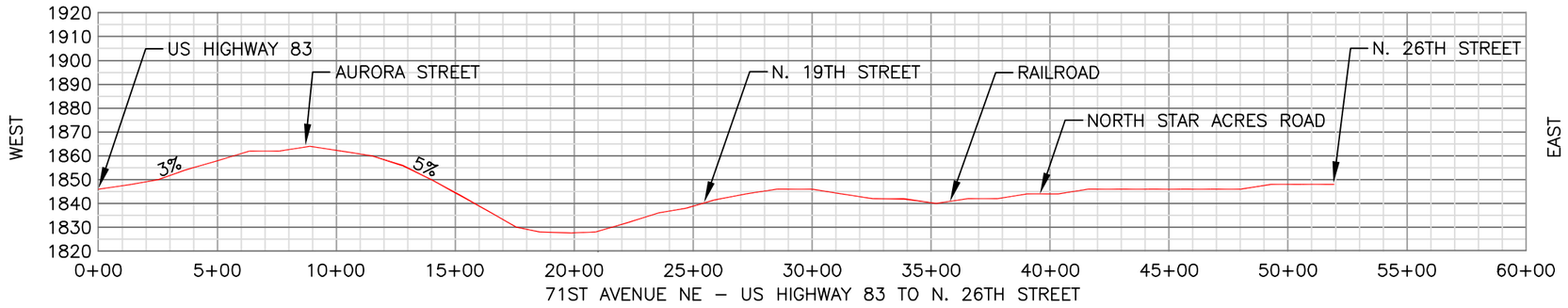
PROPOSED STREET PROFILES

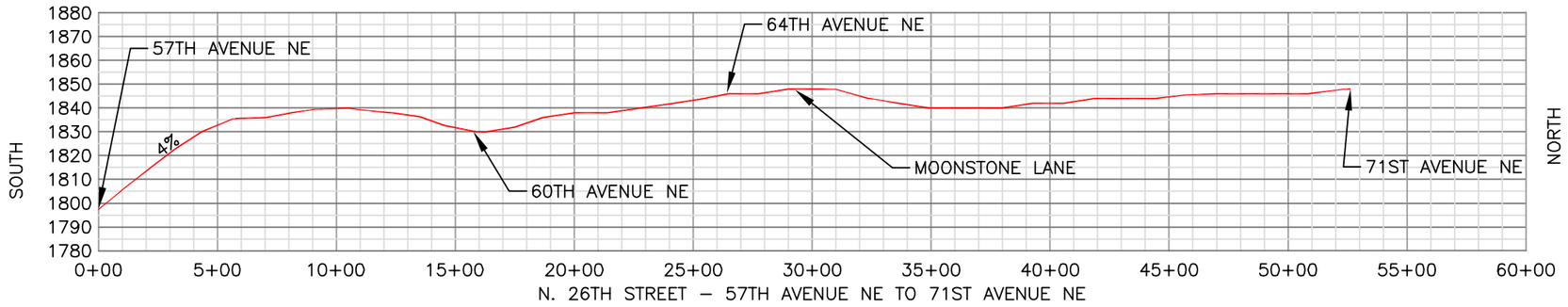
Bismarck-Mandan Metropolitan Planning Organization

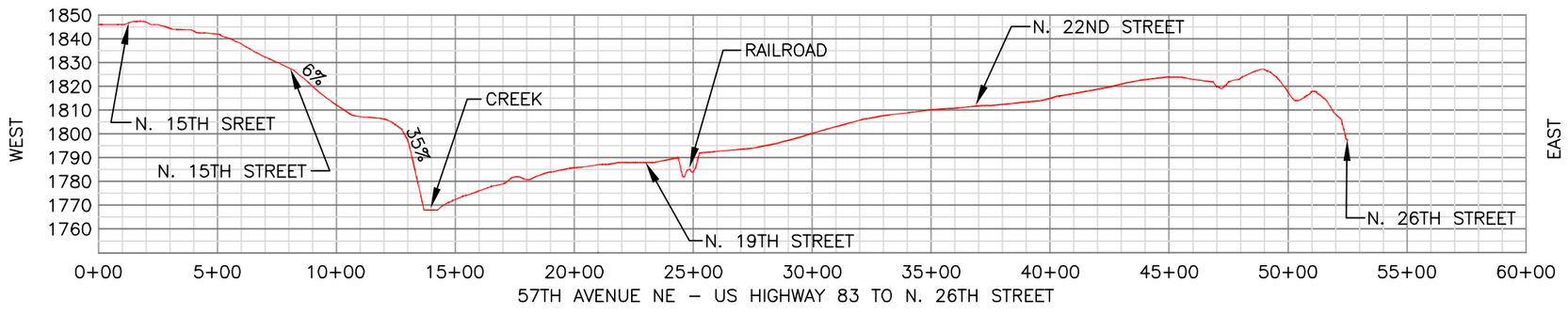
URS

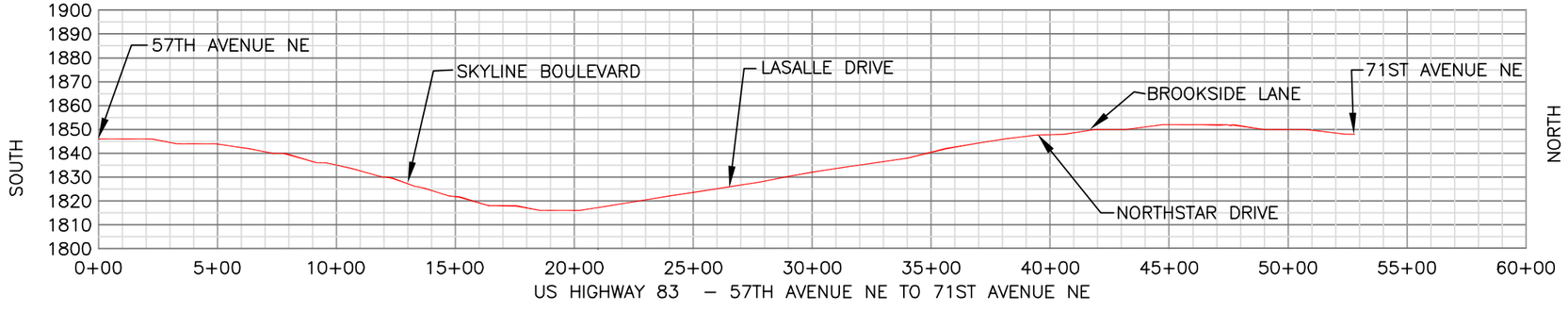
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





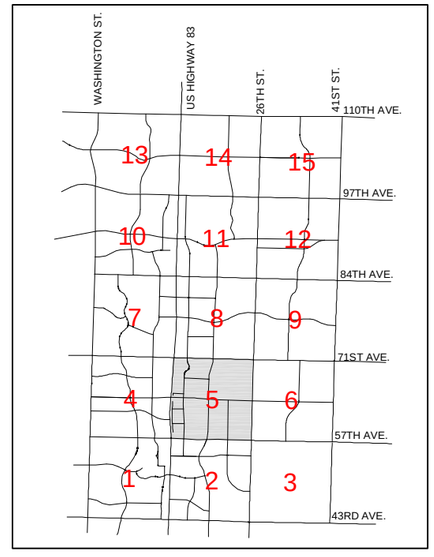




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 5



ARTERIAL ROADWAYS

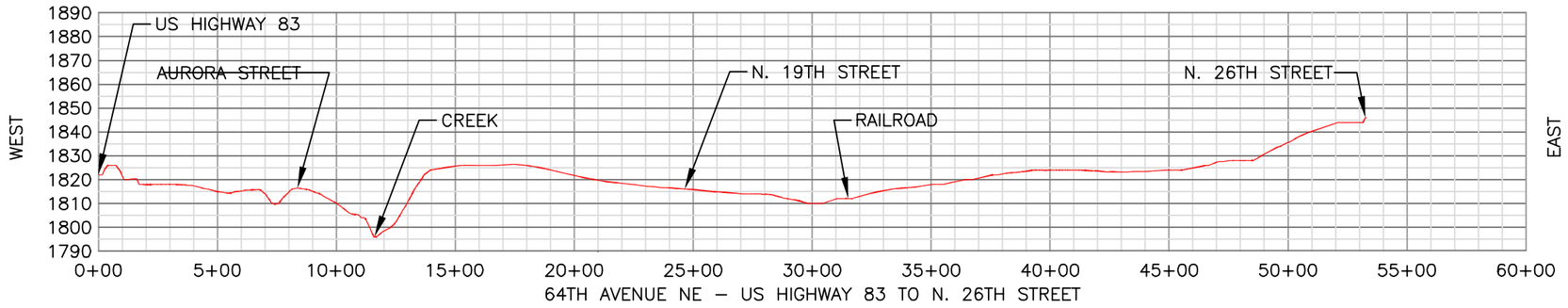
PROPOSED STREET PROFILES

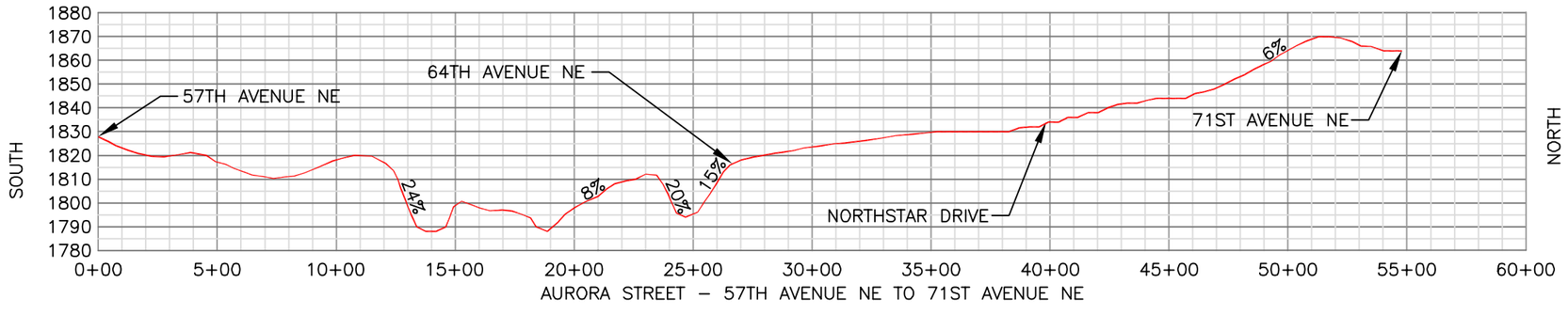
Bismarck-Mandan
Metropolitan Planning Organization

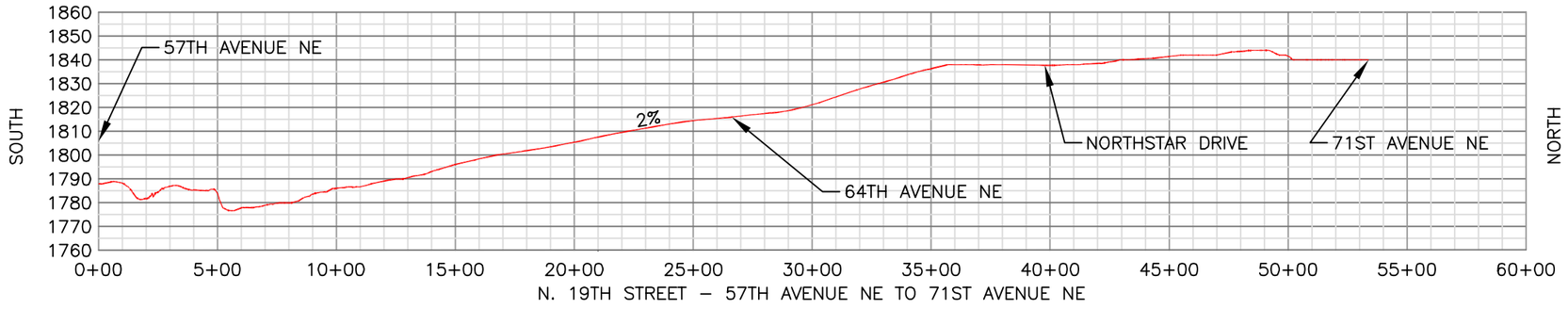
URS

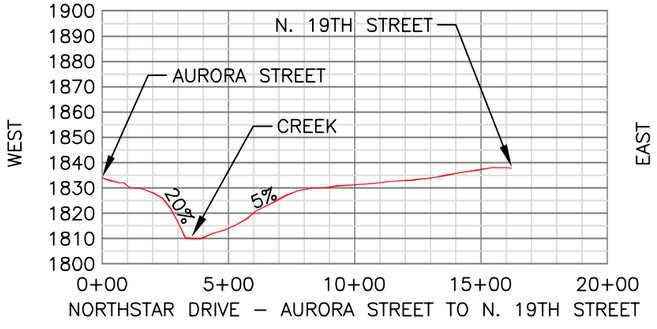
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

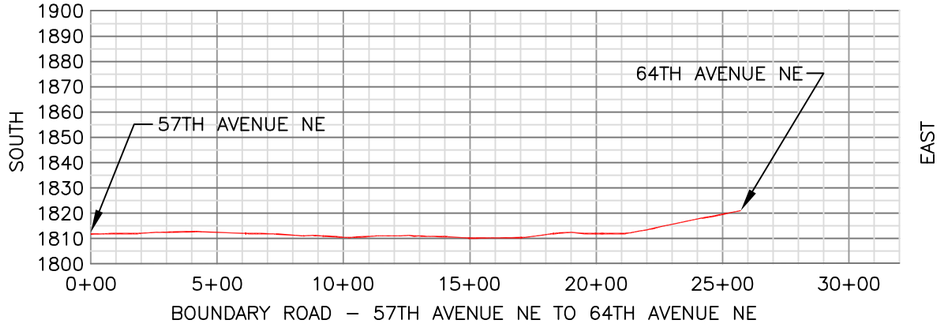
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300







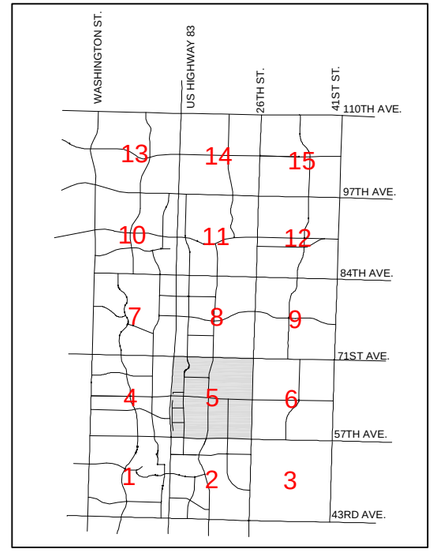




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 5



COLLECTOR ROADWAYS

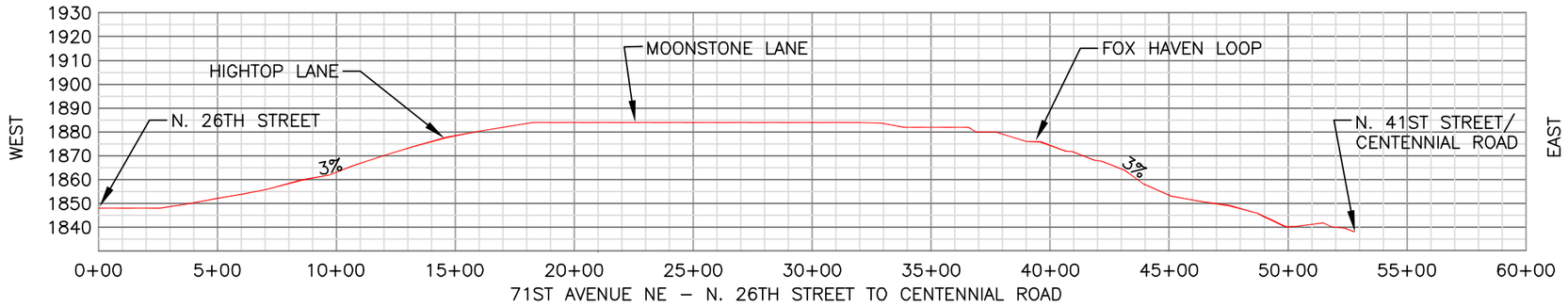
PROPOSED STREET PROFILES

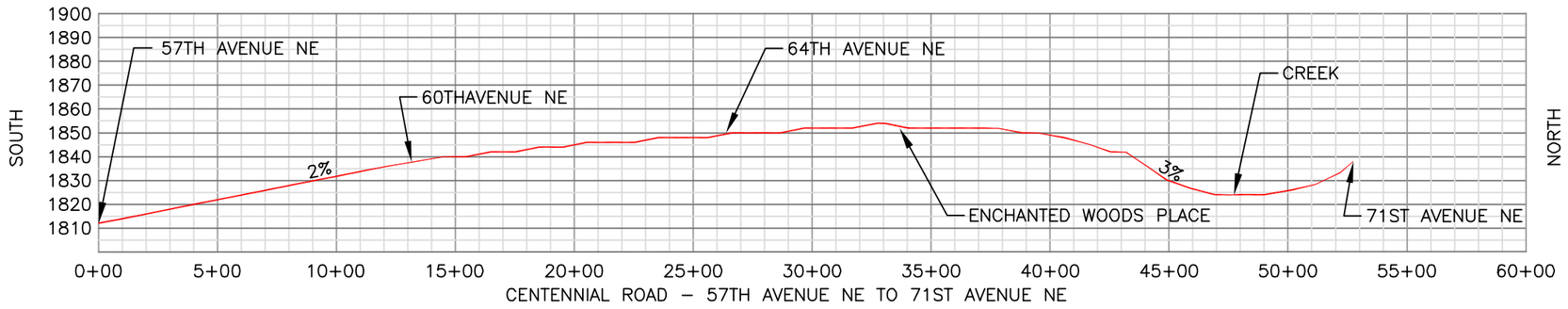
Bismarck-Mandan Metropolitan Planning Organization

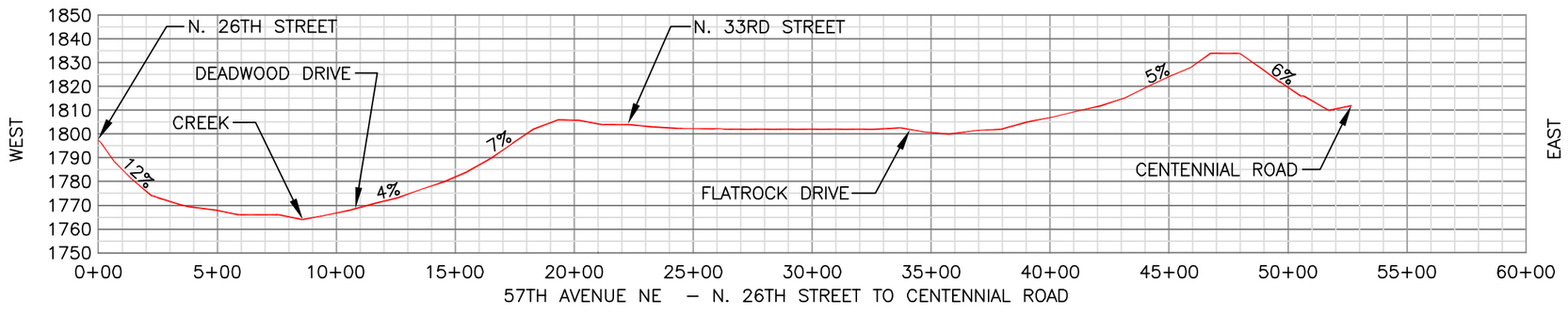
URS

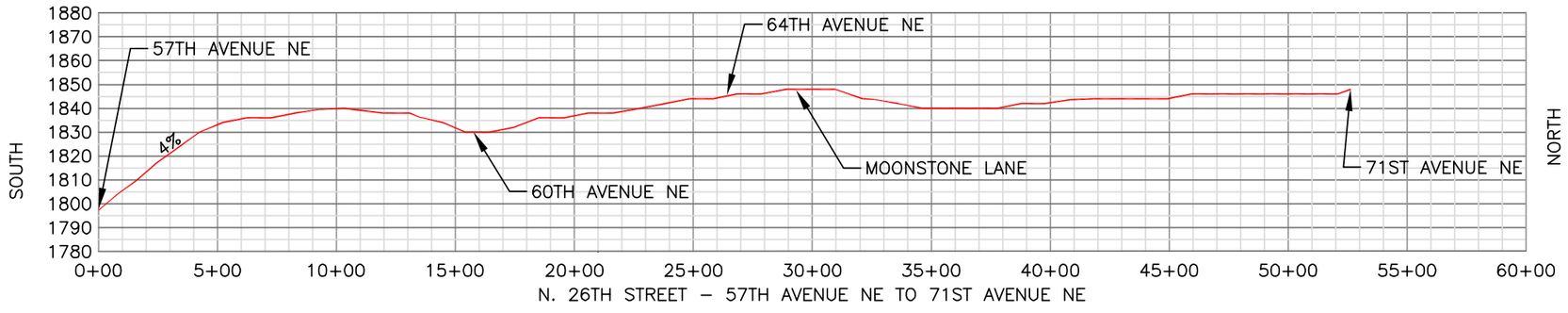
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





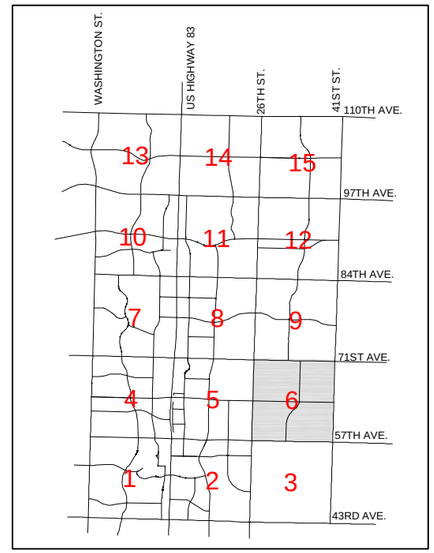




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 6



ARTERIAL ROADWAYS

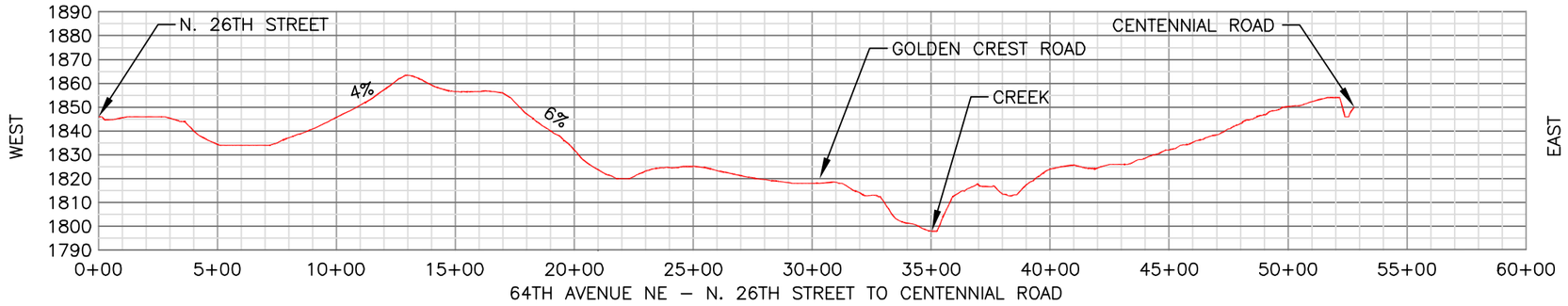
PROPOSED STREET PROFILES

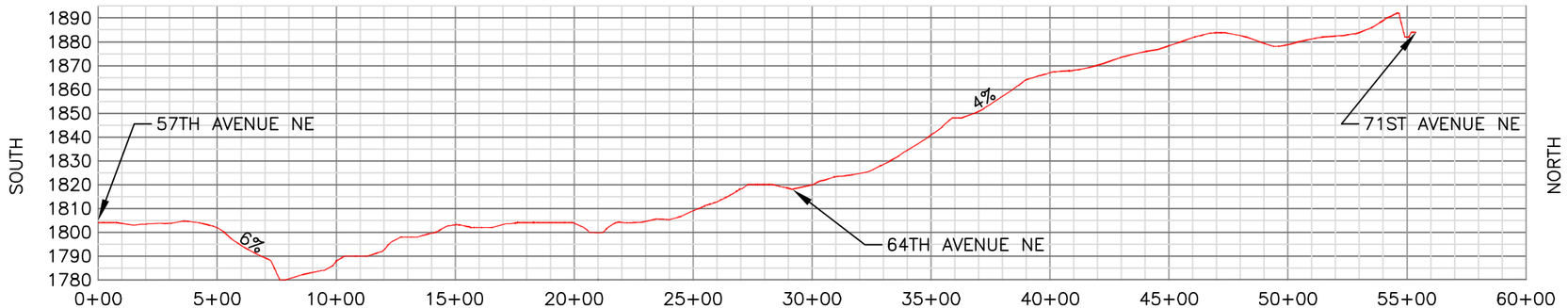
Bismarck-Mandan Metropolitan Planning Organization

URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

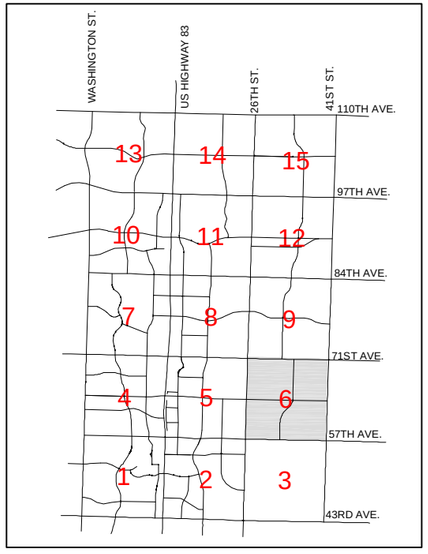




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 6



COLLECTOR ROADWAYS

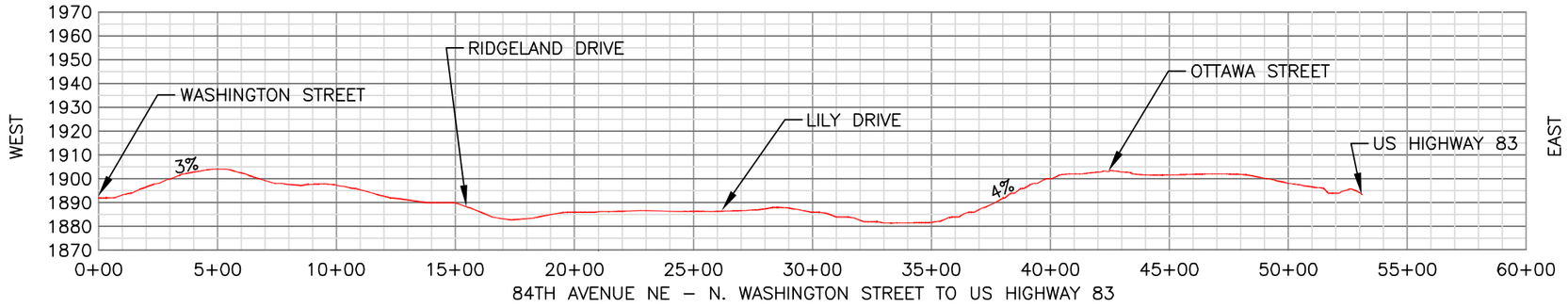
PROPOSED STREET PROFILES

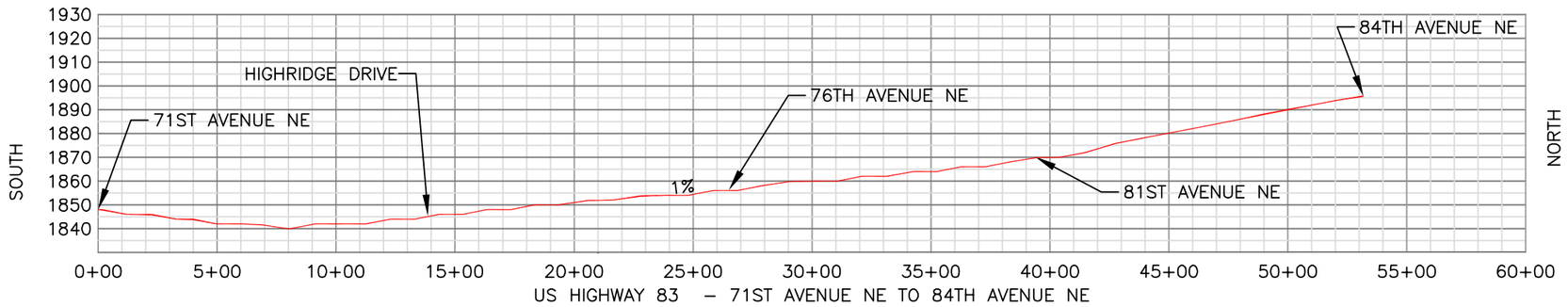
Bismarck-Mandan Metropolitan Planning Organization

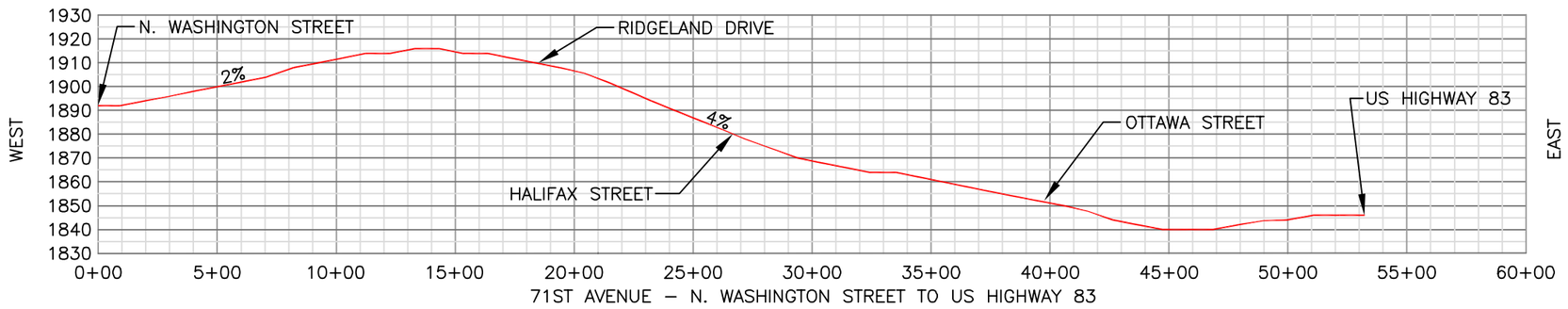
URS

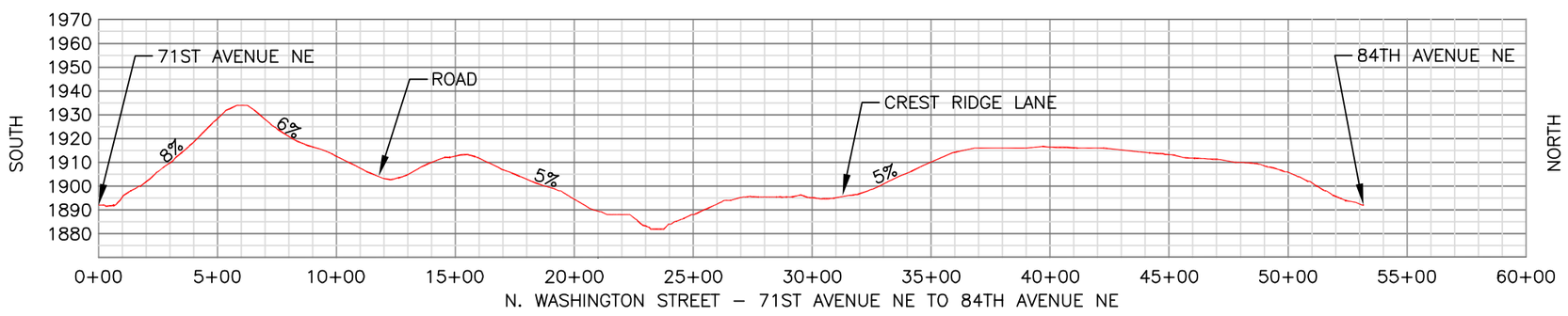
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





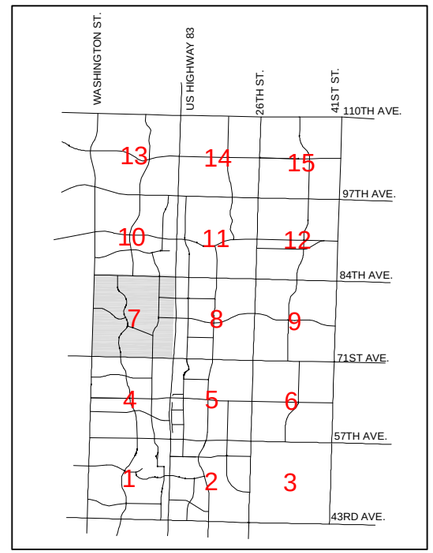




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 7



ARTERIAL ROADWAYS

PROPOSED STREET PROFILES

Bismarck-Mandan Metropolitan Planning Organization

URS

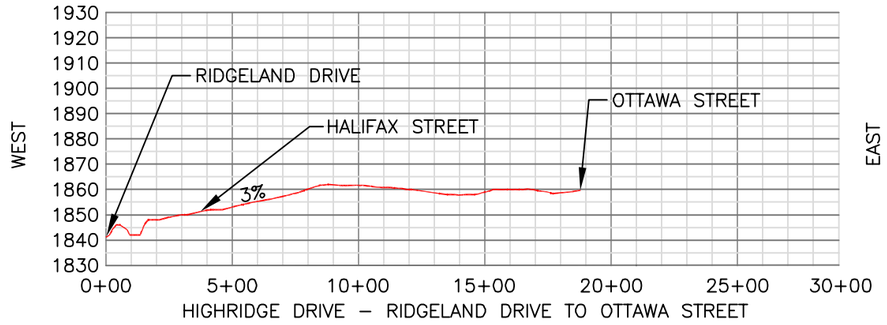
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

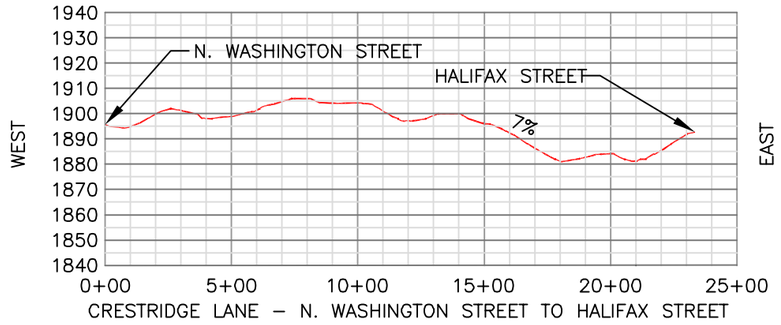
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

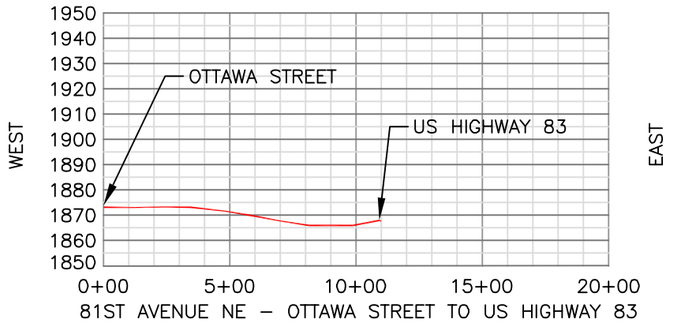
US 83
CORRIDOR STUDY

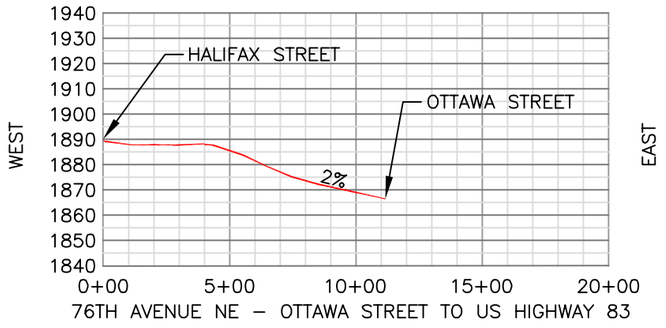
BISMARCK, NORTH DAKOTA

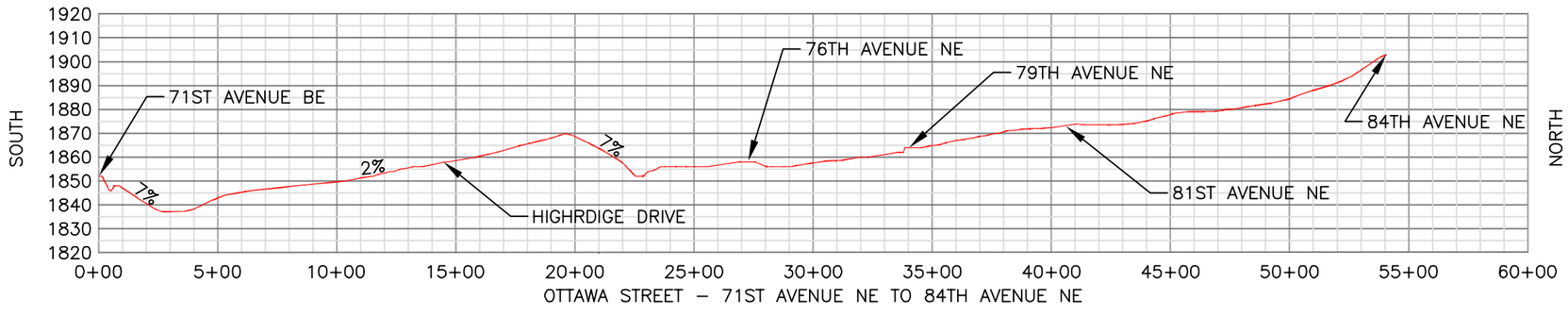
Panel 7

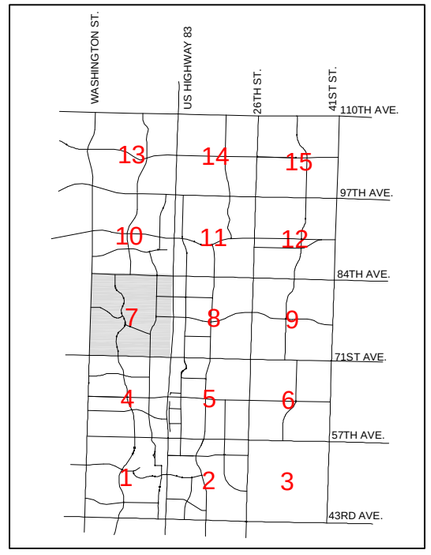












COLLECTOR ROADWAYS

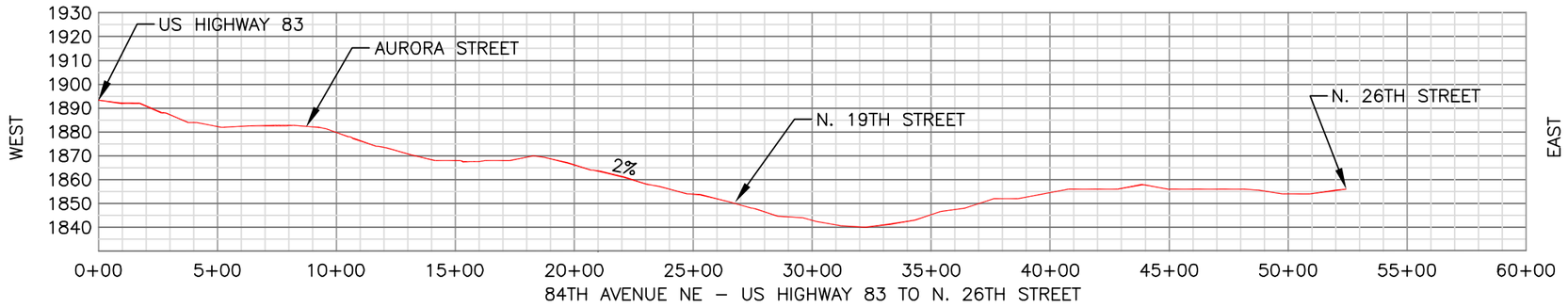
PROPOSED STREET PROFILES

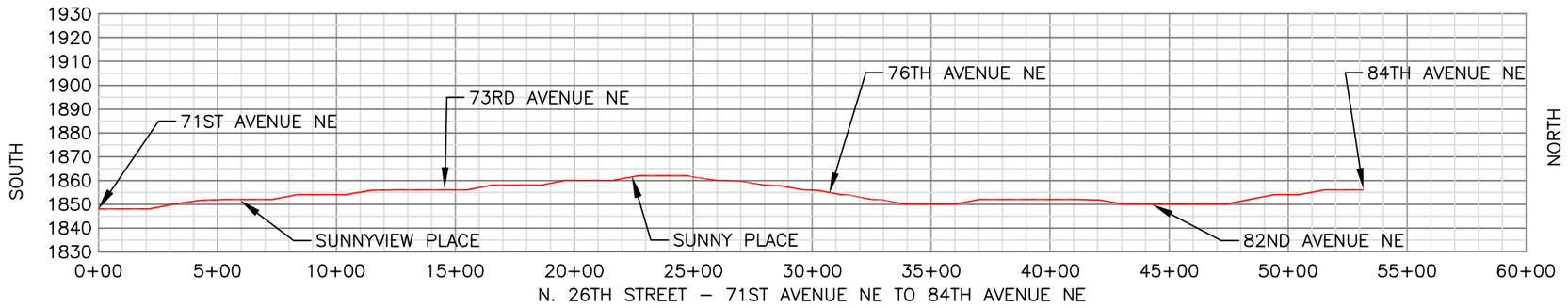
Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

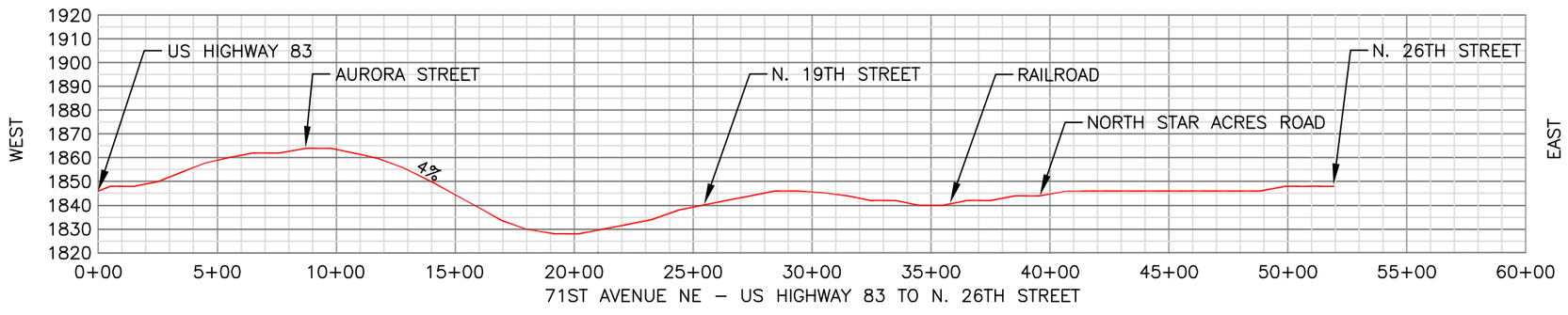
URS

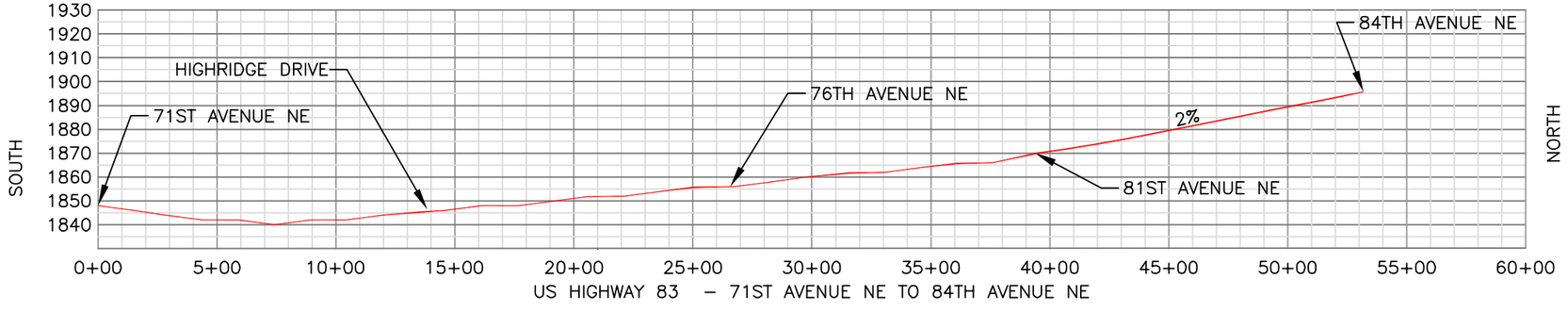
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





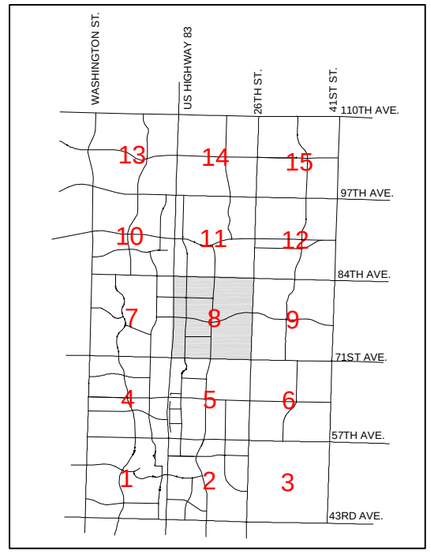




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 8



ARTERIAL ROADWAYS

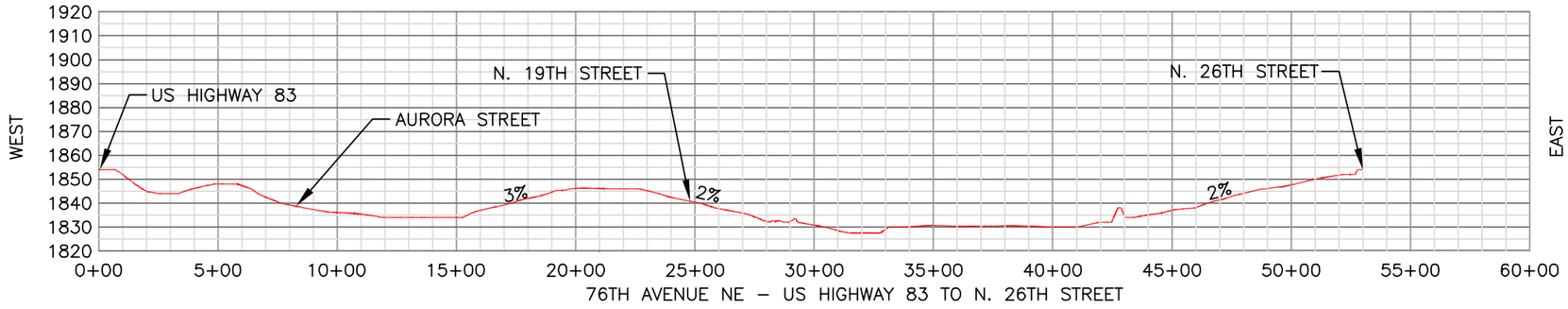
PROPOSED STREET PROFILES

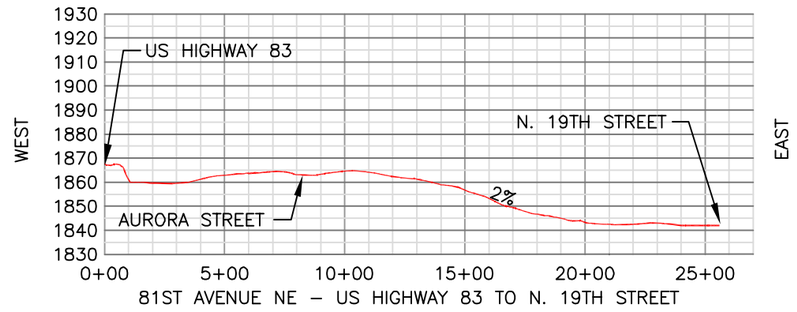
Bismarck-Mandan Metropolitan Planning Organization

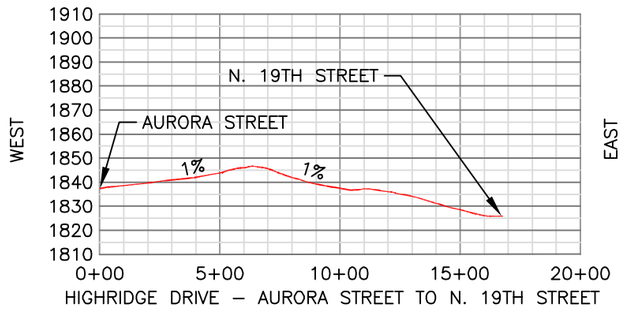
URS

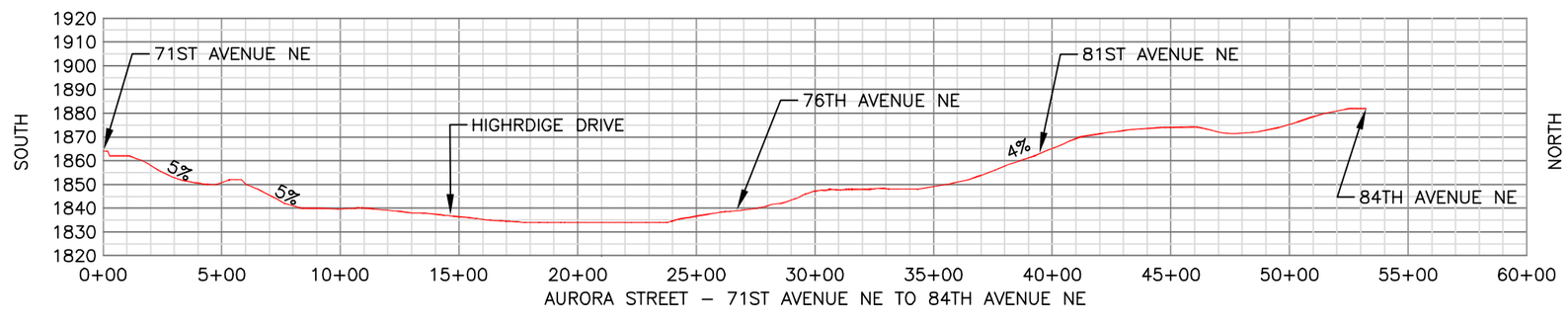
Drawn by	Date
GST	12-14-05
Checked by	Scale
ENG	NONE

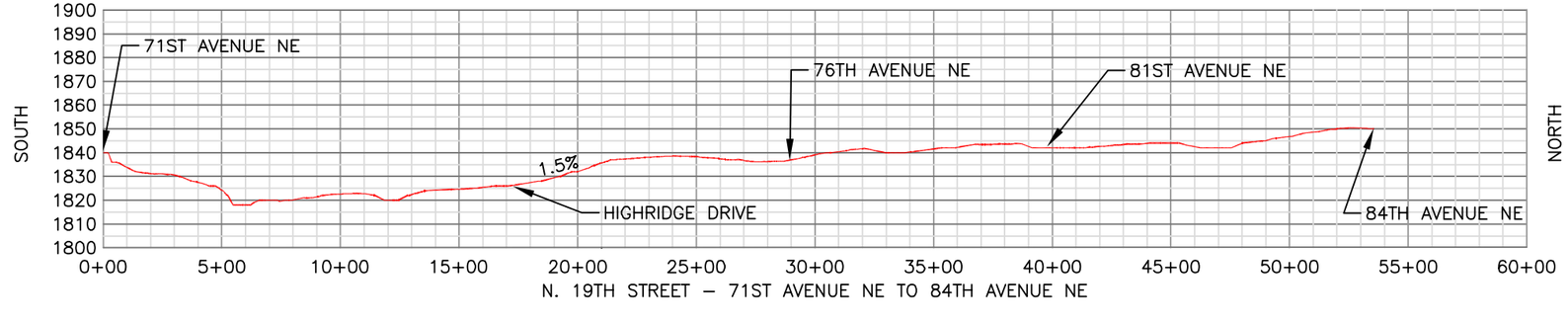
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300







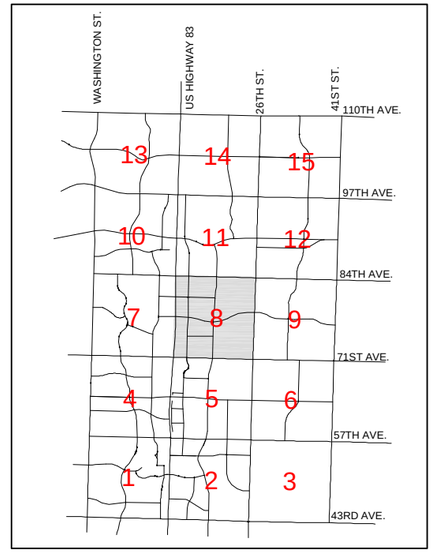




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 8



COLLECTOR ROADWAYS

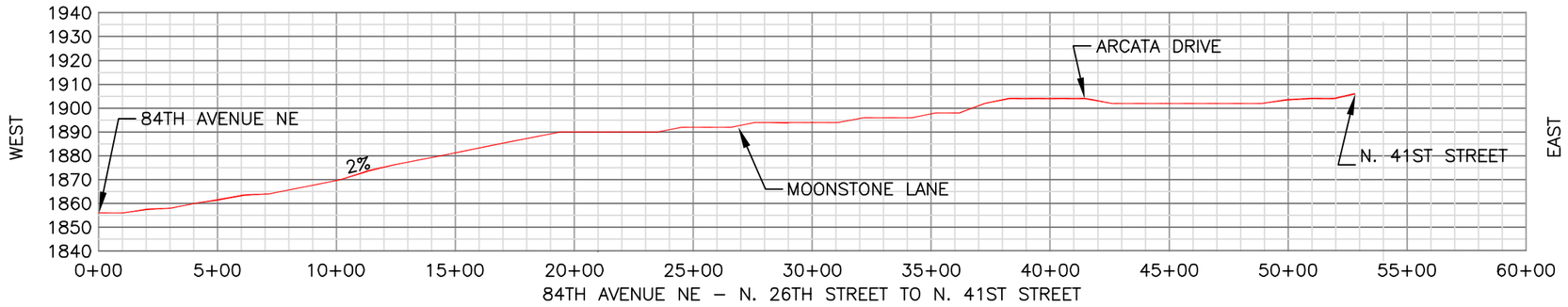
PROPOSED STREET PROFILES

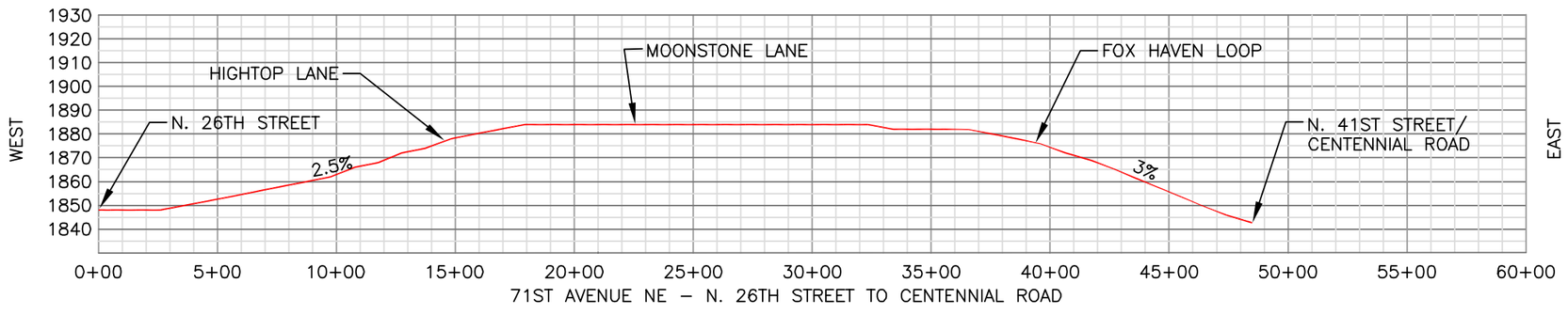
Bismarck-Mandan Metropolitan Planning Organization

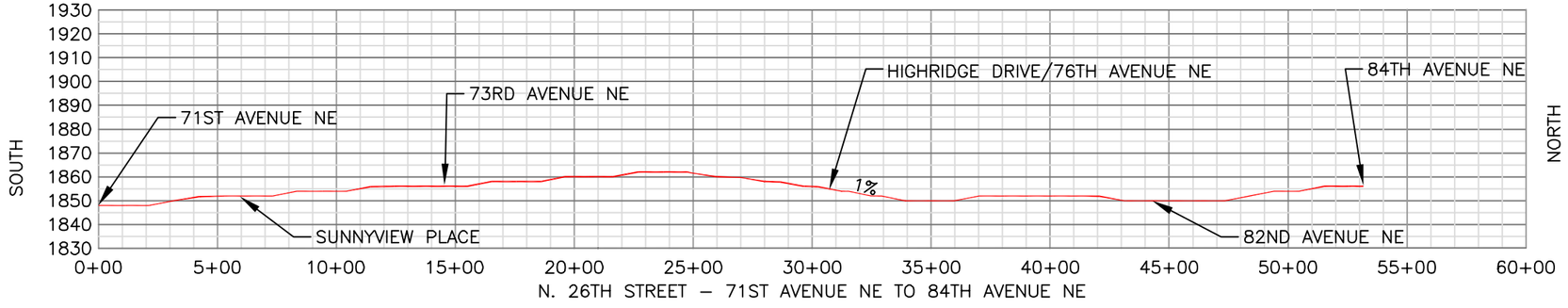
URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300



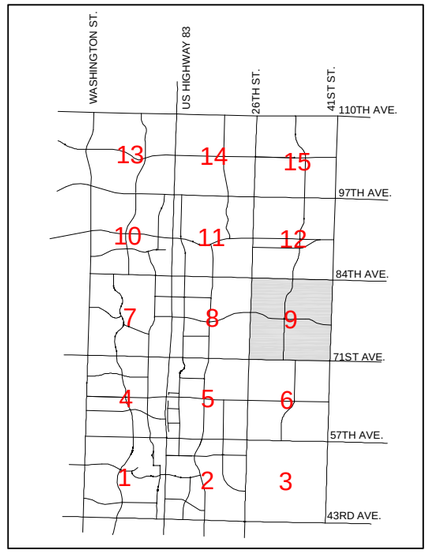




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 9



ARTERIAL ROADWAYS

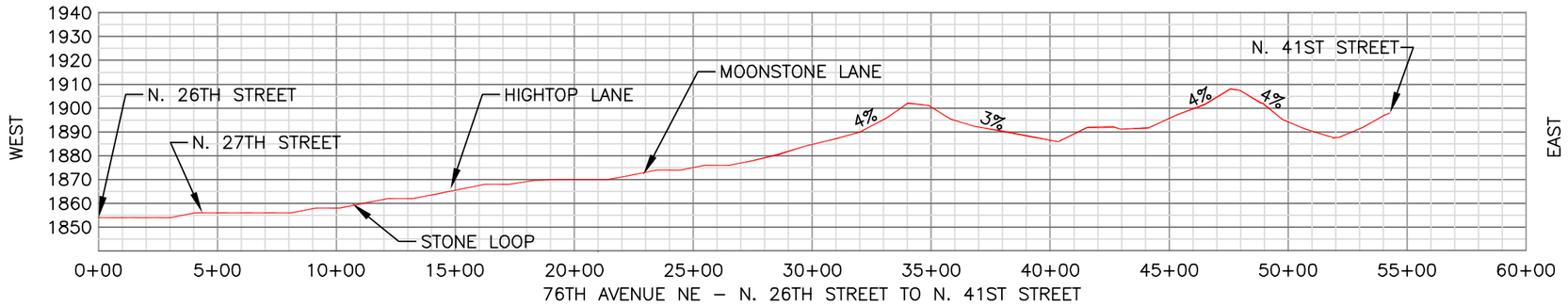
PROPOSED STREET PROFILES

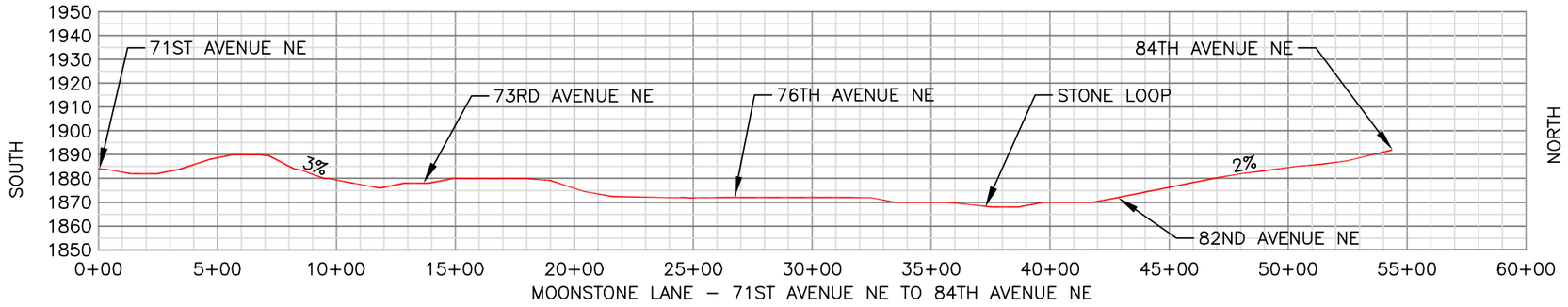
Bismarck-Mandan Metropolitan Planning Organization

URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

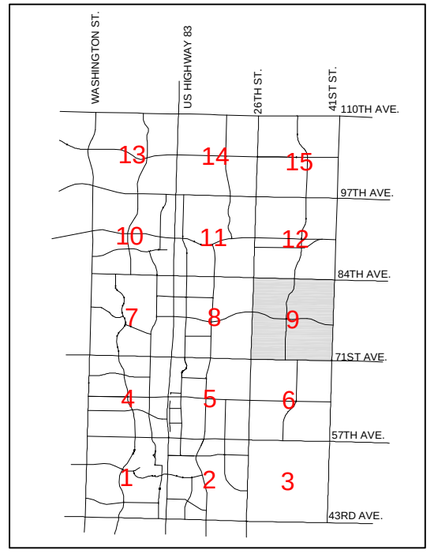




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 9



COLLECTOR ROADWAYS

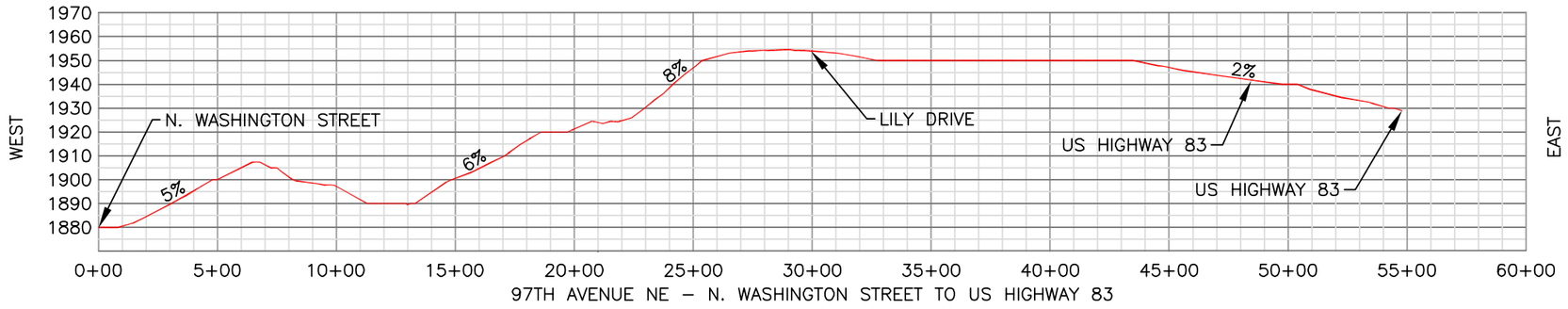
PROPOSED STREET PROFILES

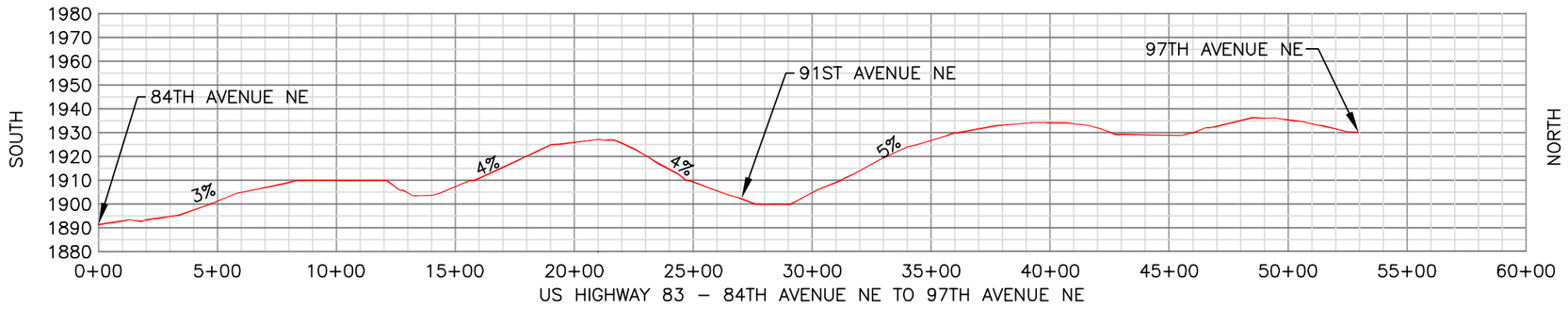
Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

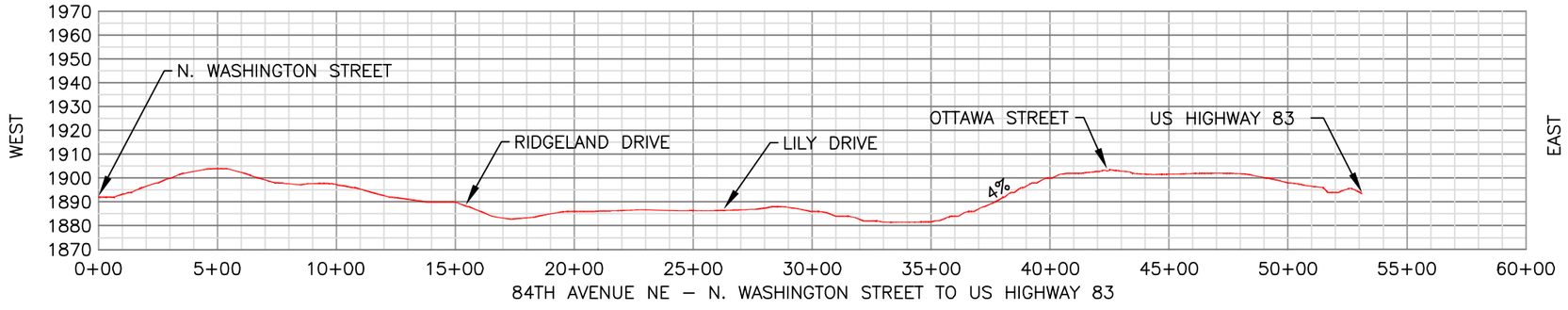
URS

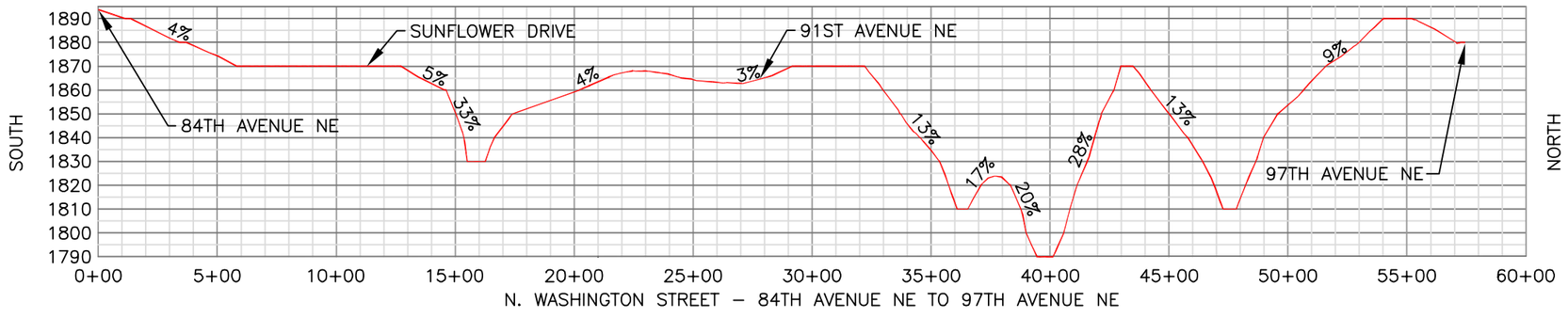
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





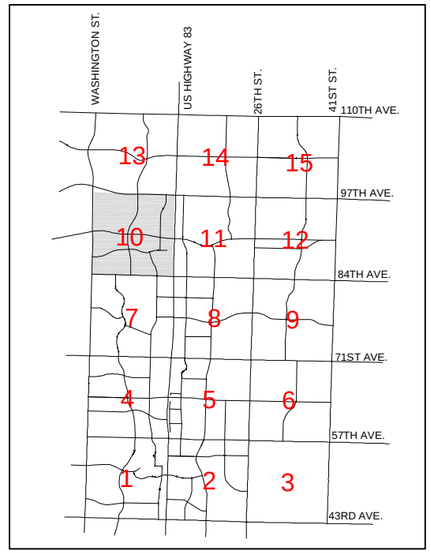




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 10



ARTERIAL ROADWAYS

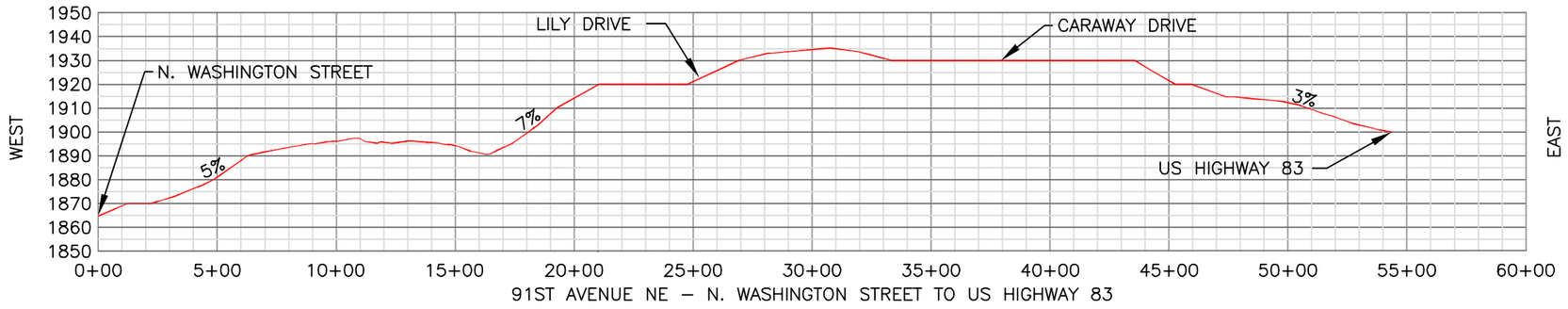
PROPOSED STREET PROFILES

Bismarck-Mandan Metropolitan Planning Organization

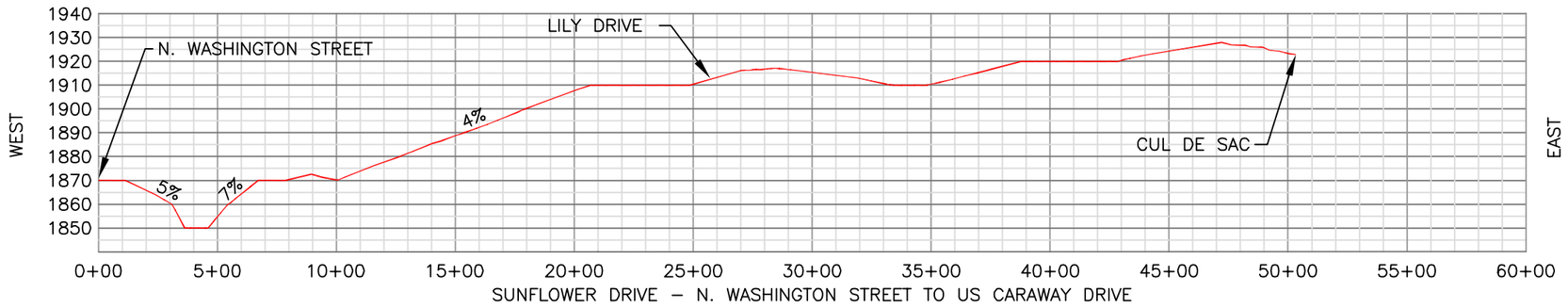
URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

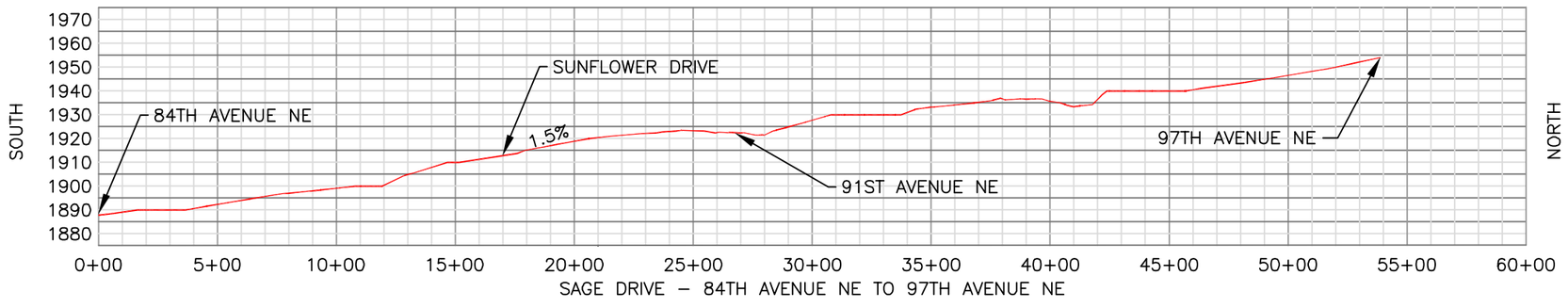
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300



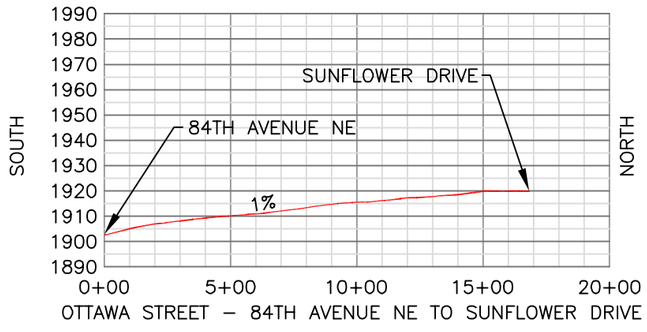
91ST AVENUE NE – N. WASHINGTON STREET TO US HIGHWAY 83



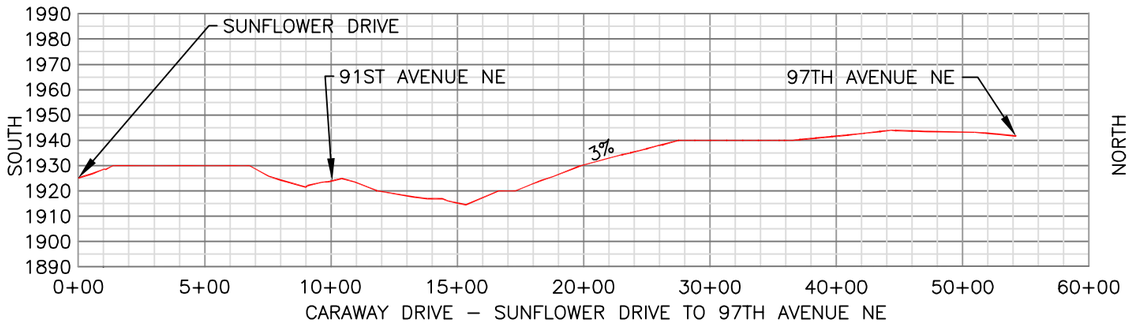
SUNFLOWER DRIVE – N. WASHINGTON STREET TO US CARAWAY DRIVE



SAGE DRIVE – 84TH AVENUE NE TO 97TH AVENUE NE



OTTAWA STREET – 84TH AVENUE NE TO SUNFLOWER DRIVE

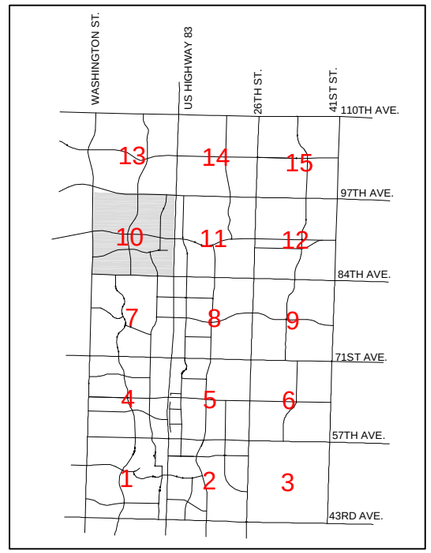


CARAWAY DRIVE – SUNFLOWER DRIVE TO 97TH AVENUE NE

US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 10



COLLECTOR ROADWAYS

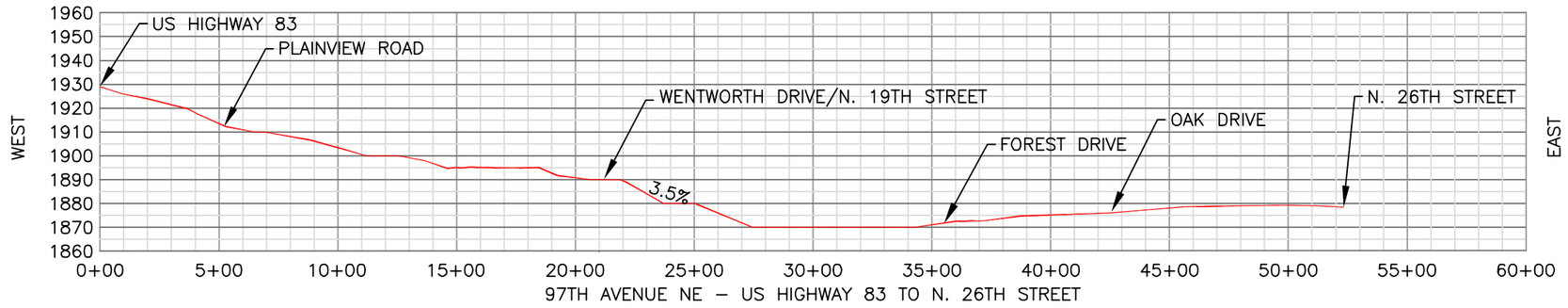
PROPOSED STREET PROFILES

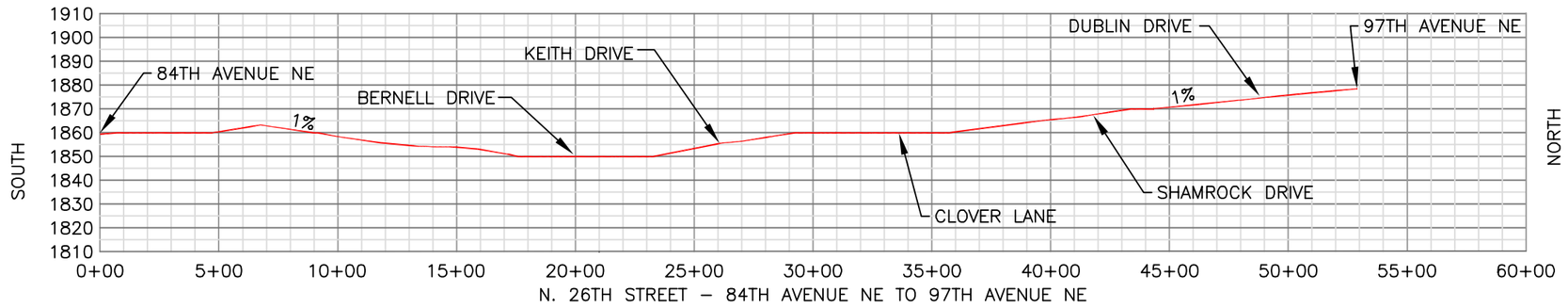
Bismarck-Mandan Metropolitan Planning Organization

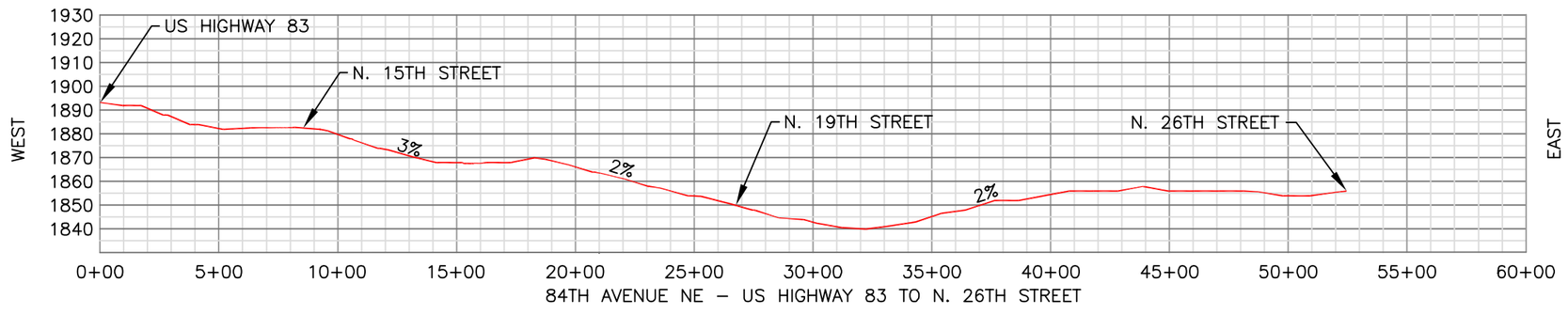
URS

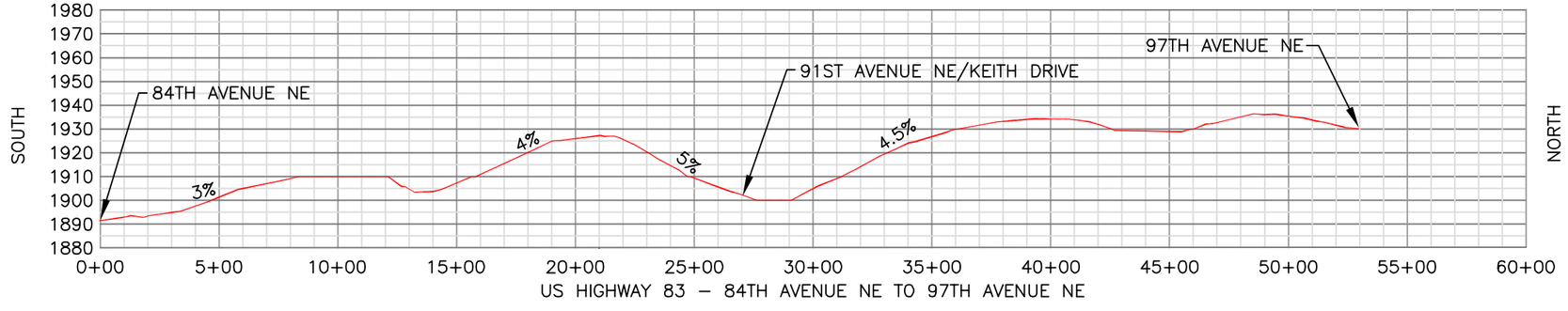
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





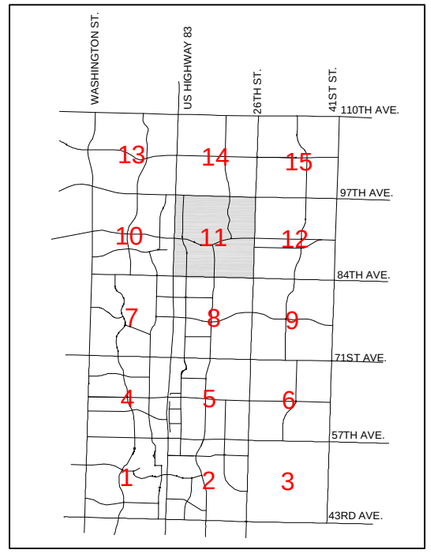




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 11



ARTERIAL ROADWAYS

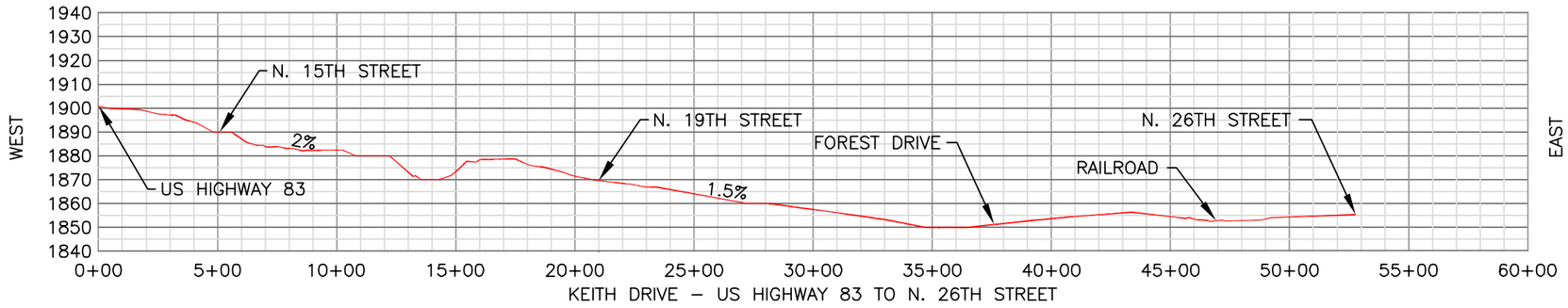
PROPOSED STREET PROFILES

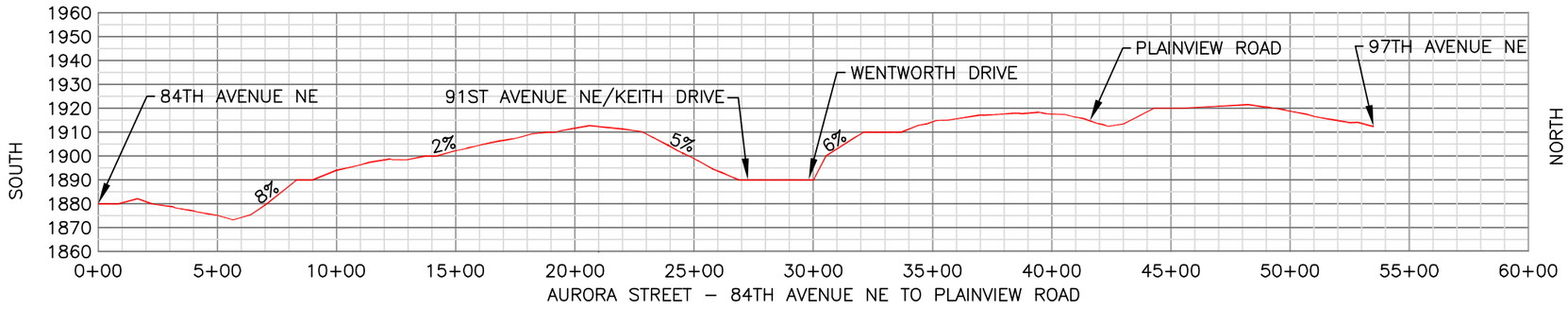
Bismarck-Mandan Metropolitan Planning Organization

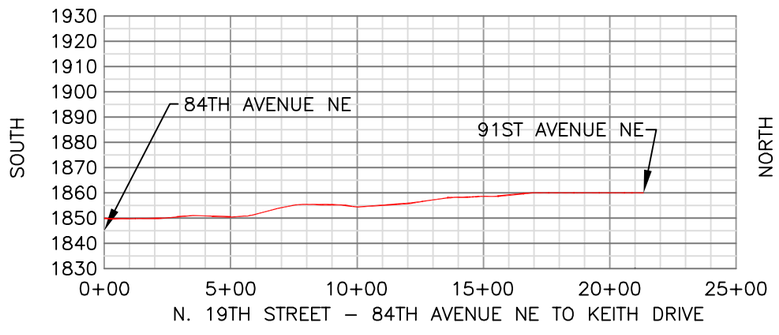
URS

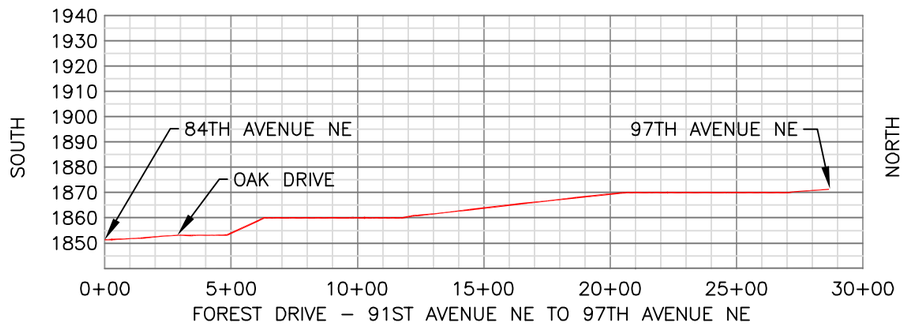
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





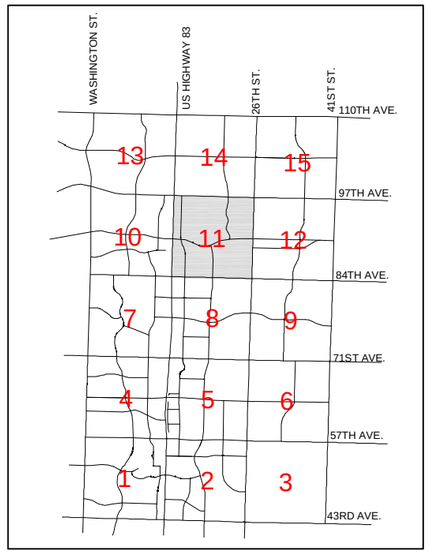




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 11



COLLECTOR ROADWAYS

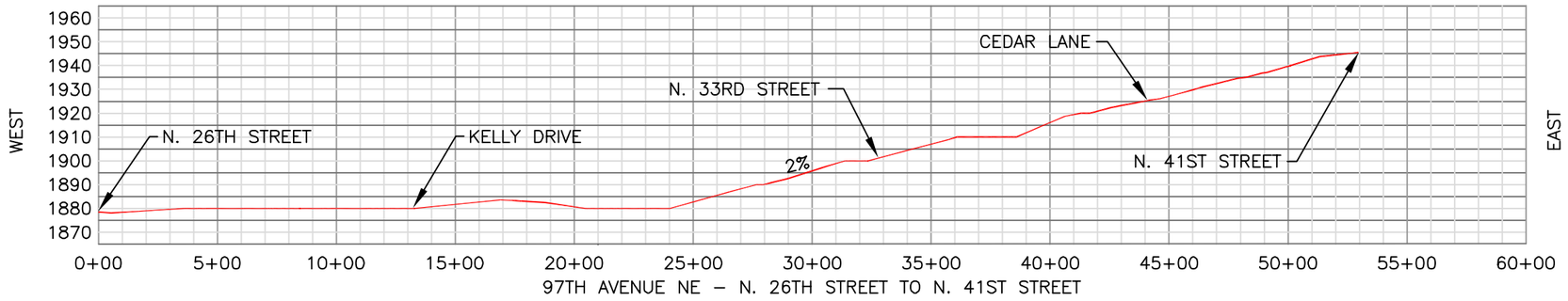
PROPOSED STREET PROFILES

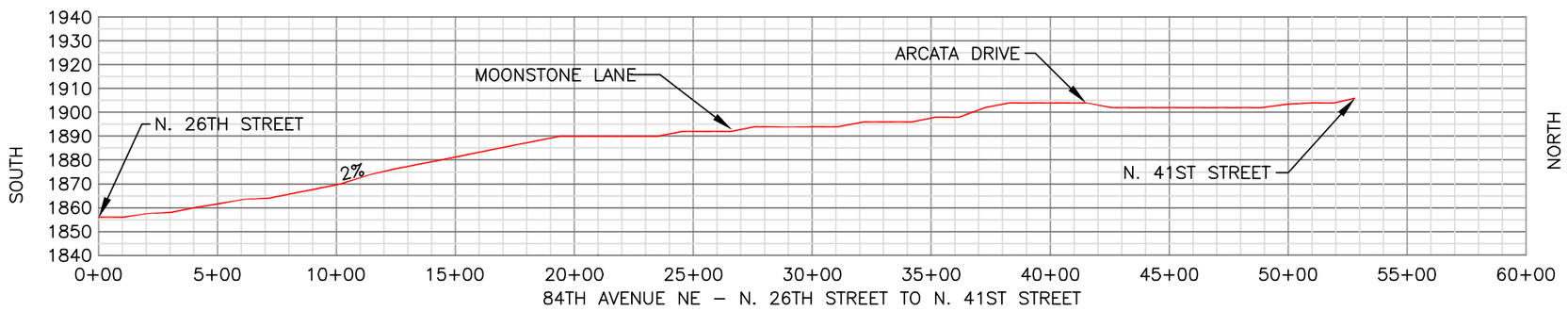
Bismarck-Mandan Metropolitan Planning Organization

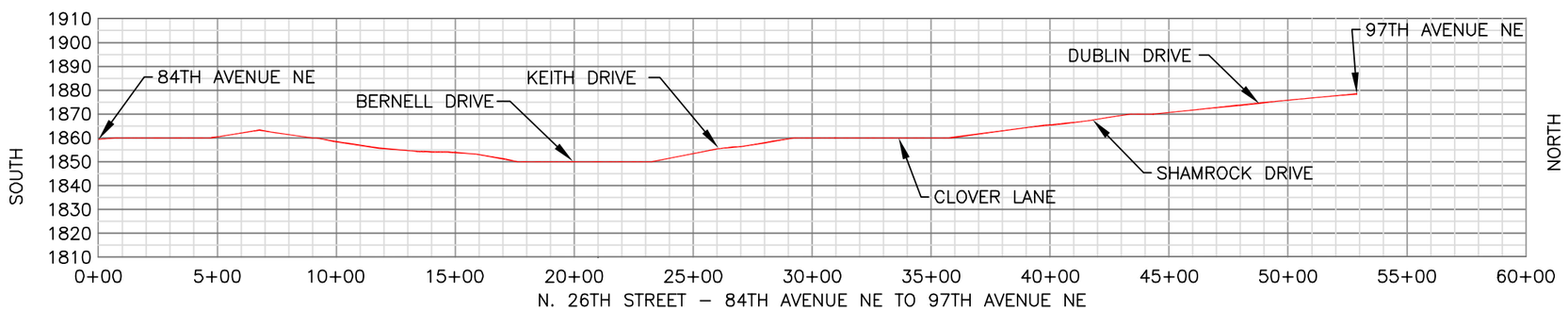
URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300



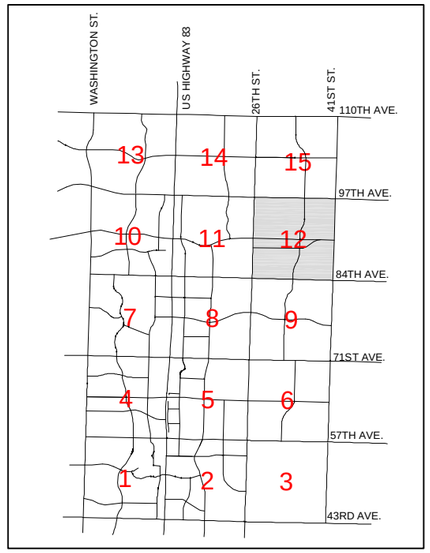




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 12



ARTERIAL ROADWAYS

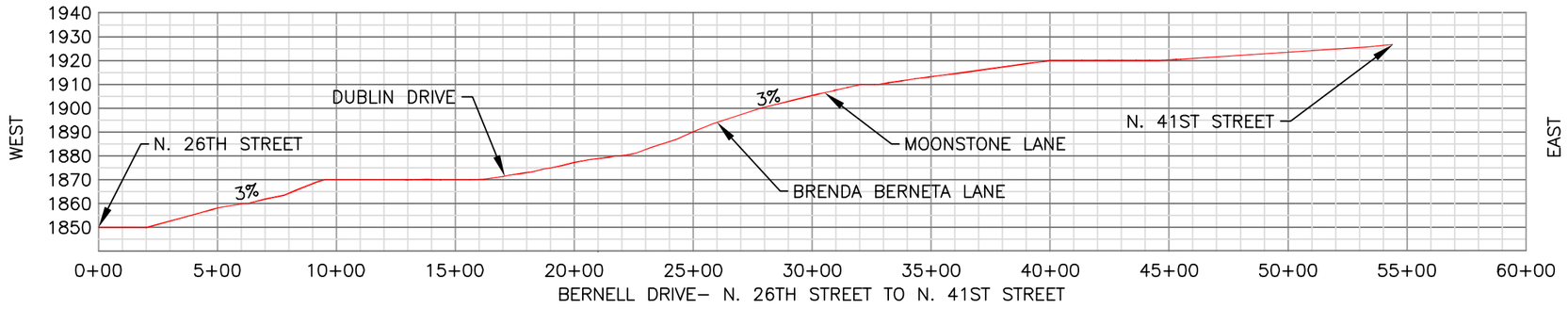
PROPOSED STREET PROFILES

Bismarck-Mandan Metropolitan Planning Organization

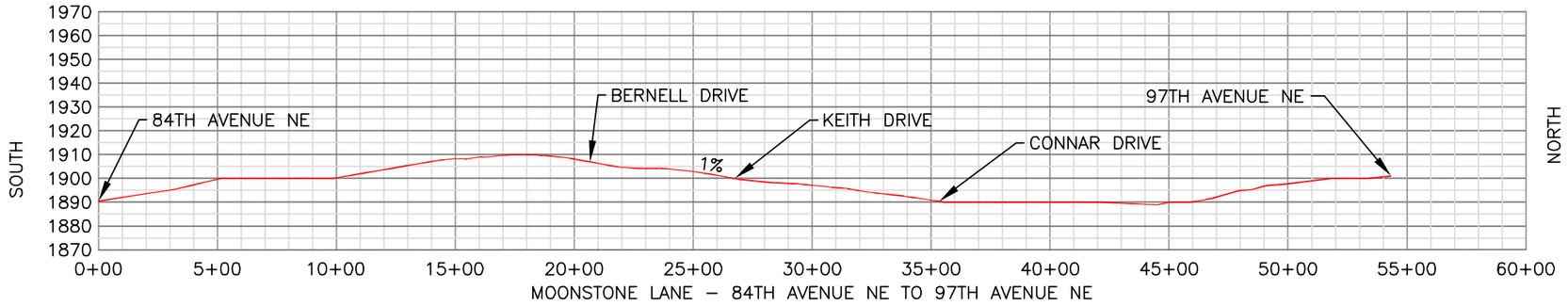
URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

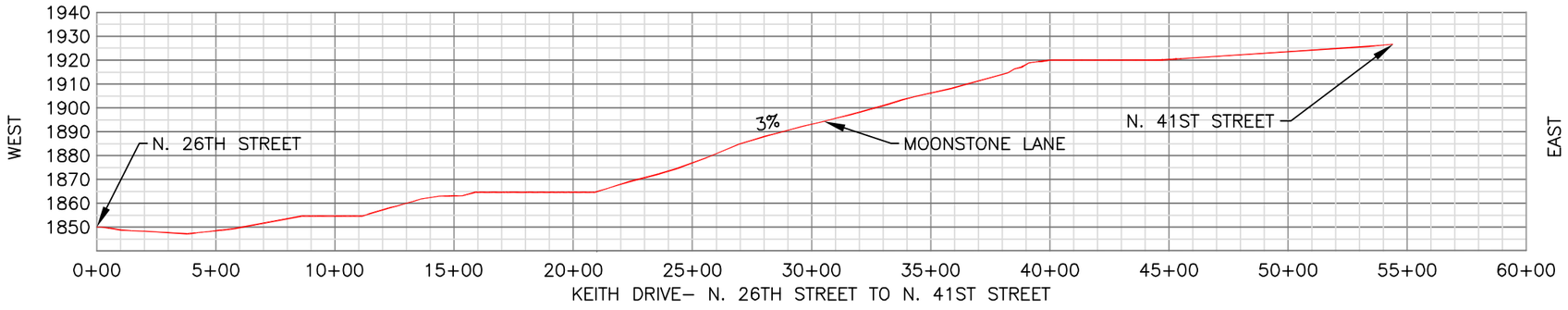
Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300



BERNELL DRIVE– N. 26TH STREET TO N. 41ST STREET



MOONSTONE LANE – 84TH AVENUE NE TO 97TH AVENUE NE

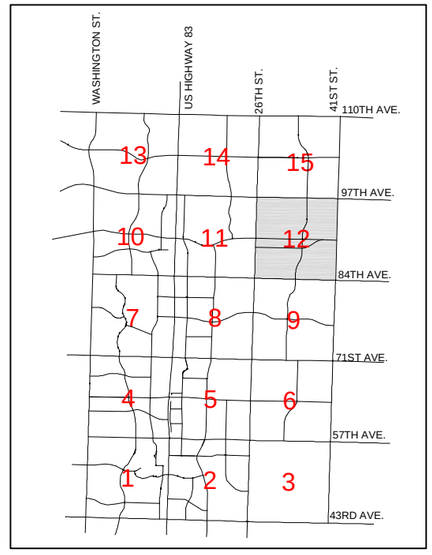


KEITH DRIVE– N. 26TH STREET TO N. 41ST STREET

US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 12



COLLECTOR ROADWAYS

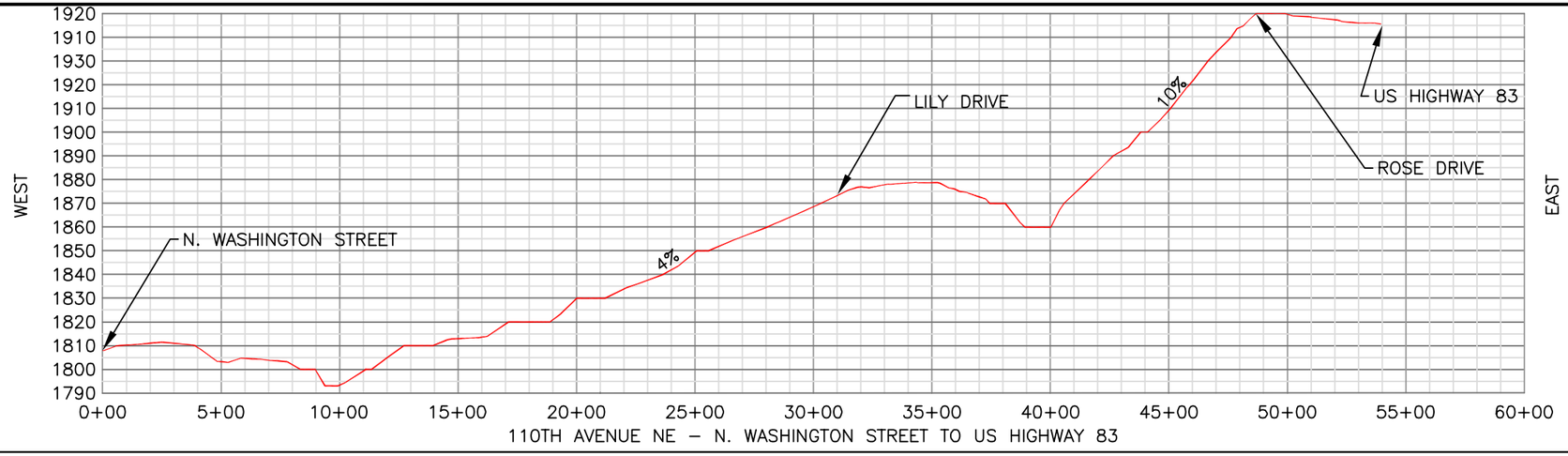
PROPOSED STREET PROFILES

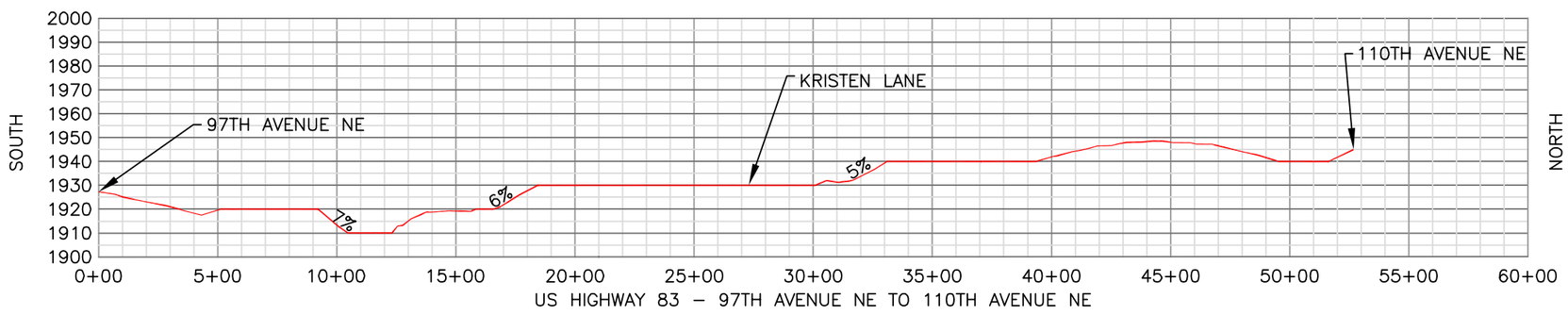
Bismarck-Mandan Metropolitan Planning Organization

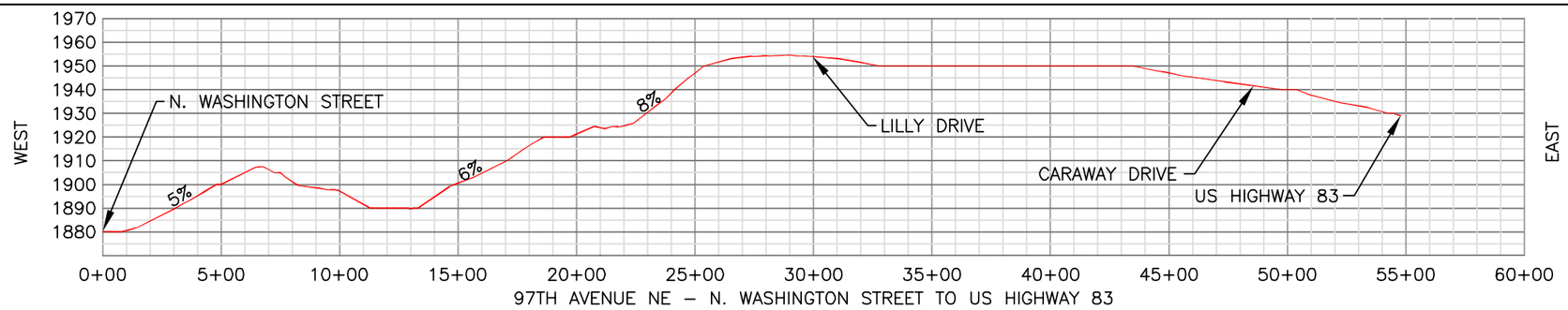
URS

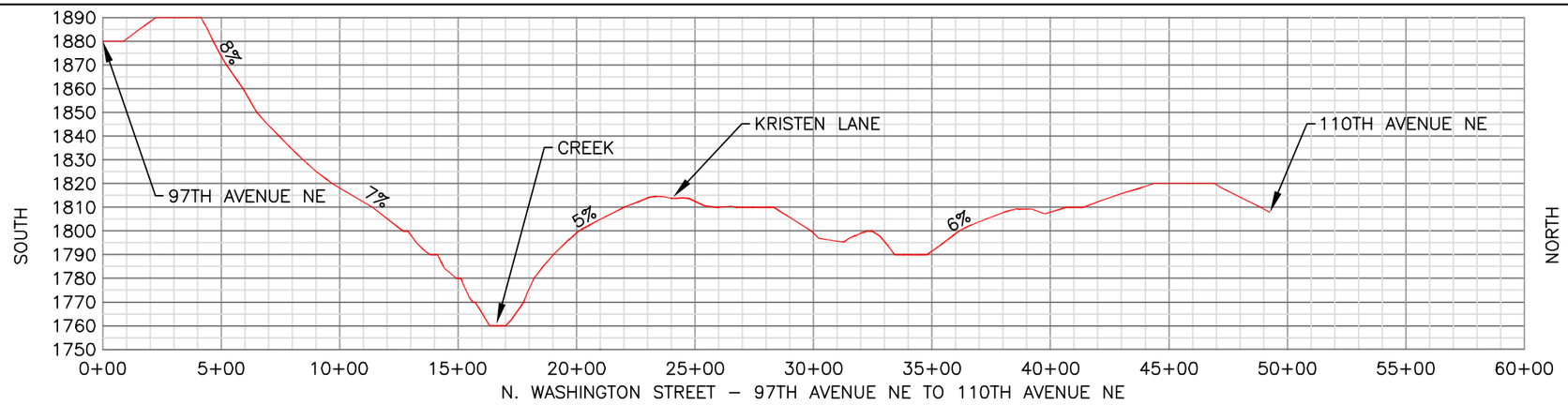
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





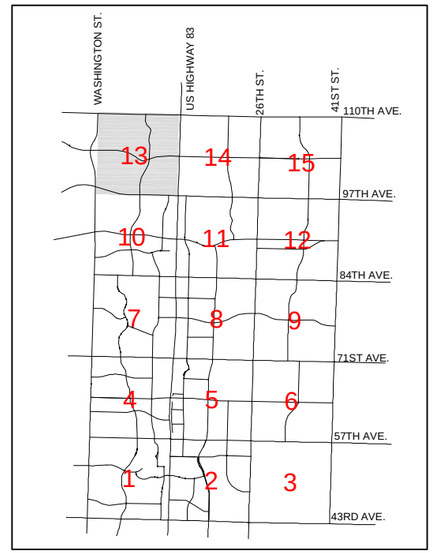




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 13



ARTERIAL ROADWAYS

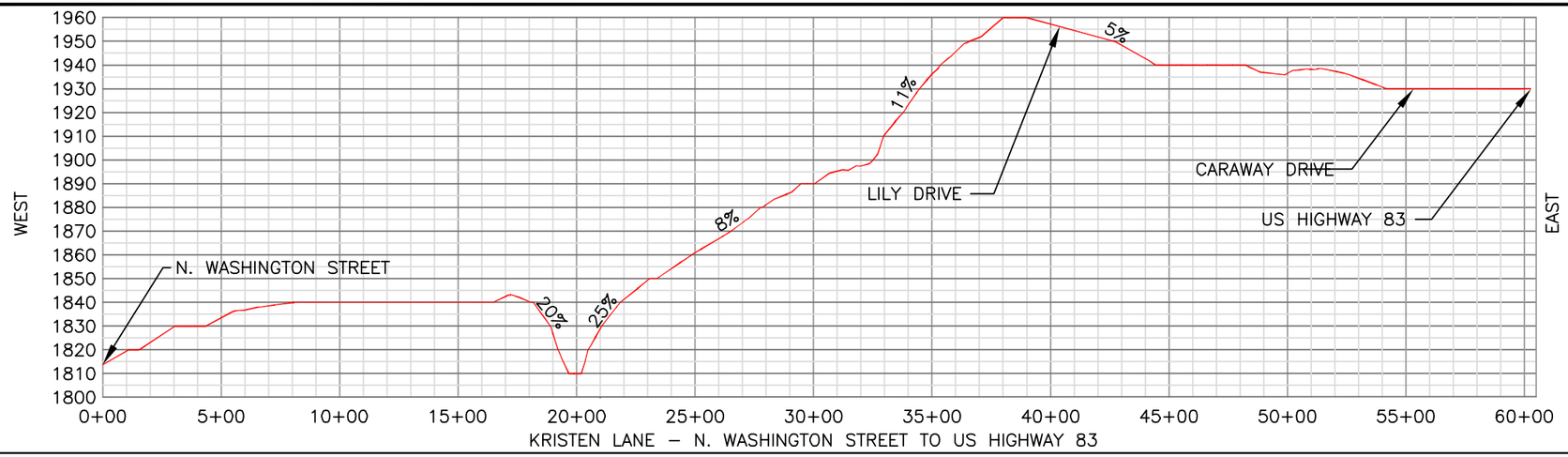
PROPOSED STREET PROFILES

Bismarck-Mandan Metropolitan Planning Organization

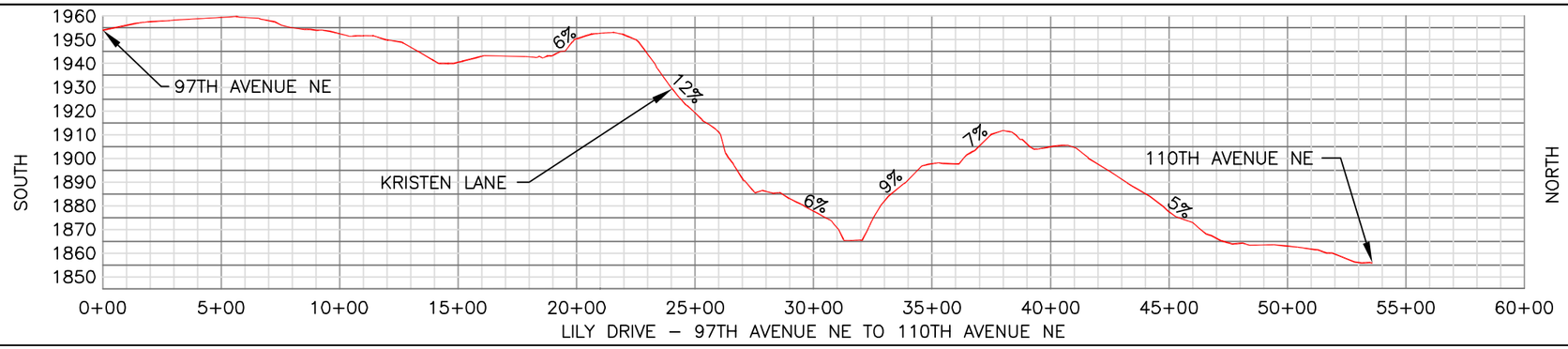
URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300



KRISTEN LANE – N. WASHINGTON STREET TO US HIGHWAY 83

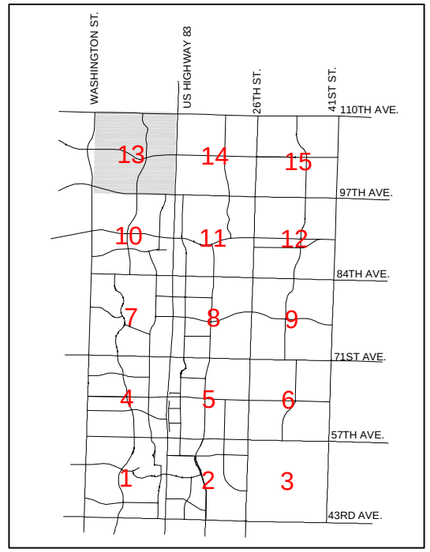


LILY DRIVE – 97TH AVENUE NE TO 110TH AVENUE NE

US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 13



COLLECTOR ROADWAYS

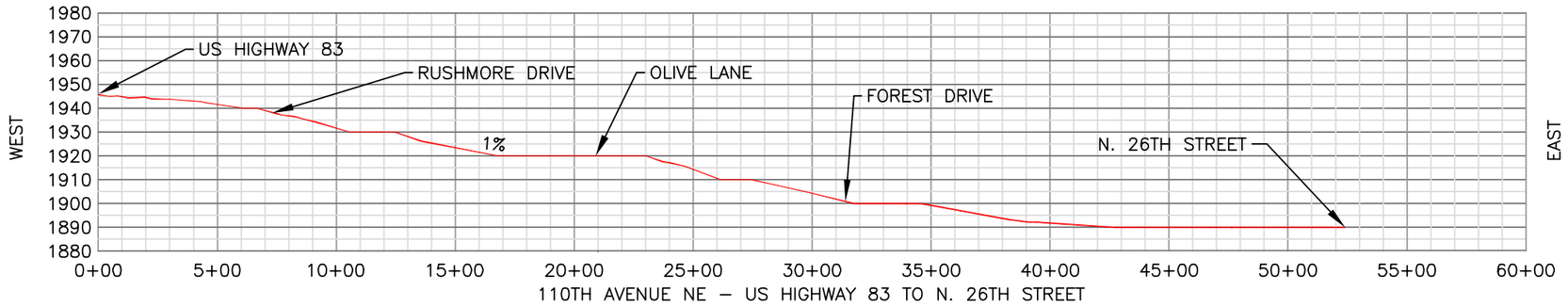
PROPOSED STREET PROFILES

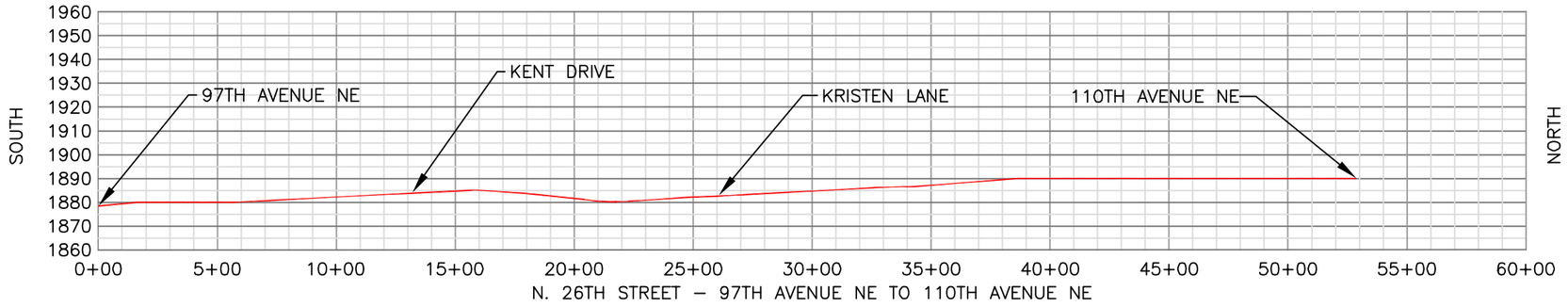
Bismarck-Mandan Metropolitan Planning Organization

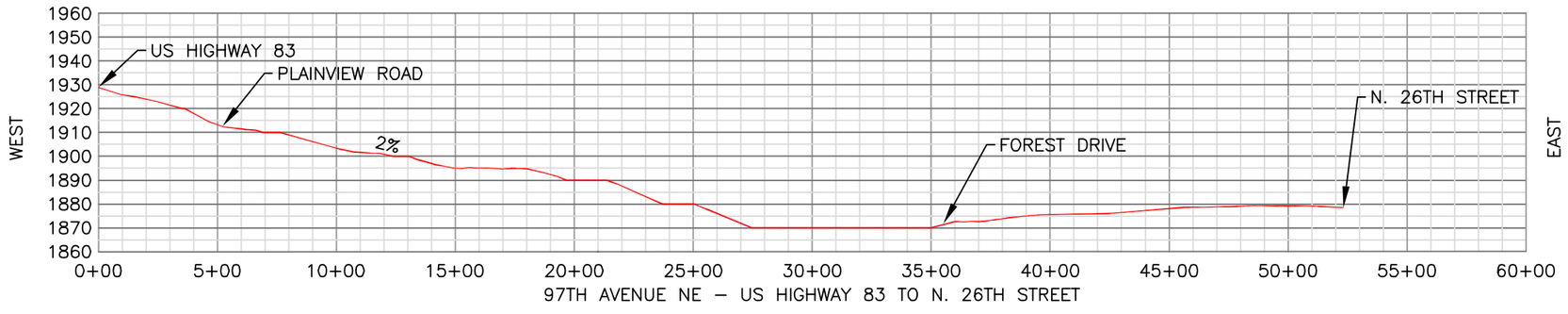
URS

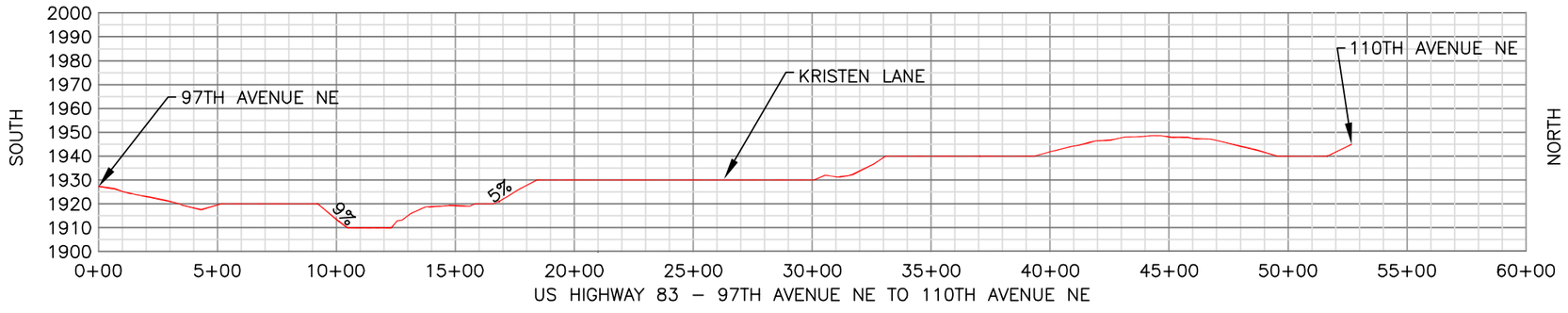
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





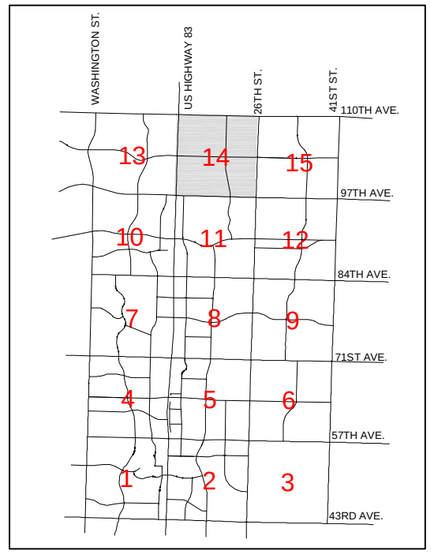




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 14



ARTERIAL ROADWAYS

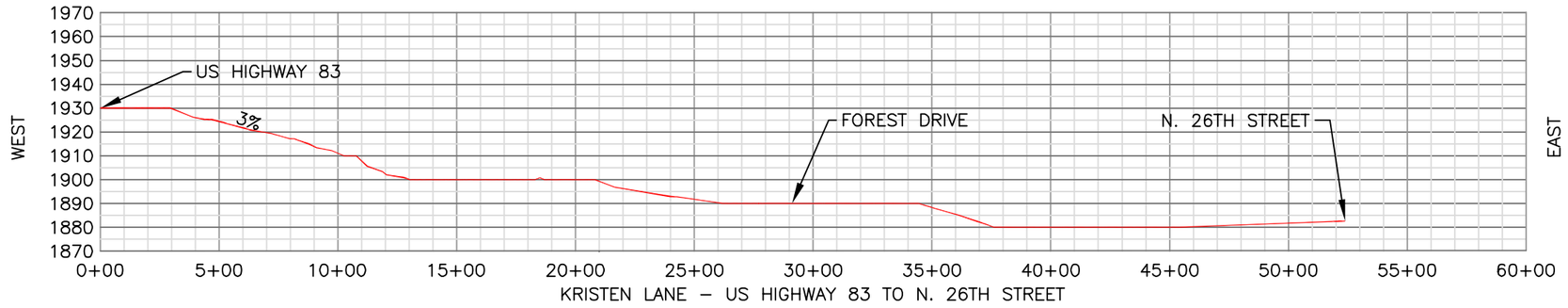
PROPOSED STREET PROFILES

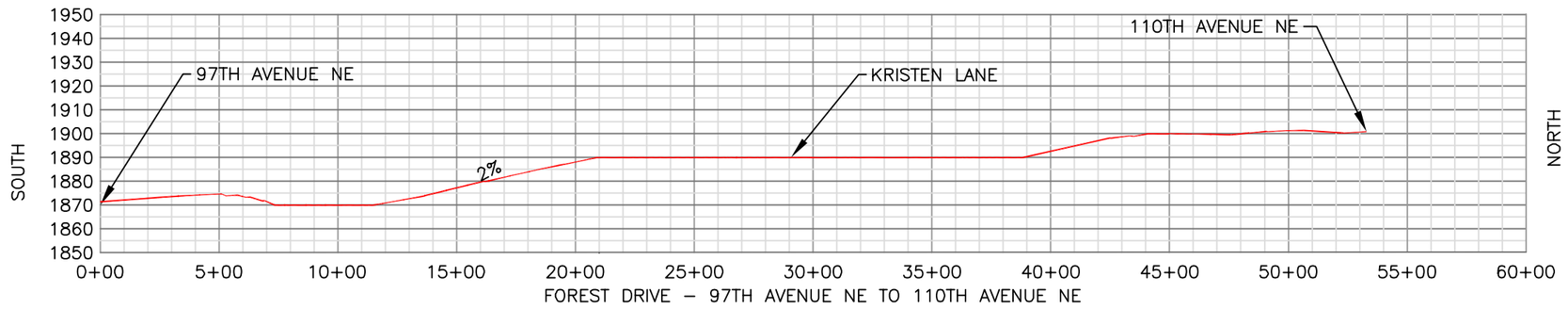
Bismarck-Mandan Metropolitan Planning Organization

URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300

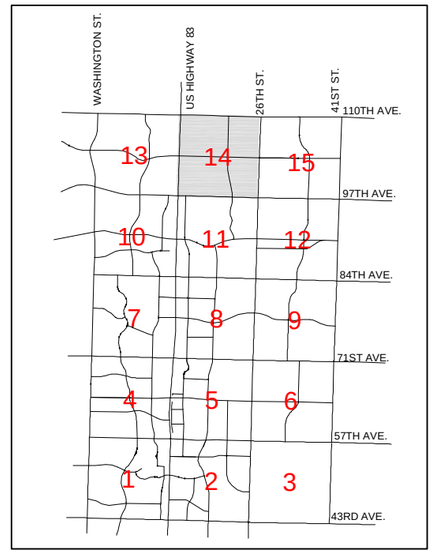




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 14



COLLECTOR ROADWAYS

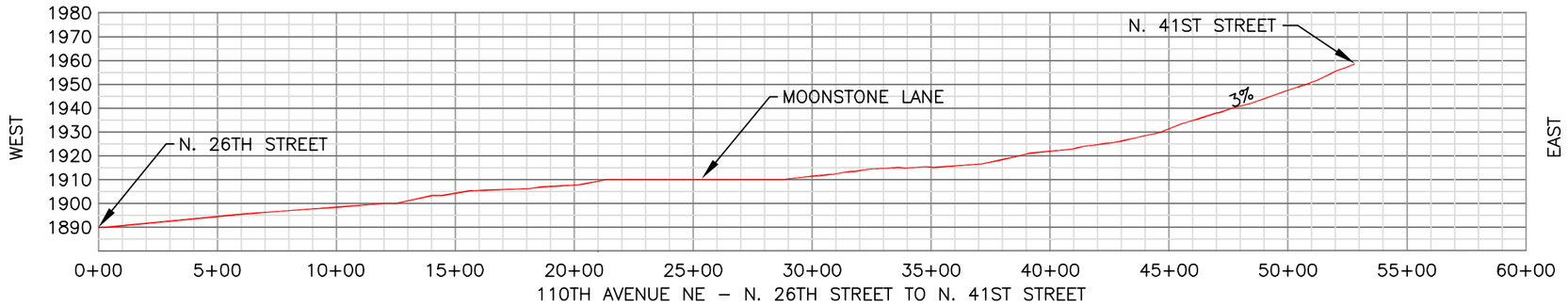
PROPOSED STREET PROFILES

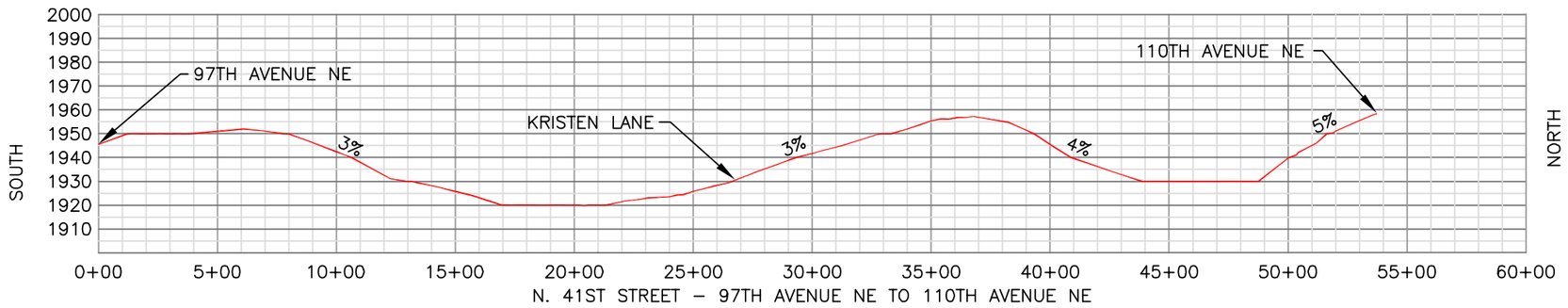
Bismarck-Mandan Metropolitan Planning Organization

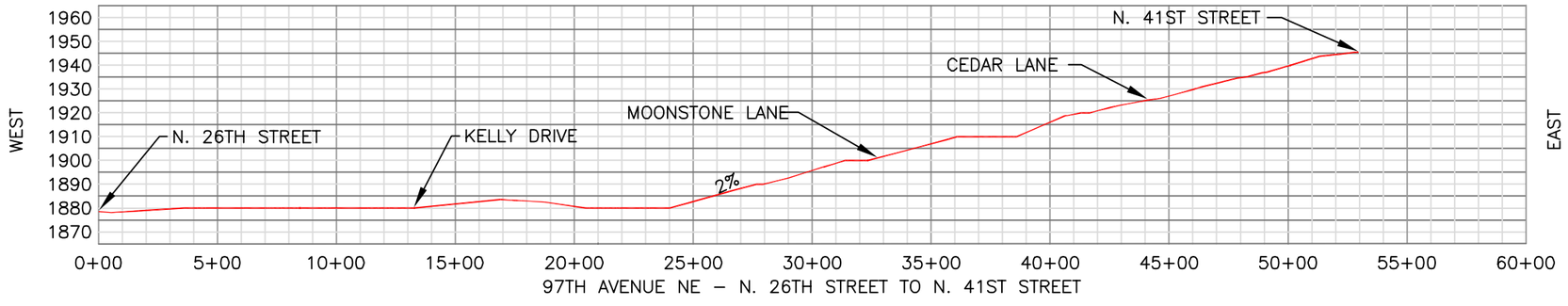
URS

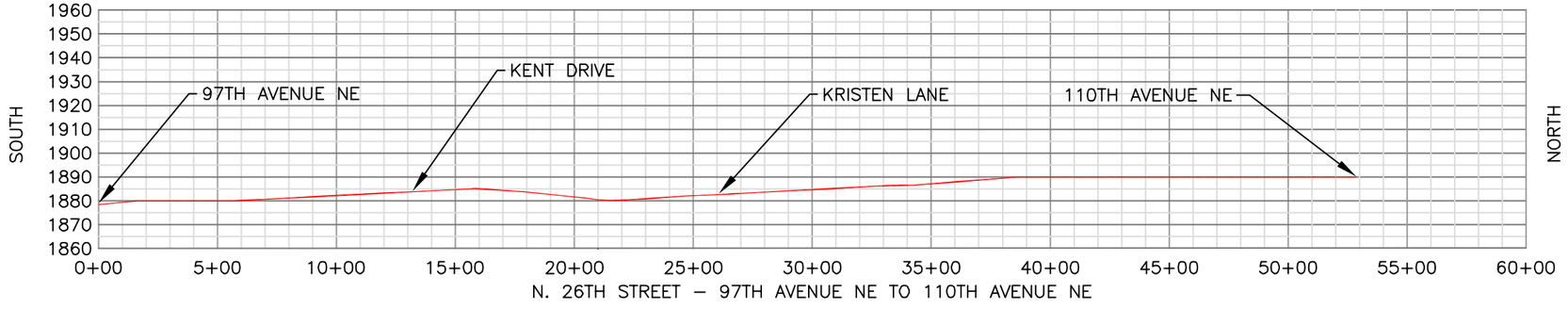
Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300





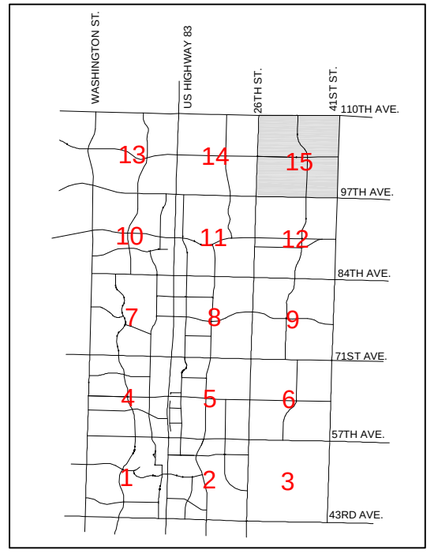




US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 15



ARTERIAL ROADWAYS

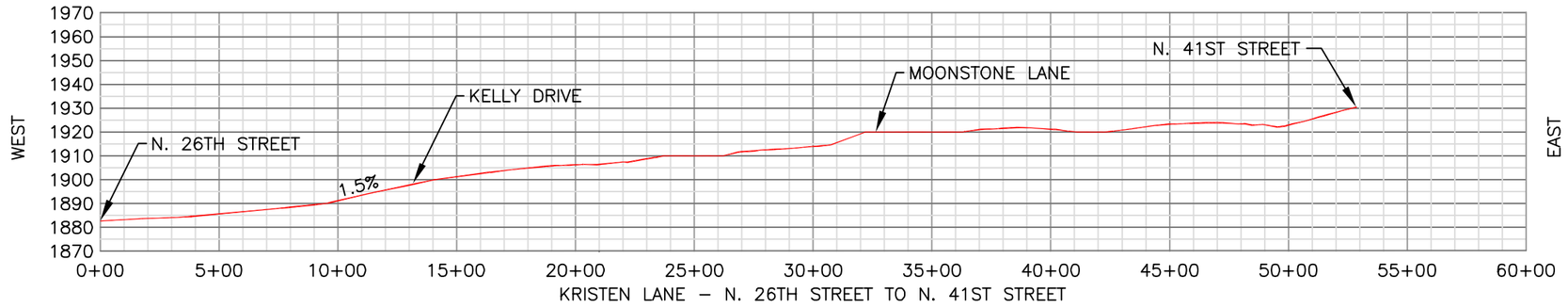
PROPOSED STREET PROFILES

Bismarck-Mandan Metropolitan Planning Organization

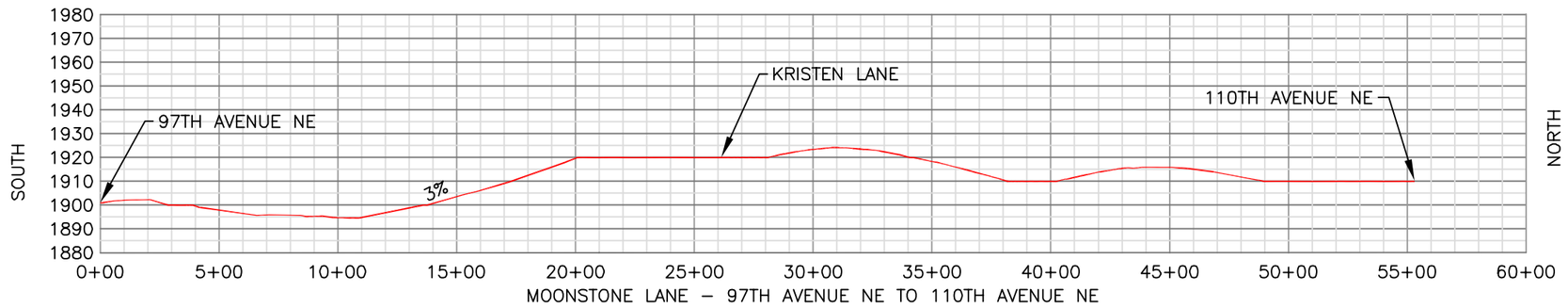
URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300



KRISTEN LANE – N. 26TH STREET TO N. 41ST STREET

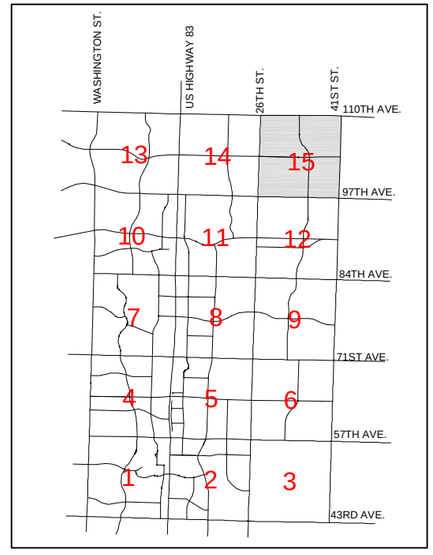


MOONSTONE LANE – 97TH AVENUE NE TO 110TH AVENUE NE

US 83 CORRIDOR STUDY

BISMARCK, NORTH DAKOTA

Panel 15



COLLECTOR ROADWAYS

PROPOSED STREET PROFILES

Bismarck-Mandan Metropolitan Planning Organization

URS

Drawn by	Date
MRS	2-7-06
Checked by	Scale
ENG	NONE

Houston Engineering, Inc.
3712 LOCKPORT STREET
BISMARCK, NORTH DAKOTA 58503
TEL: (701) 323-0200
FAX: (701) 323-0300