SKYLINE RECYCLING AND DISPOSAL FACILITY

APPENDIX IIC

TRANSPORTATION STUDY

SKYLINE LANDFILL

< TRANSPORTATION STUDY >

February 22, 2012

SKYLINE LANDFILL

< TRANSPORTATION STUDY >

Prepared for

Waste Management of Texas, Inc.

Prepared by

HDR Engineering, Inc.

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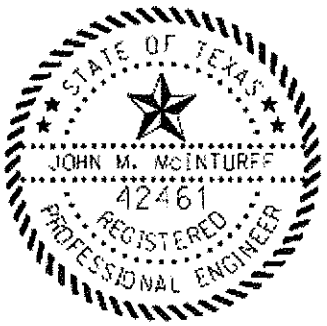


John M. McInturff

February 22, 2012

TABLE OF CONTENTS

LIST OF FIGURES

FIGURES

LIST OF TABLES

TABLES

INTRODUCTION

This transportation study was conducted by HDR Engineering, Inc. at the request of Waste Management of Texas, Inc. to provide information concerning factors related to access roads and vehicular traffic with respect to the proposed expansion of the Skyline Landfill. The landfill site is located west of N Central Street (BR 45) between Avenue A and Malloy Bridge Road in Ferris, Texas. Access to the landfill site is provided via the existing Waste Management landfill driveway on N Central Street (BR 45). Based on the proposed expansion and current and projected waste receipts, the facility is expected to continue operation until the year 2044. Existing conditions and one future time period were analyzed as part of the study.

Section 330.61 of the Texas Administrative Code contains regulations of the Texas Commission on Environmental Quality (TCEQ) regarding solid waste facility applications. These regulations require the following technical issues related to access roads and associated restrictions be identified and/or analyzed:

- Provide data on the availability and adequacy of roads that the owner or operator will use to access the site.
- Provide data on the volume of vehicular traffic on access roads within one mile of the proposed facility, both existing and expected, during the expected life of the proposed facility.
- Project the volume of traffic expected to be generated by the facility on the access roads within one mile of the proposed facility.

Activities completed during the transportation study included research of records and/or contacts with personnel from the Texas Department of Transportation (TxDOT), Dallas County, Ellis County, City of Ferris, City of Wilmer, Ferris Independent School District, Dallas Independent School District, and Lancaster Independent School District for information pertaining to the transportation system serving the proposed landfill expansion, and collection

of vehicular traffic counts. Daily traffic volumes were obtained for the following roadways within one-mile of the proposed facility using 24-hour electronic tube counters:

- IH 45 Southbound Frontage Road, north of Malloy Bridge Road
- IH 45 Northbound Frontage Road, north of Malloy Bridge Road
- IH 45 Southbound Frontage Road, south of FM 660
- IH 45 Northbound Frontage Road, south of FM 660
- N Central Street (BR 45), north of Landfill Driveway
- N Central Street (BR 45), south of Landfill Driveway
- Malloy Bridge Road, east of IH 45
- FM 660, east of BR 45
- FM 983, west of BR 45
- FM 664, west of FM 983
- E 5th Street, east of BR 45
- Skyline Landfill Driveway, west of BR 45

Turning movement counts were also collected at the following intersections:

- IH 45 and Malloy Bridge Road
- IH 45 and E 5th Street
- IH 45 and FM 660/E 8th Street
- N Central Street (BR 45)/S Dallas Avenue and Malloy Bridge Road
- N Central Street (BR 45) and Skyline Landfill Driveway
- Central Street (BR 45) and 5th Street
- S Central Street (BR 45) and FM 983/E 6th Street
- S Central Street (BR 45) and FM 660/W 8th Street
- FM 983 and FM 664

TxDOT, Dallas County, Ellis County, the City of Ferris, and the City of Wilmer were consulted regarding future roadway construction and load limits since area access roadways are under their jurisdictions. Information on population and traffic projections and proposed

transportation improvements was obtained from the North Central Texas Council of Governments (NCTCOG) Mobility 2035 Metropolitan Transportation Plan (Ref. 1) and the 2011-2014 Transportation Improvement Program for North Central Texas (Ref. 2). Historical traffic volume data were obtained from Texas Department of Transportation (TxDOT) AADT maps (Ref. 3). In addition, school bus route information was obtained for Ferris ISD, Lancaster ISD, and Dallas ISD for school bus routes in the vicinity of the landfill. The responses from TxDOT and Ellis Counties have been documented in the following sections and the Appendix.

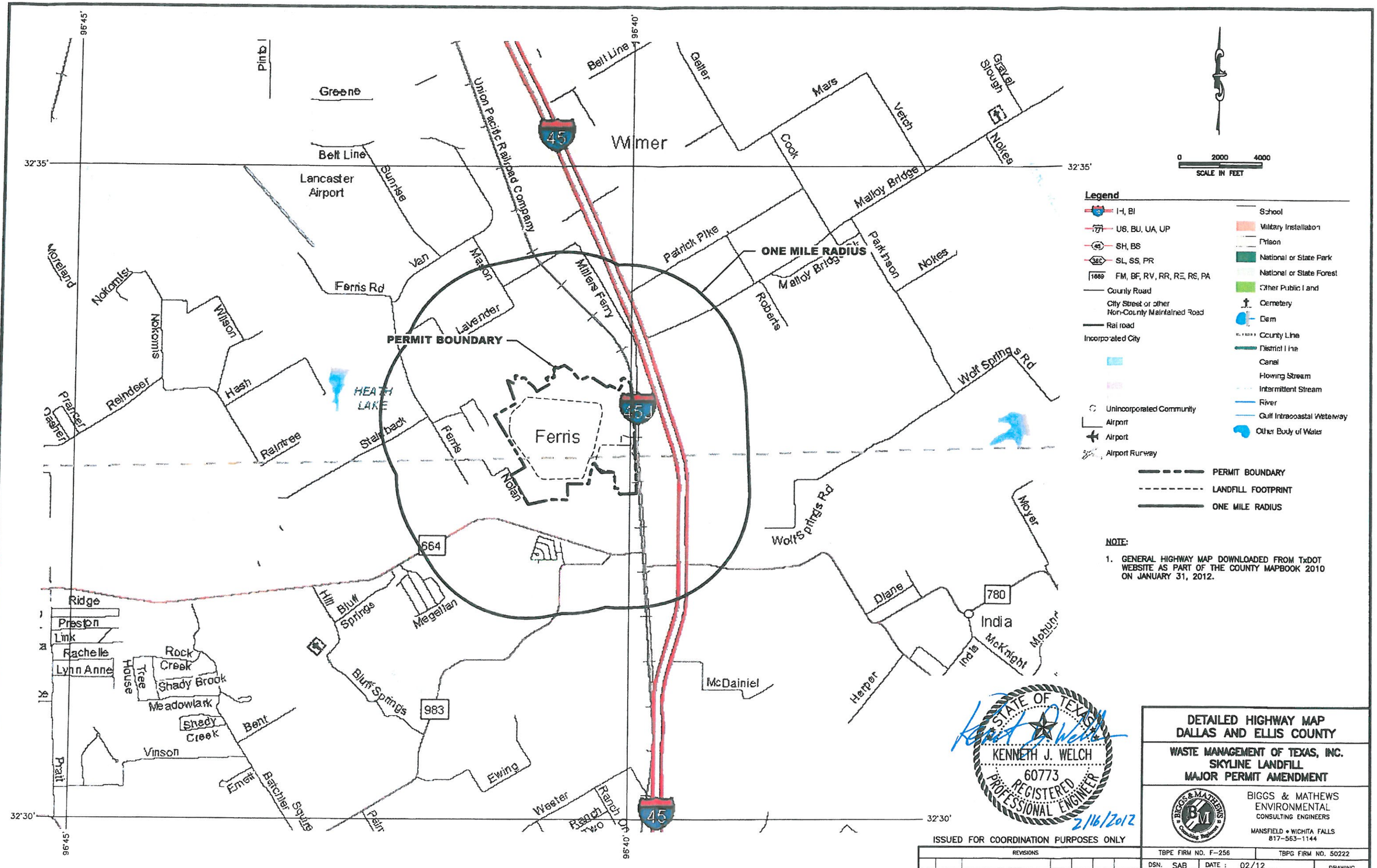
Based upon the results of this study, conclusions are provided regarding the expected impact of the proposed landfill expansion with respect to existing access roadways.

ROADWAY SYSTEM IN PROXIMITY TO SITE

The landfill site is located west of N Central Street (BR 45) between Avenue A and Malloy Bridge Road in Ferris, Texas. Figure II.C-1 shows the roadway system serving the landfill. Access to the site is provided via the existing Waste Management landfill driveway on N Central Street, as shown in Figure II.C-2 and Figure II.C-3.

A field study was conducted to note roadway conditions and intersection design for roadways which could be used by vehicles accessing the landfill. This information, combined with the roadway capacity analysis, was utilized to assess the availability and adequacy of the area roadway network. Descriptions of the following area roadways within one mile of the landfill site are provided:

- IH 45
- S Dallas Avenue/BR 45 (Central Street)
- FM 660 (8th Street)
- FM 983 (6th Street)
- FM 664
- 5th Street
- Malloy Bridge Road
- Loop 9 (Future)



NOTE:

1. GENERAL HIGHWAY MAP DOWNLOADED FROM TxDOT WEBSITE AS PART OF THE COUNTY MAPBOOK 2010 ON JANUARY 31, 2012.

STATE OF TEXAS
KENNETH J. WELCH
60773
REGISTERED
PROFESSIONAL ENGINEER
2/16/2012

ISSUED FOR COORDINATION PURPOSES ONLY

REVISIONS						
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

DETAILED HIGHWAY MAP
DALLAS AND ELLIS COUNTY

WASTE MANAGEMENT OF TEXAS, INC.
SKYLINE LANDFILL
MAJOR PERMIT AMENDMENT

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256 | TBPG FIRM NO. 50222

DSN. SAB	DATE : 02/12	DRAWING	II.C-1
DWN. SRC	SCALE : GRAPHIC		
CHK. KJW	DWG : II.C-1_DetHwyMap.dwg		

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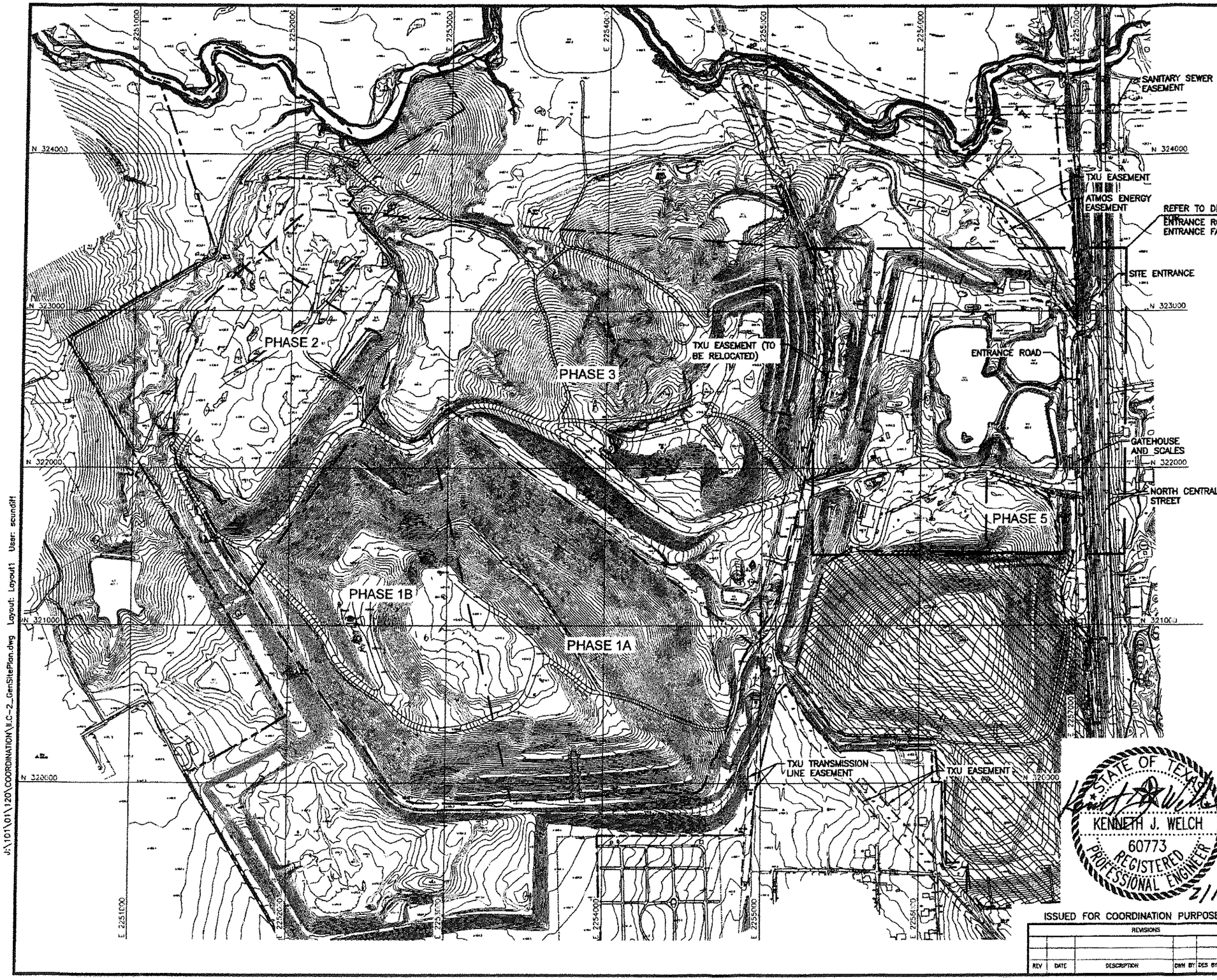

NOTE:

1. EXISTING CONTOURS COMPILED BY AEROMETRIC FROM AERIAL PHOTOGRAPHY, FLOWN MARCH 6, 2011. COORDINATE SYSTEM IS BASED ON TEXAS STATE PLANE NAD 27, TEXAS NORTH CENTRAL ZONE, US FEET.

SUBTITLE D LANDFILL FOOTPRINT	
PHASE NO.	PLAN AREA (AC)
1A	64.9
1B	53.7
2	40.1
3	125.7
5	4.2
TOTAL	288.6
PRE-SUBTITLE D LANDFILL FOOTPRINT	
	68.3
TOTAL	356.9

STATE OF TEXAS
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2/16/2012

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REVISIONS							
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY	

GENERAL SITE PLAN

WASTE MANAGEMENT OF TEXAS, INC.
SKYLINE LANDFILL
MAJOR PERMIT AMENDMENT

BIGGS & MATHEWS ENVIRONMENTAL
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TBPE FIRM NO. F-256 | TBPG FIRM NO. 50222

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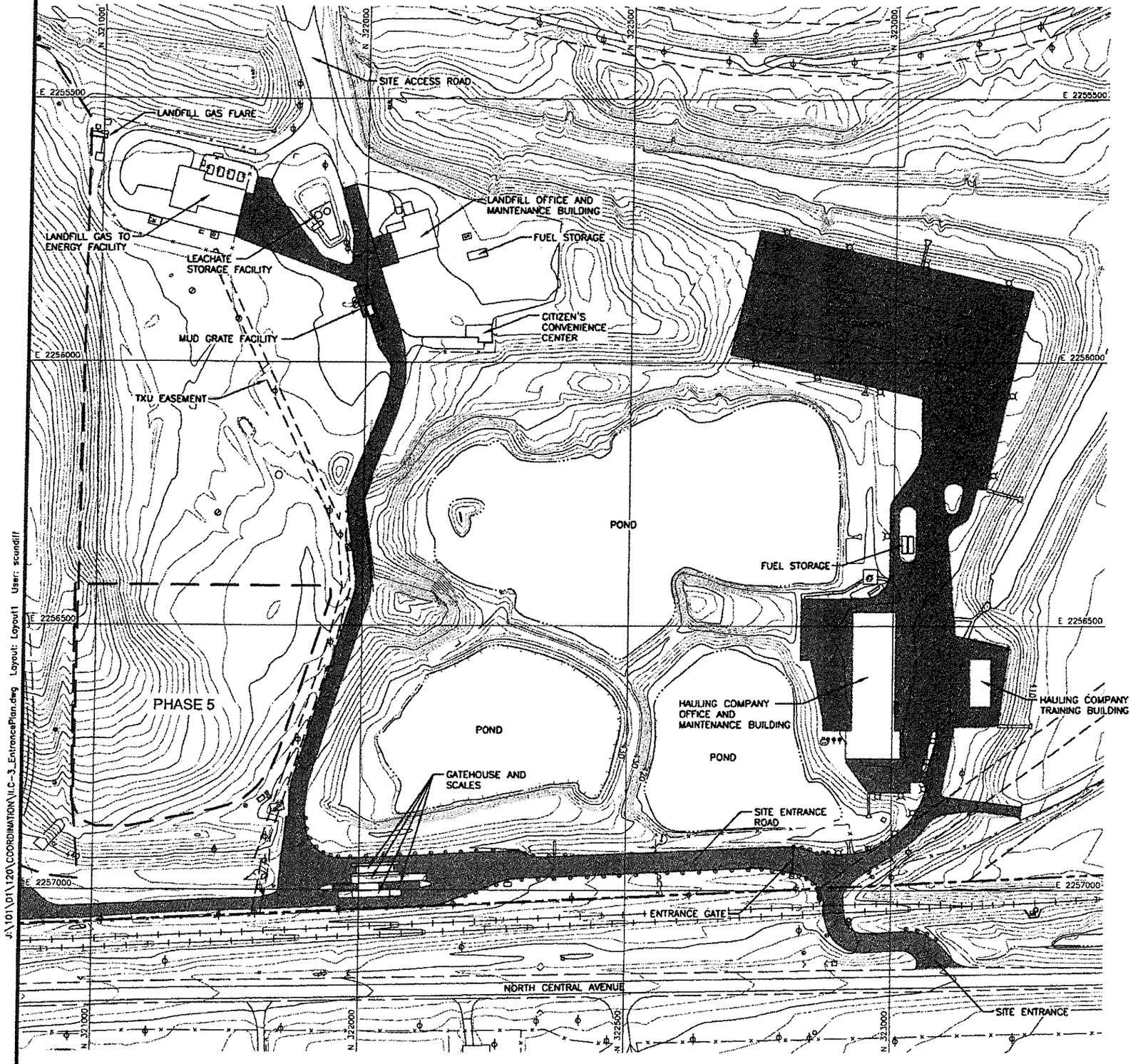

0 100 200
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LANDFILL FOOTPRINT
- 550 EXISTING GROUND CONTOUR
- N 323000 STATE PLANE GRID (NAD 27)
- CONCRETE PAVEMENT

NOTES:

1. EXISTING CONTOURS COMPILED BY AEROMETRIC FROM AERIAL PHOTOGRAPHY, FLOWN MARCH 6, 2011. COORDINATE SYSTEM IS BASED ON TEXAS STATE PLANE NAD 27, TEXAS NORTH CENTRAL ZONE, US FEET.

STATE OF TEXAS
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REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY	

ENTRANCE ROAD AND ENTRANCE FACILITIES PLAN

WASTE MANAGEMENT OF TEXAS, INC. SKYLINE LANDFILL MAJOR PERMIT AMENDMENT

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256 | TBPG FIRM NO. 50222

DSN. SAB | DATE : 02/12
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IH 45 – IH 45 is currently a six-lane Portland cement concrete-surfaced freeway facility with intermittent frontage roads in the vicinity of the site. The 2010 daily traffic volume on IH 45 was 41,000 vehicles per day (vpd), north of 5th Street, according to TxDOT AADT maps. TxDOT and the Mobility 2035 Metropolitan Transportation Plan were consulted regarding future roadway upgrade plans for IH 45. No roadway improvements are currently planned along IH 45 in the study area. According to NCTCOG, TxDOT plans to install wireless incident detection and response system from IH 20 to the Dallas/Ellis County Line along IH 45. There are no known weight restrictions on IH 45 in the proximity of the site other than the maximum legal weight limit of 80,000 pounds.

Millers Ferry Road/BR 45 (Central Street) – Central Street is currently a two-lane Portland cement concrete-surfaced roadway consisting of 11-foot travel lanes and improved shoulders in the vicinity of the site. At various locations within the study area, Central Street is asphalt surfaced, and has lane widths that vary between 10 feet and 11 feet. Traffic volumes recorded during the study on Central Street, north and south of the Landfill Driveway, were 4,061 and 2,913 vpd, respectively. Dallas County, TxDOT and the Mobility 2035 Metropolitan Transportation Plan were consulted regarding future roadway upgrade plans for Miller's Ferry Road/Central Street. Based on the information obtained from Dallas County, TxDOT, and NCTCOG, no improvements are currently planned along this roadway. There are no known weight restrictions on Millers Ferry Road/Central Street in the proximity of the site other than the maximum legal weight limit of 80,000 pounds.

FM 660 (8th Street) – 8th Street is currently a two-lane asphalt-surfaced roadway consisting of 10.5-foot travel lanes in the vicinity of the site. At various locations within the study area, 8th Street is concrete surfaced, and has lane widths that vary between 10 and 12 feet. The traffic volume recorded during the study on 8th Street east of Central Street was 4,015 vpd. TxDOT, the City of Ferris, Ellis County, and the Mobility 2035 Metropolitan Transportation Plan were consulted regarding future roadway upgrade plans for 8th Street. The Ellis County Thoroughfare Plan designates FM 660 as a principal (6 lane) arterial. No time frame was provided for this upgrade, and no upgrade was assumed as part of this study. Based on the

information provided by Ellis County and TxDOT, and obtained from the City of Ferris and NCTCOG, no improvements are currently planned for 8th Street/FM 660. The maximum allowable gross vehicle weight on FM 660 is 58,420 pounds.

FM 983 (6th Street) – FM 983 (6th Street) is currently a two-lane asphalt-surfaced roadway consisting of 11-foot travel lanes in the vicinity of the site. At various locations within the study area, FM 983 (6th Street) is Portland cement concrete-surfaced and has lane widths that vary between 11 and 15 feet. The traffic volume recorded during the study on 6th Street, west of Central Street, was 7,606 vpd. The City of Ferris, Ellis County, TxDOT and the Mobility 2035 Metropolitan Transportation Plan were consulted regarding future roadway upgrade plans for 6th Street/FM 983. The Ellis County Thoroughfare Plan designates FM 983 as a minor (4 lane) arterial. No time frame was provided for this upgrade, and no upgrade was assumed for this study. Based on the information provided by Ellis County and TxDOT, and obtained from the City of Ferris and NCTCOG, no improvements are currently planned for 6th Street/FM 983. The maximum allowable gross vehicle weight on FM 983 is 58,420 pounds.

FM 664 – FM 664 is currently a two-lane asphalt-surfaced roadway consisting of 12-foot travel lanes and full-size shoulders west of FM 983. The traffic volume recorded during the study on FM 664, west of FM 983, was 6,676 vpd. Ellis County, TxDOT and the Mobility 2035 Regional Transportation Plan were consulted regarding future roadway upgrade plans for FM 664. The Ellis County Thoroughfare Plan designates FM 664 as a principal (6 lane) arterial. NCTCOG is funding a study to determine the feasibility of upgrading FM 664 to a four-lane divided roadway from US 287 in Waxahachie to IH 45 in Ferris. In addition, TxDOT is preparing a corridor study to examine realignment of FM 664 to the south in order to reduce pedestrian/vehicle conflicts in the downtown (Ferris) area. These potential improvements were not assumed as part of this study for analysis purposes. There are no known weight restrictions on FM 664 in the proximity of the site other than the maximum legal weight limit of 80,000 pounds.

5th Street – 5th Street is currently a two-lane Portland cement concrete-surfaced divided roadway consisting of a 24-foot and an 18-foot unstriped pavement section east of BR 45. West of BR 45, 5th Street is an asphalt surfaced undivided roadway with a 25-foot pavement section and no striping. At various locations within the study area, 5th Street has lane widths that vary between 12 and 24 feet. Between Central Street and Campus Street, 5th Street is divided by a raised median. 5th Street is undivided elsewhere in the vicinity of the site. The traffic volume recorded during the study on 5th Street, east of Central Street, was 4,449 vpd. The City of Ferris and the Mobility 2035 Metropolitan Transportation Plan were consulted regarding future roadway upgrade plans for 5th Street. Based on the information obtained from the City of Ferris, and NCTCOG, no improvements are currently planned for 5th Street. There are no known weight restrictions on 5th Street in the proximity of the site other than the maximum legal weight limit of 80,000 pounds.

Malloy Bridge Road – Malloy Bridge Road is currently a two-lane Portland cement concrete surfaced roadway consisting of 12-foot travel lanes in the vicinity of the site. At various locations within the study area, Malloy Bridge Road is asphalt surfaced. The traffic volume recorded during the study on Malloy Bridge Road, east of IH 45, was 2,375 vpd. Dallas County and the Mobility 2035 Metropolitan Transportation Plan were consulted regarding future roadway upgrade plans for Malloy Bridge Road. Based on the information obtained from Dallas County and NCTCOG, no improvements are currently planned for Malloy Bridge Road. There are no known weight restrictions on Malloy Bridge Road in the proximity of the site other than the maximum legal weight limit of 80,000 pounds.

Loop 9 (Future) – Loop 9 is a proposed freeway type facility that will circumvent the Dallas/Fort Worth Metroplex area, as proposed by NCTCOG. The proposed alignment of Loop 9 will run adjacent to the northern property boundary, and intersect with IH 45 in the vicinity of the current interchange of Malloy Bridge Road and IH 45. Currently, no proposed design plans are available for Loop 9, and no construction date has been set. Construction of Loop 9 will have significant impact on the roadway network in the vicinity of the landfill. It can be expected that

upon completion, Loop 9 will reduce overall traffic demands on existing roadways within the study area network, although local traffic could increase near access points due to rerouting of trips. However, forecasting future travel demand on Loop 9 is outside the scope of this traffic study. For this reason, Loop 9 was not included as part of the existing or closing year analysis for the landfill facility.

Design factors and use restrictions for these roadways are summarized in Table II.C-1.

Table II.C-1.
Existing Access Roadway Characteristics

Roadway	Maximum Vehicle Height (feet)	Maximum Weight (1,000's pounds)	Cross-Section[1] (# of Lanes)	Surface Type	Average Daily Traffic (vpd)
IH 45, north of 5th Street	14	80.0	6	PC Concrete	41,000[3]
BR 45, north of Landfill Driveway	14	80.0	2	PC Concrete	4,061[2]
BR 45, south of Landfill Driveway	14	80.0	2	PC Concrete	2,913[2]
FM 660, east of BR 45	14	58.42	2	Asphalt	4,015[2]
FM 983, west of BR 45	14	58.42	2	Asphalt	7,606[2]
FM 664, west of FM 983	14	80.0	2	Asphalt	6,676[2]
5th Street, east of BR 45	14	80.0	2	PC Concrete	4,449[2]
Malloy Bridge Road, east of IH 45	14	80.0	2	Asphalt	2,375[2]

Notes:
1. Cross-section shown is that for the primary portions of the roadway.
2. Average daily traffic volumes were obtained from 2011 HDR 24-hour electronic tube counts performed by Gram North Texas, as shown in Tables II.C-2 through II.C-13.
3. Average daily traffic volume obtained from TxDOT AADT traffic maps for year 2010.

DATA COLLECTION

Traffic volume data collected during the study consisted of automatic tube counts and turning movement counts. Summaries of daily (24-hour) traffic volumes collected on September 13, 2011 and November 10, 2011 on the roadways mentioned previously are presented in Tables II.C-2 through II.C-13. Turning movement counts collected on September 13, 2011 were used to develop the summary of vehicle classifications and hourly traffic volumes presented in Tables II.C-14 through II.C-24. Due to limitations in data collection and availability of site traffic ticketing data, it was necessary to extrapolate hourly traffic volumes at certain locations. A detailed discussion of data collection and extrapolation methodology used for this study follows.

Daily traffic volumes were collected at the following locations:

1. Both directions on BR 45, north and south of Landfill Driveway
2. FM 660, east of BR 45
3. FM 983, west of BR 45
4. FM 664, west of FM 983
5. Malloy Bridge Road, east of IH 45
6. E 5th Street, east of BR 45
7. Skyline Landfill driveway, west of BR 45
8. IH 45 frontage roads, north of Malloy Bridge Road and south of FM 660

The results are reported in the following tables as collected.

All tube count data collected were validated by comparison with adjacent turning movement count data. It is expected that there will be minor discrepancies between the data collected, as the 24-hour volumes are collected by an automated pneumatic tube counter and adjusted to arrive at a reasonable volume estimate, whereas the turning movement count is performed by an individual observing and recording traffic data. There is additional potential for discrepancy when clock synchronicity, tube malfunction, and human error are considered. Given this expected potential for error between the counts, it was determined that all of the 24-hour traffic

volume data collected were reasonable, with the exception of the Skyline Landfill Driveway count. Based on discussions with Gram North Texas, the geometrics of this driveway did not provide for a reliable tube count; therefore, a supplemental turning movement count covering all of the operating hours of the facility was performed on November 10, 2011 in order to determine an accurate estimate of landfill trips.

The traffic volume results described previously can be expected to vary throughout the year. As noted in AASHTO (Ref. 4), "The amount by which the volume of an average day is exceeded on certain days is appreciable and varied. At typical rural locations, the volume on certain days may be significantly higher than the ADT [average daily traffic]."

Table II.C-2.
Hourly Traffic Volumes – Skyline Landfill Driveway, West of BR 45

Skyline Landfill Driveway			
West of BR 45			
November 10, 2011			
Time	Eastbound	Westbound	Total
12:00 AM	-	-	-
1:00 AM	-	-	-
2:00 AM	-	-	-
3:00 AM	26	9	35
4:00 AM	3	22	25
5:00 AM	25	32	57
6:00 AM	29	44	73
7:00 AM	42	45	87
8:00 AM	42	62	104
9:00 AM	47	50	97
10:00 AM	57	48	105
11:00 AM	62	59	121
12:00 PM	66	59	125
1:00 PM	62	56	118
2:00 PM	51	55	106
3:00 PM	60	28	88
4:00 PM	26	11	37
5:00 PM	19	2	21
6:00 PM	8	1	9
7:00 PM	9	0	9
8:00 PM	-	-	-
9:00 PM	-	-	-
10:00 PM	-	-	-
11:00 PM	-	-	-
Total	**634**	**583**	**1,217**

Note: Data not collected before 3:00 AM or after 8:00 PM due to facility operating hours

Table II.C-3

Hourly Traffic Volumes – BR 45, North of Skyline Landfill Driveway

BR 45			
North of Skyline Landfill Driveway			
September 13, 2011			
Time	Northbound	Southbound	Total
12:00 AM	11	6	17
1:00 AM	4	5	9
2:00 AM	6	21	27
3:00 AM	35	28	63
4:00 AM	36	17	53
5:00 AM	55	54	109
6:00 AM	122	102	224
7:00 AM	196	133	329
8:00 AM	138	101	239
9:00 AM	110	127	237
10:00 AM	105	116	221
11:00 AM	133	146	279
12:00 PM	139	137	276
1:00 PM	110	104	214
2:00 PM	126	172	298
3:00 PM	137	152	289
4:00 PM	109	164	273
5:00 PM	108	197	305
6:00 PM	93	124	217
7:00 PM	57	75	132
8:00 PM	39	54	93
9:00 PM	27	45	72
10:00 PM	30	23	53
11:00 PM	11	21	32
Total	**1,937**	**2,124**	**4,061**

Table II.C-4.
Hourly Traffic Volumes – BR 45, South of Skyline Landfill Driveway

BR 45			
South of Skyline Landfill Driveway			
September 13, 2011			
Time	Northbound	Southbound	Total
12:00 AM	13	7	20
1:00 AM	1	5	6
2:00 AM	7	5	12
3:00 AM	8	8	16
4:00 AM	15	5	20
5:00 AM	41	16	57
6:00 AM	87	43	130
7:00 AM	172	115	287
8:00 AM	120	73	193
9:00 AM	58	75	133
10:00 AM	63	80	143
11:00 AM	74	75	149
12:00 PM	83	85	168
1:00 PM	72	70	142
2:00 PM	66	110	176
3:00 PM	90	105	195
4:00 PM	83	132	215
5:00 PM	86	195	281
6:00 PM	70	115	185
7:00 PM	52	81	133
8:00 PM	41	52	93
9:00 PM	29	42	71
10:00 PM	30	24	54
11:00 PM	11	23	34
Total	**1,372**	**1,541**	**2,913**

Table II.C-5.
Hourly Traffic Volumes – IH 45 SBFR, North of Malloy Bridge Road

IH 45 SBFR	
North of Malloy Bridge Road	
September 13, 2011	
Time	Southbound
12:00 AM	10
1:00 AM	4
2:00 AM	22
3:00 AM	22
4:00 AM	11
5:00 AM	66
6:00 AM	113
7:00 AM	114
8:00 AM	72
9:00 AM	110
10:00 AM	129
11:00 AM	125
12:00 PM	159
1:00 PM	107
2:00 PM	155
3:00 PM	144
4:00 PM	160
5:00 PM	170
6:00 PM	93
7:00 PM	73
8:00 PM	51
9:00 PM	33
10:00 PM	23
11:00 PM	24
Total	**1,990**

Table II.C-6.
Hourly Traffic Volumes – IH 45 NBFR, North of Malloy Bridge Road

IH 45 NBFR	
North of Malloy Bridge Road	
September 13, 2011	
Time	Northbound
12:00 AM	9
1:00 AM	3
2:00 AM	6
3:00 AM	33
4:00 AM	29
5:00 AM	64
6:00 AM	128
7:00 AM	157
8:00 AM	123
9:00 AM	125
10:00 AM	95
11:00 AM	136
12:00 PM	119
1:00 PM	119
2:00 PM	133
3:00 PM	149
4:00 PM	102
5:00 PM	71
6:00 PM	75
7:00 PM	36
8:00 PM	26
9:00 PM	16
10:00 PM	24
11:00 PM	12
Total	**1,790**

Table II.C-7.
Hourly Traffic Volumes – IH 45 SBFR, South of FM 660

IH 45 SBFR	
South of FM 660	
September 13, 2011	
Time	Southbound
12:00 AM	4
1:00 AM	3
2:00 AM	0
3:00 AM	4
4:00 AM	5
5:00 AM	39
6:00 AM	60
7:00 AM	92
8:00 AM	50
9:00 AM	59
10:00 AM	50
11:00 AM	65
12:00 PM	61
1:00 PM	37
2:00 PM	57
3:00 PM	91
4:00 PM	67
5:00 PM	86
6:00 PM	49
7:00 PM	63
8:00 PM	52
9:00 PM	33
10:00 PM	15
11:00 PM	6
Total	**1,048**

Table II.C-8.
Hourly Traffic Volumes – IH 45 NBFR, South of FM 660

IH 45 NBFR	
South of FM 660	
September 13, 2011	
Time	Northbound
12:00 AM	1
1:00 AM	2
2:00 AM	3
3:00 AM	1
4:00 AM	3
5:00 AM	38
6:00 AM	61
7:00 AM	129
8:00 AM	79
9:00 AM	46
10:00 AM	49
11:00 AM	40
12:00 PM	44
1:00 PM	47
2:00 PM	50
3:00 PM	73
4:00 PM	85
5:00 PM	96
6:00 PM	72
7:00 PM	37
8:00 PM	42
9:00 PM	19
10:00 PM	9
11:00 PM	5
Total	**1,031**

Table II.C-9.
Hourly Traffic Volumes - FM 660, East of BR 45

FM 660			
East of BR 45			
September 13, 2011			
Time	Eastbound	Westbound	Total
12:00 AM	13	14	27
1:00 AM	5	4	9
2:00 AM	2	1	3
3:00 AM	1	3	4
4:00 AM	3	8	11
5:00 AM	32	35	67
6:00 AM	84	70	154
7:00 AM	177	153	330
8:00 AM	183	147	330
9:00 AM	111	88	199
10:00 AM	83	98	181
11:00 AM	100	103	203
12:00 PM	123	111	234
1:00 PM	103	97	200
2:00 PM	126	162	288
3:00 PM	231	153	384
4:00 PM	226	216	442
5:00 PM	142	126	268
6:00 PM	82	81	163
7:00 PM	77	99	176
8:00 PM	59	66	125
9:00 PM	51	53	104
10:00 PM	38	31	69
11:00 PM	26	18	44
Total	**2,078**	**1,937**	**4,015**

Table II.C-10.
Hourly Traffic Volumes – FM 983, West of BR 45

FM 983			
West of BR 45			
September 13, 2011			
Time	Eastbound	Westbound	Total
12:00 AM	15	9	24
1:00 AM	11	10	21
2:00 AM	12	9	21
3:00 AM	14	14	28
4:00 AM	43	15	58
5:00 AM	113	42	155
6:00 AM	263	148	411
7:00 AM	386	363	749
8:00 AM	284	237	521
9:00 AM	188	151	339
10:00 AM	168	179	347
11:00 AM	181	208	389
12:00 PM	212	194	406
1:00 PM	176	174	350
2:00 PM	228	294	522
3:00 PM	258	303	561
4:00 PM	242	349	591
5:00 PM	273	390	663
6:00 PM	213	294	507
7:00 PM	147	214	361
8:00 PM	111	175	286
9:00 PM	73	100	173
10:00 PM	37	35	72
11:00 PM	21	30	51
Total	**3,669**	**3,937**	**7,606**

Table II.C-11.
Hourly Traffic Volumes – FM 664, West of FM 983

FM 664			
West of FM 983			
September 13, 2011			
Time	Eastbound	Westbound	Total
12:00 AM	14	11	25
1:00 AM	12	9	21
2:00 AM	7	4	11
3:00 AM	11	14	25
4:00 AM	28	14	42
5:00 AM	91	40	131
6:00 AM	259	114	373
7:00 AM	494	303	797
8:00 AM	263	178	441
9:00 AM	160	145	305
10:00 AM	145	145	290
11:00 AM	161	168	329
12:00 PM	170	176	346
1:00 PM	143	148	291
2:00 PM	172	211	383
3:00 PM	233	309	542
4:00 PM	227	260	487
5:00 PM	235	340	575
6:00 PM	179	237	416
7:00 PM	136	176	312
8:00 PM	108	156	264
9:00 PM	62	89	151
10:00 PM	34	40	74
11:00 PM	19	26	45
Total	**3,363**	**3,313**	**6,676**

Table II.C-12.
Hourly Traffic Volumes – East 5th Street, East of BR 45

East 5th Street			
East of BR 45			
September 13, 2011			
Time	Eastbound	Westbound	Total
12:00 AM	10	11	21
1:00 AM	5	5	10
2:00 AM	7	5	12
3:00 AM	5	9	14
4:00 AM	19	5	24
5:00 AM	89	17	106
6:00 AM	193	67	260
7:00 AM	316	169	485
8:00 AM	161	108	269
9:00 AM	90	94	184
10:00 AM	91	100	191
11:00 AM	107	124	231
12:00 PM	90	121	211
1:00 PM	92	109	201
2:00 PM	105	143	248
3:00 PM	166	227	393
4:00 PM	110	214	324
5:00 PM	129	239	368
6:00 PM	98	160	258
7:00 PM	93	105	198
8:00 PM	69	91	160
9:00 PM	66	79	145
10:00 PM	38	43	81
11:00 PM	28	27	55
Total	**2,177**	**2,272**	**4,449**

Table II.C-13.
Hourly Traffic Volumes – Malloy Bridge Road, East of IH 45

Malloy Bridge Road			
East of IH 45			
September 13, 2011			
Time	Eastbound	Westbound	Total
12:00 AM	8	2	10
1:00 AM	9	2	11
2:00 AM	3	5	8
3:00 AM	4	12	16
4:00 AM	6	12	18
5:00 AM	38	47	85
6:00 AM	89	83	172
7:00 AM	108	102	210
8:00 AM	66	64	130
9:00 AM	63	86	149
10:00 AM	61	47	108
11:00 AM	54	79	133
12:00 PM	64	47	111
1:00 PM	53	50	103
2:00 PM	69	78	147
3:00 PM	95	90	185
4:00 PM	100	117	217
5:00 PM	84	87	171
6:00 PM	69	80	149
7:00 PM	51	36	87
8:00 PM	47	31	78
9:00 PM	15	19	34
10:00 PM	8	17	25
11:00 PM	7	11	18
Total	**1,171**	**1,204**	**2,375**

Table II.C-14.
Existing Vehicle Classification – BR 45, North of Skyline Landfill Driveway

BR 45							
North of Skyline Landfill Driveway							
September 13, 2011							
Northbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	5	3%	24	13%	157	84%	186
8:00 - 9:00 AM	1	1%	23	18%	104	81%	128
4:00 – 5:00 PM	0	0%	14	14%	86	86%	100
5:00 – 6:00 PM	4	4%	11	11%	85	85%	100
NB SUBTOTAL	10	2%	72	14%	432	84%	514
Southbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	1	1%	23	18%	105	81%	129
8:00 - 9:00 AM	2	2%	24	25%	71	73%	97
4:00 – 5:00 PM	3	2%	24	15%	131	83%	158
5:00 – 6:00 PM	2	1%	7	4%	183	95%	192
SB SUBTOTAL	8	1%	78	14%	490	85%	576
TOTAL	**18**	**2%**	**150**	**14%**	**922**	**84%**	**1,090**

Table II.C-15.
Existing Vehicle Classification – BR 45, South of Skyline Landfill Driveway

BR 45							
South of Skyline Landfill Driveway							
September 13, 2011							
Northbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	5	3%	4	2%	159	95%	168
8:00 - 9:00 AM	1	1%	8	7%	103	92%	112
4:00 – 5:00 PM	1	1%	6	8%	67	91%	74
5:00 – 6:00 PM	4	5%	2	3%	73	92%	79
NB SUBTOTAL	11	3%	20	5%	402	92%	433
Southbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	1	1%	8	7%	99	92%	108
8:00 - 9:00 AM	2	3%	2	3%	68	94%	72
4:00 – 5:00 PM	2	1%	5	4%	131	95%	138
5:00 – 6:00 PM	2	1%	1	1%	184	98%	187
SB SUBTOTAL	7	1%	16	3%	482	96%	505
TOTAL	**18**	**2%**	**36**	**4%**	**884**	**94%**	**938**

Table II.C-16.
Existing Vehicle Classification – IH 45 SBFR, North of Malloy Bridge Road

IH 45 SBFR							
North of Malloy Bridge Road							
September 13, 2011							
Southbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	3	3%	16	13%	101	84%	120
8:00 - 9:00 AM	5	6%	20	24%	59	70%	84
4:00 – 5:00 PM	3	2%	21	13%	141	85%	165
5:00 – 6:00 PM	2	1%	8	5%	157	94%	167
TOTAL	**13**	**2%**	**65**	**12%**	**458**	**86%**	**536**

Table II.C-17.
Existing Vehicle Classification – IH 45 NBFR, North of Malloy Bridge Road

IH 45 NBFR							
North of Malloy Bridge Road							
September 13, 2011							
Northbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	7	5%	8	5%	131	90%	146
8:00 - 9:00 AM	6	7%	12	14%	70	79%	88
4:00 – 5:00 PM	0	0%	9	10%	81	90%	90
5:00 – 6:00 PM	3	5%	5	8%	54	87%	62
TOTAL	**16**	**4%**	**34**	**9%**	**336**	**87%**	**386**

Table II.C-18.
Existing Vehicle Classification – IH 45 SBFR, South of FM 660

IH 45 SBFR							
South of FM 660							
September 13, 2011							
Southbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	0	0%	0	0%	87	100%	87
8:00 - 9:00 AM	0	0%	0	0%	39	100%	39
4:00 – 5:00 PM	0	0%	0	0%	64	100%	64
5:00 – 6:00 PM	0	0%	0	0%	82	100%	82
TOTAL	**0**	**0%**	**0**	**0%**	**272**	**100%**	**272**

Table II.C-19.
Existing Vehicle Classification – IH 45 NBFR, South of FM 660

IH 45 NBFR							
South of FM 660							
September 13, 2011							
Northbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	0	0%	0	0%	132	100%	132
8:00 - 9:00 AM	0	0%	0	0%	72	100%	72
4:00 – 5:00 PM	3	4%	0	0%	77	96%	80
5:00 – 6:00 PM	0	0%	0	0%	92	100%	92
TOTAL	**3**	**1%**	**0**	**0%**	**373**	**99%**	**376**

Table II.C-20

Existing Vehicle Classification – FM 660, East of BR 45

FM 660							
East of BR 45							
September 13, 2011							
Eastbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	0	0%	0	0%	163	100%	163
8:00 - 9:00 AM	0	0%	0	0%	179	100%	179
4:00 – 5:00 PM	0	0%	0	0%	224	100%	224
5:00 – 6:00 PM	0	0%	0	0%	136	100%	136
EB SUBTOTAL	0	0%	0	0%	702	100%	702
Westbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	1	1%	0	0%	148	99%	149
8:00 - 9:00 AM	0	0%	0	0%	152	100%	152
4:00 – 5:00 PM	1	<1%	1	<1%	202	99%	204
5:00 – 6:00 PM	0	0%	0	0%	128	100%	128
WB SUBTOTAL	2	<1%	1	<1%	630	99%	633
TOTAL	**2**	**<1%**	**1**	**<1%**	**1,332**	**99%**	**1,335**

Table II.C-21.
Existing Vehicle Classification – FM 983, West of BR 45

FM 983							
West of BR 45							
September 13, 2011							
Eastbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	1	<1%	1	<1%	371	99%	373
8:00 - 9:00 AM	2	1%	5	2%	281	97%	288
4:00 – 5:00 PM	1	<1%	4	2%	228	98%	233
5:00 – 6:00 PM	1	<1%	1	<1%	268	99%	270
EB SUBTOTAL	5	<1%	11	1%	1,148	99%	1,164
Westbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	1	<1%	1	<1%	334	99%	336
8:00 - 9:00 AM	0	0%	0	0%	226	100%	226
4:00 – 5:00 PM	0	0%	2	1%	328	99%	330
5:00 – 6:00 PM	0	0%	1	<1%	386	99%	387
WB SUBTOTAL	1	<1%	4	<1%	1,274	99%	1,279
TOTAL	**6**	**<1%**	**15**	**1%**	**2,422**	**99%**	**2,443**

Table II.C-22.
Existing Vehicle Classification – FM 664, West of FM 983

FM 664							
West of FM 983							
September 13, 2011							
Eastbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	3	1%	1	<1%	474	99%	478
8:00 - 9:00 AM	3	1%	5	2%	239	97%	247
4:00 – 5:00 PM	2	1%	4	2%	206	97%	212
5:00 – 6:00 PM	1	<1%	1	<1%	241	99%	243
EB SUBTOTAL	9	1%	11	1%	1,160	98%	1,180
Westbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	0	0%	0	0%	305	100%	305
8:00 - 9:00 AM	0	0%	0	0%	180	100%	180
4:00 – 5:00 PM	2	1%	2	1%	257	98%	261
5:00 – 6:00 PM	1	<1%	1	<1%	347	99%	349
WB SUBTOTAL	3	<1%	3	<1%	1,089	99%	1,095
TOTAL	**12**	**1%**	**14**	**1%**	**2,249**	**98%**	**2,275**

Table II.C-23.
Existing Vehicle Classification – East 5th Street, East of BR 45

East 5th Street							
East of BR 45							
September 13, 2011							
Eastbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	0	0%	0	0%	324	100%	324
8:00 - 9:00 AM	0	0%	0	0%	149	100%	149
4:00 – 5:00 PM	0	0%	0	0%	112	100%	112
5:00 – 6:00 PM	0	0%	0	0%	128	100%	128
EB SUBTOTAL	0	0%	0	0%	713	100%	713
Westbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	0	0%	0	0%	162	100%	162
8:00 - 9:00 AM	0	0%	0	0%	106	100%	106
4:00 – 5:00 PM	0	0%	0	0%	188	100%	188
5:00 – 6:00 PM	0	0%	0	0%	246	100%	246
WB SUBTOTAL	0	0%	0	0%	702	100%	702
TOTAL	**0**	**0%**	**0**	**0%**	**1,415**	**100%**	**1,415**

Table II.C-24.
Existing Vehicle Classification – Malloy Bridge Road, East of IH 45

Malloy Bridge Road							
East of IH 45							
September 13, 2011							
Eastbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	0	0%	4	5%	84	95%	88
8:00 - 9:00 AM	0	0%	3	6%	51	94%	54
4:00 – 5:00 PM	1	1%	1	1%	79	98%	81
5:00 – 6:00 PM	0	0%	0	0%	78	100%	78
EB SUBTOTAL	1	<1%	8	3%	292	97%	301
Westbound							
Time Period	Heavy Vehicles		Waste Vehicles		Other Vehicles		Total
	No.	%	No.	%	No.	%	
7:00 - 8:00 AM	8	8%	1	1%	89	91%	98
8:00 - 9:00 AM	4	7%	4	7%	51	86%	59
4:00 – 5:00 PM	1	1%	1	1%	106	98%	108
5:00 – 6:00 PM	1	1%	0	0%	82	99%	83
WB SUBTOTAL	14	4%	6	2%	328	94%	348
TOTAL	**15**	**2%**	**14**	**2%**	**620**	**96%**	**649**

EXISTING TRAFFIC ANALYSIS

Roadway Capacity Analysis Methodology

The Highway Capacity Manual (Ref. 5) provides methodologies for estimating roadway operating levels of service (LOS) in terms of comparing expected speed-flow and density-flow relationships. Roadway LOS is characterized by four performance measures:

- Density of the traffic lane (passenger cars per mile per lane)
- Speed of the traffic (miles per hour)
- Volume to capacity ratio of the travel lane
- Percent time spent following

Each of these measures affects the overall roadway operating level of service. In general, overall operating levels of service A to D are typically deemed acceptable, while an overall LOS of E or F is unacceptable, in terms of the roadway capacity. Each level of service is described in detail within the Highway Capacity Manual and is summarized below:

- Level of Service A – Under LOS A, the roadway operates at free flow conditions. There is very little interaction among vehicles on the roadway. All drivers can travel at the posted speed limit if they desire and maneuverability is good.
- Level of Service B – Under LOS B, drivers start to notice other vehicles on the roadway but operations are still at free flow conditions. Maneuverability is somewhat limited due to the presence of vehicles.
- Level of Service C – Under LOS C, drivers are affected by the presence of other vehicles on the roadway. The speed at which drivers can travel has become clearly affected and maneuverability is limited due to the presence of vehicles. Due to the higher number of vehicles, a minor incident can easily turn into a major traffic problem.
- Level of Service D – Under LOS D conditions, the driver's ability to maneuver is severely impaired. Due to the high volume of vehicles, the travel speed has become greatly reduced.

- Level of Service E – Under LOS E conditions, the roadway is operating at or near capacity. Vehicle headways have reached minimum spacing, and incidents cannot be easily absorbed into the system.
- Level of Service F – Under LOS F conditions, the roadway has reached capacity and is experiencing breakdown flow. Long queues are easily formed due to vehicles arriving at a rate that is faster than they can be discharged.

Based on the criteria given in the Highway Capacity Manual, the first step in the analysis of the roadway network was to categorize the roadways within one mile of the landfill facility for analysis purposes. Based on its operating characteristics, IH 45 was classified as a freeway facility; however, the IH 45 frontage roads operate as multilane highway facilities. BR 45, FM 660, FM 983, and East 5th Street also operate as urban street facilities. Further discussion of urban street facilities and analysis methodologies used for each follows. FM 664 and Malloy Bridge Road were classified as rural two-lane highways based on their functional characteristics.

Urban street facilities are roadways that experience interrupted flow. Stop signs, traffic signals, and/or roundabout intersections located within two mile intervals along the roadway effectively meter the flow of traffic on the roadway. For this reason, urban street facilities experience level of service differently than rural two-lane and multilane highway facilities. However, since roadway capacity is a function of roadway cross-section, analysis of urban streets using rural highway analysis methodologies provides a baseline value for the effectiveness of the facility. For this reason, BR 45, FM 660, FM 983, and East 5th Street were analyzed as two-lane rural highways using the microcomputer software program HCS2000 (Ref 6.). In order to quantify the factors related to urban street levels of service on these facilities, intersection analysis was also performed for major intersections within the study area, using the microcomputer software program "Synchro 7.0" (Ref. 7), which is based on the methodology specified in the Highway Capacity Manual.

The existing traffic volumes on study area roadways are listed in Table II.C-25. Estimated daily landfill trips and landfill trip distribution were provided by Biggs & Matthews Environmental. Tables II.C-26 and II.C-27 summarize the volumes and LOS results.

Table II.C-25.
2011 Existing Traffic Volumes

Location	Existing Traffic Volumes 2011					
	Daily			Peak Hour		
	Landfill Trips[1]	Non-Landfill Trips[2]	Total	Landfill Trips	Non-Landfill Trips	Total
BR 45, North of Skyline Landfill Driveway	569	3,492	4,061	67	272	339
BR 45, South of Skyline Landfill Driveway	117	2,796	2,913	11	276	287
IH 45 SBFR, North of Malloy Bridge Road	239	1,751	1,990	21	144	165
IH 45 NBFR, North of Malloy Bridge Road	161	1,629	1,790	15	138	153
IH 45 SBFR, South of FM 660	0	1,048	1,048	0	85	85
IH 45 NBFR, South of FM 660	0	1,031	1,031	0	134	134
FM 660, East of BR 45	3	4,012	4,015	0	534	534
FM 983, West of BR 45	76	7,530	7,606	0	1,170	1,170
FM 664, West of FM 983	67	6,609	6,676	0	797	797
East 5th Street, East of BR 45	0	4,449	4,449	0	525	525
Malloy Bridge Road, East of IH 45	48	2,327	2,375	2	189	191

Notes:
1 – Calculated from waste vehicle percentages in vehicle classification counts
2 – Total 24 hour volume minus calculated landfill trips

Table II.C-26.
Level of Service for 2011 Existing Traffic Volumes (Two-Lane Highway Analysis)

Location	Roadway Capacity (pc/hr)	Peak Hour Volume (veh/hr)	% of Access Road Capacity Used[1]	HCM Roadway LOS[2]	% of Roadway Capacity Used by Existing Landfill Vehicles[1]
BR 45, North of Landfill Drwy	3,200	339	10.6	n/a[3]	2.1
FM 660	3,200	534	16.7	n/a[3]	<0.1
FM 983	3,200	1,170	36.6	n/a[3]	<0.1
FM 664	3,200	797	24.9	D	<0.1
East 5th Street	3,200	525	16.4	n/a[3]	<0.1
Malloy Bridge Road	3,200	191	6.0	A	0.1

Notes:

1 – Based on traffic volumes (veh/hr) compared with capacity (pc/hr).
2 – Refer to HCM Exhibit 20-3 for Class I LOS criteria and Exhibit 20-4 for Class II LOS Criteria
3 – Two-lane rural highway analysis LOS not applicable on urban streets – Refer to intersection analyses for LOS

Table II.C-27.
Level of Service for 2011 Existing Traffic Volumes (Multilane Highway Analysis)

Location	Access Road Capacity (Calculated)	One Way Peak Hour Volume (veh/hr)	% of Access Road Capacity Used[1]	HCM Roadway LOS	Landfill Vehicles % of One Way Capacity - Peak Hour[1]
IH 45 SBFR, North of Malloy Bridge Road	2,090 pc/hr/ln	165	3.9	A	0.5
IH 45 NBFR, North of Malloy Bridge Road	2,056 pc/hr/ln	153	3.7	A	0.4
IH 45 SBFR, South of FM 660	1,900 pc/hr/ln[2]	85	2.2	A	<0.1
IH 45 NBFR, South of FM 660	1,902 pc/hr/ln	134	3.5	A	<0.1

Notes:

1 – Based on traffic volumes (veh/hr) compared with capacity (pc/hr)
2 - Minimum access road capacity used – calculated free flow speed < 45 mph.

Intersection Analysis

BR 45 and Skyline Landfill Driveway

The Waste Management Driveway forms the stop-controlled eastbound approach at this unsignalized "T" intersection. The northbound approach of BR 45 provides one left turn/through shared lane, and the southbound approach provides one through/right turn shared lane. The eastbound approach of Skyline Landfill Driveway provides one left turn/right turn shared lane. Current overall LOS is A during both the AM and PM peak periods. No sight distance limitations were observed during field review of intersection operations.

IH 45 and Malloy Bridge Road (East Intersection)

Malloy Bridge Road and the IH 45 Northbound Frontage Road form an all-way stop controlled intersection. The IH 45 Northbound Frontage Road provides one left turn/through/right turn shared lane. The eastbound approach of Malloy Bridge Road provides one left turn/through shared lane, and the westbound approach provides one through/right turn shared lane. Current overall LOS is A during both the AM and PM peak periods. No sight distance limitations or other safety factors were observed during field review of intersection operations.

IH 45 and Malloy Bridge Road/BR 45/Millers Ferry Road (West Intersection)

Malloy Bridge Road, the IH 45 Southbound Frontage Road, Millers Ferry Road, and BR 45 form an all-way stop controlled intersection. The northbound approach of BR 45 provides one left turn/right turn shared lane. The IH 45 Southbound Frontage Road provides one left turn lane and one through/right turn shared lane. The eastbound approach of Millers Ferry Road provides one through/right turn lane. The westbound approach of Malloy Bridge Road provides one left turn/through lane. Immediately to the east of the intersection, Malloy Bridge Road provides an eastbound right turn and a westbound left turn onto the southbound IH 45 on-ramp. Current overall LOS is A during both the AM and PM peak periods. No sight distance limitations or other safety factors were observed during field review of intersection operations.

BR 45 and FM 660/West 8th Street

BR 45 and FM 660/West 8th Street form an all-way stop controlled intersection. The northbound and southbound approaches of BR 45 each provide one left turn/through/right turn shared lane. The eastbound approach of West 8th Street is unstriped, but provides one left turn/through/right turn shared lane. The westbound approach of FM 660 provides one left turn/through/right turn shared lane. Current overall LOS is A and B during the AM and PM peak periods, respectively. No sight distance limitations or other safety factors were observed during field review of intersection operations.

BR 45 and FM 983

BR 45 and FM 983/East 6th Street form an all-way stop controlled intersection. The northbound and southbound approaches of BR 45 each provide one left turn/through/right turn shared lane. The eastbound approach of FM 983 provides one left turn/through/right turn shared lane. The westbound approach of East 6th Street is unstriped, but provides one left turn/through/right turn shared lane. Current overall LOS is B during both the AM and PM peak periods. No sight distance limitations or other safety factors were observed during field review of intersection operations.

BR 45 and 5th Street

BR 45 and 5th Street form an all-way stop controlled intersection. The northbound and southbound approaches of BR 45 each provide one left turn/through/right turn shared lane. The eastbound and westbound approaches of 5th Street each provide one left turn/through/right turn shared lane. Current overall LOS is B and A during the AM and PM peak periods, respectively. No sight distance limitations or other safety factors were observed during field review of intersection operations.

FM 983 and FM 664

The south leg of FM 983 forms the stop-controlled northbound approach of this "T"-intersection. The south and east legs of this intersection are designated as FM 983, and the

west leg is designated as FM 664. The northbound approach of FM 983 provides one left turn/right turn shared lane. The eastbound approach of FM 664 provides one through/right turn shared lane. The westbound approach of FM 983 provides one left turn lane and one through lane. Current overall LOS is A during both the AM and PM peak periods. No sight distance limitations or other safety factors were observed during field review of intersection operations.

IH 45 and FM 660 (East Intersection)

The IH 45 Northbound Frontage Road and FM 660 form an all-way stop controlled intersection. The IH 45 Northbound Frontage Road provides one left turn/through shared lane and one through/right turn shared lane; however, due to the offset alignment of the IH 45 Northbound Frontage Road through the intersection, the left turn/through shared lane operates as a de facto left turn lane. The eastbound approach of FM 660 provides one left turn/through shared lane, and the westbound approach provides one through/right turn shared lane. Current overall LOS is C and B during the AM and PM peak periods, respectively. No sight distance limitations or other safety factors were observed during field review of intersection operations.

IH 45 and FM 660 (West Intersection)

The IH 45 Southbound Frontage Road and FM 660 form an all-way stop controlled intersection. The IH 45 Southbound Frontage Road provides one left turn/through shared lane and one through/right turn shared lane. The eastbound approach of FM 660 provides one through/right turn shared lane, and the westbound approach provides one left turn/through shared lane. Current overall LOS is B during both the AM and PM peak periods. No sight distance limitations or other safety factors were observed during field review of intersection operations.

IH 45 and East 5th Street (East Intersection)

The IH 45 Northbound Frontage Road and East 5th Street form an all-way stop controlled intersection. The IH 45 Northbound Frontage Road provides one left turn/through shared lane

and one through/right turn shared lane. The eastbound approach of East 5th Street provides one left turn/through shared lane, and the westbound approach provides one through/right turn shared lane. Current overall LOS is B and A during the AM and PM peak periods, respectively. No sight distance limitations or other safety factors were observed during field review of intersection operations.

IH 45 and East 5th Street (West Intersection)

The IH 45 Southbound Frontage Road and East 5th Street form an all-way stop controlled intersection. The IH 45 Southbound Frontage Road provides one left turn/through shared lane and one through/right turn shared lane. The eastbound approach of East 5th Street provides one through/right turn shared lane, and the westbound approach provides one left turn/through shared lane. Current overall LOS is B and A during the AM and PM peak periods, respectively. No sight distance limitations or other safety factors were observed during field review of intersection operations.

FUTURE TRAFFIC ANALYSIS

Projected landfill traffic volumes include the following contributing elements:

- Private vehicles belonging to facility personnel
- Waste shipment vehicles
- Hauling facility (Waste Management) vehicles staged on-site

Existing and future site-generated vehicular traffic volumes were provided by Biggs & Matthews Environmental. Existing and proposed landfill trip distributions were calculated based on existing turning movement and classification data collected during the study. Estimated daily site-generated traffic is shown in Table II.C-28. Biggs & Matthews Environmental provided the following description of projected landfill operations:

- Landfill traffic growth was developed independently of background traffic. Existing classification counts noted in Tables II.C-14 through II.C-24 above provided the basis for determining future landfill trip distribution. All landfill traffic will enter and exit the site to BR 45 via the landfill driveway. Based on classification counts collected during the study, approximately 83 percent of all landfill traffic will enter and exit from the north on BR 45, and approximately 17 percent of all landfill traffic will enter and exit from the south on BR 45.
- Under the expanded operational permit being proposed by the landfill facility, the landfill is projected to be operational 24-hours per day, Monday through Friday, and 12:00 AM through 3:00 PM on Saturday.

Table II.C-28.
Estimated Average Daily Traffic Volumes for the Landfill

Year 2011 Number of Existing Trips	Year 2044 Projected Number of Trips
1,004	1,567

Background traffic growth rates were determined based on information obtained from TxDOT Historical ADT Traffic Maps (Ref. 3), and the Skyline Landfill Facility Traffic Projections table prepared as part of this permit application and attached in the appendix (Ref. 8). Based on the data obtained during the study, it was assumed that background traffic (or non-site traffic) within the study area will increase annually at a rate of one (1) percent over the life of the facility.

The projected traffic volumes on each study area roadway are listed in Table II.C-29.

Roadway Capacity Analysis

In order to determine the roadway level of service under existing and 2044 traffic conditions, a comparison between the expected speed-flow and density-flow was made. Traffic volumes were projected using the traffic counts collected by HDR as the base value. All roadway improvements noted within this report were assumed to be completed prior to design year 2044 conditions. Tables II.C-30 and II.C-31 summarize peak hour volume projections and capacity analysis results for year 2044. As shown, traffic generated by the landfill will represent a very small portion of the capacity of each study area roadway during the peak hour: 3.3 percent on BR 45, 0.8 percent on IH 45 SBFR, 0.6 percent on IH 45 NBFR, 0.1 percent on Malloy Bridge Road, and less than 0.1 percent on FM 660, FM 664, FM 983, and East 5th Street.

It should be noted that these calculations are based on traffic volumes assumed to occur during the peak period of traffic flow for each roadway, not on daily traffic volumes. It is more appropriate to evaluate a roadway based on its peak hour volume rather than the 24-hour volume, since peak hour volumes provide a better indication of the operating conditions of the roadway. Peak hour flows were determined based on existing traffic turning movement counts collected by HDR during the study. The future peak hour volumes were determined using historical count data obtained from TxDOT and the Skyline Landfill Traffic Projections included as part of this permit application. Projected landfill site traffic volumes were based on the

projected waste acceptance rate provided by Biggs & Matthews Environmental. It should be noted that the proposed change to the operational hours of the facility may have an impact on the peak hour landfill traffic accessing the site. However, this impact is likely to be minor – the distribution of waste acceptance vehicles is not uniform throughout the day – and will generally result in fewer vehicles per hour for each hour of operation, including the peak hour of operation. For this reason, and to provide a reasonable and conservative estimation of landfill trips, the current landfill trip distribution was maintained for future projection of landfill based trips.

Table II.C-29.
2044 Forecasted Traffic Volumes

Location	Projected Traffic Volume at 2044 Facility Closure					
	Daily			Peak Hour		
	Landfill Trips	Non-Landfill Trips	Total	Landfill Trips	Non-Landfill Trips	Total
BR 45, North of Skyline Landfill Driveway	888	4,854	5,742	105	378	483
BR 45, South of Skyline Landfill Driveway	183	3,886	4,069	17	384	401
IH 45 SBFR, North of Malloy Bridge Road	373	2,434	2,807	33	200	233
IH 45 NBFR, North of Malloy Bridge Road	251	2,264	2,515	23	192	215
IH 45 SBFR, South of FM 660	0	1,457	1,457	0	118	118
IH 45 NBFR, South of FM 660	0	1,433	1,433	0	186	186
FM 660, East of BR 45	5	5,577	5,582	0	742	742
FM 983, West of BR 45	119	10,467	10,586	0	1,626	1,626
FM 664, West of FM 983	105	9,187	9,292	0	1,108	1,108
East 5th Street, East of BR 45	0	6,184	6,184	0	730	730
Malloy Bridge Road, East of IH 45	75	3,235	3,310	3	263	266

Table II.C-30.
Level of Service for 2044 Forecasted Traffic Volumes (Two-Lane Highway Analysis)

Location	Roadway Capacity (pc/hr)	Peak Hour Volume (veh/hr)	% of Access Road Capacity Used[1]	HCM Roadway LOS[2]	% of Roadway Capacity Used by Forecasted Landfill Vehicles[1]
BR 45, North of Landfill Drwy	3,200	483	15.1	n/a[3]	3.3
FM 660	3,200	742	23.2	n/a[3]	<0.1
FM 983	3,200	1,626	50.8	n/a[3]	<0.1
FM 664	3,200	1,108	34.6	E	<0.1
East 5th Street	3,200	730	22.8	n/a[3]	<0.1
Malloy Bridge Road	3,200	266	8.3	A	0.1

Note:

1 – Based on traffic volumes (veh/hr) compared to capacity (pc/hr)
2 – Refer to HCM Exhibit 20-3 for Class I LOS criteria and Exhibit 20-4 for Class II LOS Criteria
3 – Two-lane rural highway analysis LOS not applicable on urban streets – Refer to intersection analyses for LOS

Table II.C-31
Level of Service for 2044 Forecasted Traffic Volumes (Multilane Highway Analysis)

Location	Access Road Capacity (Calculated)	One Way Peak Hour Volume (veh/hr)	% of Access Road Capacity Used[1]	Roadway LOS	Landfill Vehicles % of One Way Capacity - Peak Hour[1]
IH 45 SBFR, North of Malloy Bridge Road	2,090 pc/hr/ln	233	5.6	A	0.8
IH 45 NBFR, North of Malloy Bridge Road	2,056 pc/hr/ln	215	5.2	A	0.6
IH 45 SBFR, South of FM 660	1,900 pc/hr/ln[2]	118	3.1	A	<0.1
IH 45 NBFR, South of FM 660	1,902 pc/hr/ln	186	4.9	A	<0.1

Notes:

1 – Based on volumes (veh/hr) compared to capacity (pc/hr)
2 – Minimum access road capacity used – calculated free flow speed < 45 mph.

Intersection Analysis

BR 45 and Skyline Landfill Driveway

This intersection will operate at LOS A during both the AM and PM peak periods under 2044 forecasted conditions, assuming existing geometrics and traffic controls are maintained.

IH 45 and Malloy Bridge Road (East Intersection)

This intersection will operate at LOS A during both the AM and PM peak periods under 2044 forecasted conditions, assuming existing geometrics and traffic controls are maintained. No improvements are recommended at this intersection.

IH 45 and Malloy Bridge Road/BR 45/Millers Ferry Road (West Intersection)

This intersection will operate at LOS A during both the AM and PM peak periods under 2044 forecasted conditions, assuming existing geometrics and traffic controls are maintained. No improvements are recommended at this intersection.

BR 45 and FM 660

This intersection will operate at LOS B and F during the AM and PM peak periods, respectively, under 2044 forecasted conditions, assuming existing geometrics and traffic controls are maintained. It should be noted that landfill traffic does not cause this intersection to operate at unacceptable levels of service; therefore, no improvements are recommended at this intersection as part of this transportation study.

BR 45 and FM 983

This intersection will operate at LOS E and C during the AM and PM peak periods, respectively, under 2044 forecasted conditions, assuming existing geometrics and traffic controls are maintained. It should be noted that landfill traffic does not cause this intersection to operate at unacceptable levels of service; therefore, no improvements are recommended at this intersection as part of this transportation study.

BR 45 and East 5th Street

This intersection will operate at LOS C and B during the AM and PM peak periods, respectively, under 2044 forecasted conditions, assuming existing geometrics and traffic controls are maintained. No improvements are recommended at this intersection.

FM 983 and FM 664

This intersection will operate at LOS F and A during the AM and PM peak periods, respectively, under 2044 forecasted conditions, assuming existing geometrics and traffic controls are maintained. It should be noted that landfill traffic does not cause this intersection to operate at unacceptable levels of service; therefore, no improvements are recommended at this intersection as part of this transportation study.

IH 45 and FM 660 (East Intersection)

This intersection will operate at LOS F and C during the AM and PM peak periods, respectively, under 2044 forecasted conditions, assuming existing geometrics and traffic controls are maintained. It should be noted that landfill traffic does not cause this intersection to operate at unacceptable levels of service; therefore, no improvements are recommended at this intersection as part of this transportation study.

IH 45 and FM 660 (West Intersection)

This intersection will operate at LOS C and B during the AM and PM peak periods, respectively, under 2044 forecasted conditions, assuming existing geometrics and traffic controls are maintained. No improvements are recommended at this intersection.

IH 45 and East 5th Street (East Intersection)

This intersection will operate at LOS C and A during the AM and PM peak periods, respectively, under 2044 forecasted conditions, assuming existing geometrics and traffic controls are maintained. No improvements are recommended at this intersection.

IH 45 and East 5th Street (West Intersection)

This intersection will operate at LOS C and B during the AM and PM peak periods, respectively under 2044 forecasted conditions, assuming existing geometrics and traffic controls are maintained. No improvements are recommended at this intersection.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the information gathered during this transportation study, the following conclusions are made concerning the impact of the proposed expansion of the Skyline Landfill Facility on the local transportation system serving the site.

- FM 660 and FM 983 have maximum gross vehicle weights of 58,420 lbs. All other access roadways within one mile of the site have maximum gross vehicle weight limits of 80,000 lbs.
- Roadway improvements currently planned or under construction within the study area include construction of a six lane toll-road running east-west through the roadway network (Loop 9) between US 287 and IH 20, installation of wireless incident detection and response system on IH 45 from IH 20 to the Dallas/Ellis County line, a feasibility study to widen FM 664 from two to four lanes between US 287 and IH 45, and a study to realign FM 664 to the south of downtown Ferris. For the purpose of this study, none of these improvements were assumed to be constructed prior to 2044 conditions. Implementation of these improvements, and others identified and implemented during the life of the facility, will have an impact on the operation of the roadway network, prediction of which is beyond the scope of this study.
- Based on the roadway capacity analysis, all main access roadways within one mile of the site will operate at acceptable levels of service, with the exception of FM 664.
- FM 664 will operate at an unacceptable level of service under 2044 forecasted conditions, with or without facility related traffic. Addition of site traffic does not result in a deterioration of LOS on this roadway. Upgrade/realignment of FM 664, as proposed by NCTCOG and TxDOT, will have a significant positive impact on the level of service of this facility.
- Based on the intersection capacity analysis, the intersections of BR 45 with FM 660 and FM 983, FM 983 with FM 664, and FM 660 with the IH 45 Southbound Frontage Road will operate at unacceptable levels of service under 2044 forecasted conditions, with or without facility related traffic. It should be noted that site traffic does not result in a deterioration of LOS for any of the study area intersections.

- As detailed in Tables II.C-26 and II.C-27, 2011 existing landfill traffic accounts for less than three (3) percent of the overall roadway capacity on each of the study area roadways during the observed peak hour for each.
- As detailed in Tables II.C-30 and II.C-31, under 2044 forecasted traffic conditions, the landfill traffic will account for less than four (4) percent of the overall roadway capacity on each of the study area roadways during the observed peak hour for each.
- No sight distance limitations were observed during field review of intersection operations.
- Based on the information presented previously, there are no existing or future restrictions on the main access roadways within one mile of the site that would preclude safe and efficient operations for landfill vehicles and other traffic in the area.

REFERENCES

1. Mobility 2035: The Metropolitan Transportation Plan for North Central Texas, North Central Texas Council of Governments, Arlington, Texas, March 2011.
2. 2011-2014 Transportation Improvement Program for North Central Texas, North Central Texas Council of Governments, Arlington, Texas, Approved on June 3, 2010, Amended on March 10, 2011.
3. 2000 - 2010 Traffic Maps, Dallas District, Texas Department of Transportation, http://www.txdot.gov/travel/planning_map.htm, Austin, Texas.
4. A Policy on Geometric Design of Highways and Streets, Sixth Edition, American Association of State Highway and Transportation Officials, Washington, D.C., 2011.
5. Highway Capacity Manual, Transportation Research Board, Washington, D.C., 2010.
6. HCS2000 Highway Capacity Software, v4.1f, McTrans Center, University of Florida, Gainesville, Florida, 2003.
7. David Husch, John Albeck, "Synchro 7.0", Trafficware, Albany, California, 2007
8. Skyline Landfill Traffic Projections, WMI Skyline Landfill Permit Amendment, Prepared by Biggs & Matthews Environmental, January 24, 2012.

APPENDIX

1. TxDOT-Dallas Coordination Letter
2. TxDOT-Ellis Coordination Letter
3. City of Ferris Coordination Letter
4. City of Wilmer Coordination Letter
5. Dallas County Coordination Letter
6. Ellis County Coordination Letter
7. Ferris I.S.D. Coordination Letter
8. Dallas I.S.D. Coordination Letter
9. Lancaster I.S.D. Coordination Letter
10. TxDOT-Ellis Formal Response
11. Ellis County Formal Response
12. Skyline Landfill Traffic Projections
13. Site Traffic Distribution Worksheets
14. HCS Analysis Worksheets
15. Synchro Analysis Worksheets

October 10, 2011

Mr. Paul Williams, P.E.
Area Engineer
TxDOT Dallas District – Dallas East
P.O. Box 3067
Dallas, Texas 75221

Subject: Skyline Landfill, Ferris, Texas

Dear Mr. Williams:

Waste Management of Texas, Inc. is preparing a permit application for the proposed expansion of the Skyline Landfill located in Ferris, Texas. The purpose of this letter is to document coordination with the Texas Department of Transportation (TxDOT) consistent with the requirements of the municipal solid waste regulations, 30 Texas Administrative Code Chapter 330 (30 TAC §330.61(i)(4)). Additionally we are requesting information regarding any traffic or location restrictions or proposed roadway improvements in the vicinity of the site.

The site entrance is located on BR 45 (N Central Street), approximately 3,100 feet south of Malloy Bridge Road. The primary access route to the Skyline Landfill facility is BR 45. Enclosed Figure 1 shows the location of the site prepared from Texas Department of Transportation maps.

Listed below are specific issues that we would like TxDOT to confirm or address in written form:

- Traffic volume projections: Please provide an annual traffic volume growth rate for the following roadways in the vicinity of the site. This information will be used to compare the traffic anticipated to be generated by the Skyline Landfill with the TxDOT traffic projections:
    1. BR 45 (North Central Street)
    2. IH 45
- Please provide the capacity determined by TxDOT for the roadways listed above in the vicinity of the site.
- Please provide any information regarding planned maintenance or construction improvements in the vicinity of the site, specifically on roadways listed above. Also please include any existing information regarding traffic volume counts and studies performed in the vicinity of the site.

504 Lavaca Street, #1175
Austin, Texas 78701
512-904-3700

- Please provide information on any load-zoned roadways in the vicinity of the site that have gross vehicle weight limits less than 80,000 pounds.
- Please provide any special design criteria that may be required for the operation of the landfill.
- Please provide existing cross-section data showing travel lane and shoulder widths for the roadways listed above in the vicinity of the site.

We appreciate your review of this information and your written response. Please feel free to contact Mike McInturff or me if you have any questions.

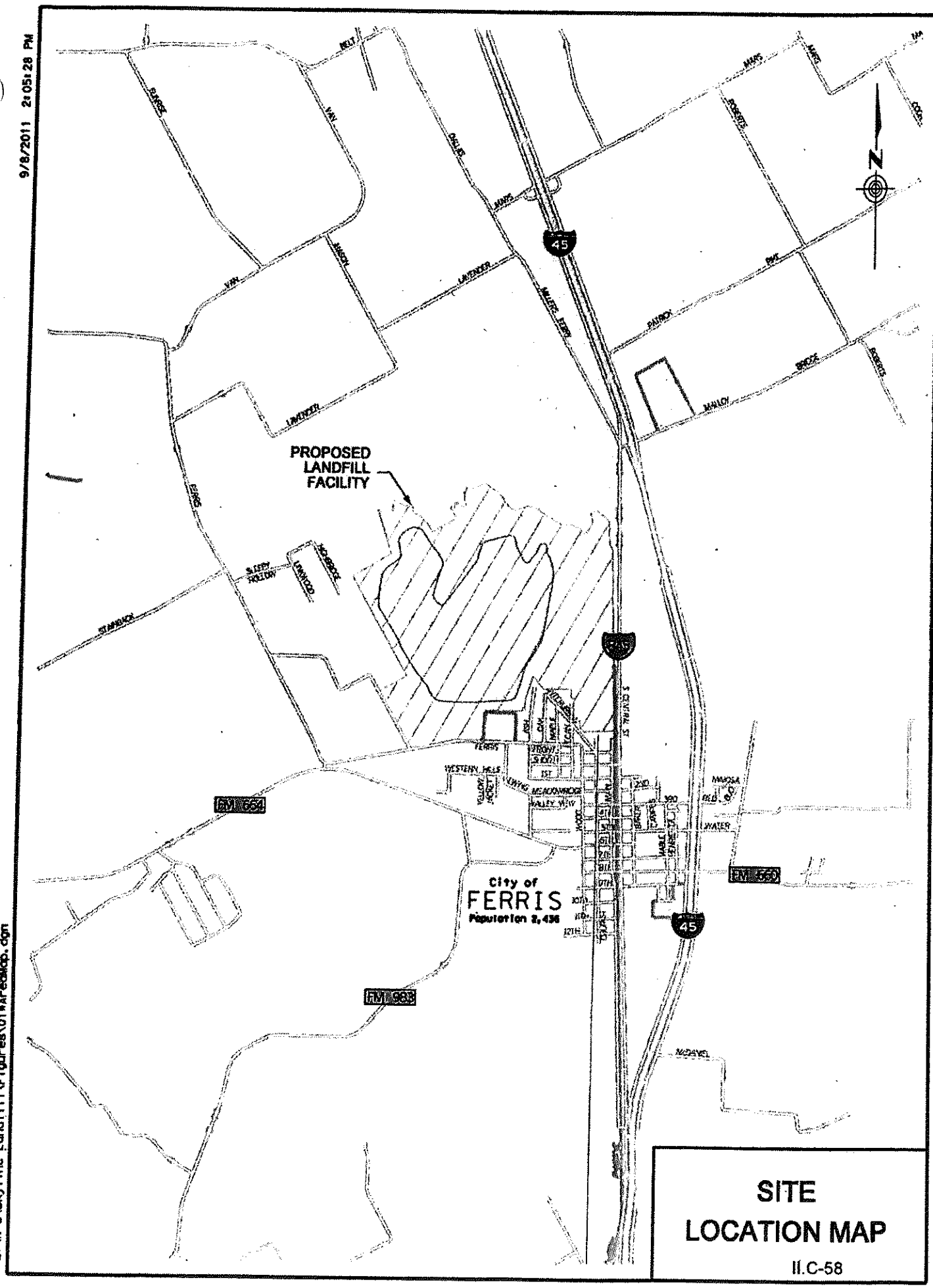
Sincerely,

Timothy Grimes, P.E., PTOE
Project Engineer

Enclosure

cc: Mike McInturff, P.E., PTOE, HDR
Kenneth Welch, P.E., Biggs & Matthews Environmental

504 Lavaca Street, #1175
Austin, Texas 78701
512-904-3700



SITE LOCATION MAP

II.C-58

October 10, 2011

Mr. Bill Pierce, P.E.
Area Engineer
TxDOT Dallas District – Ellis
124 FM 876
Waxahachie, Texas 75167

Subject: Skyline Landfill, Ferris, Texas

Dear Mr. Pierce:

Waste Management of Texas, Inc. is preparing a permit application for the proposed expansion of the Skyline Landfill located in Ferris, Texas. The purpose of this letter is to document coordination with the Texas Department of Transportation (TxDOT) consistent with the requirements of the municipal solid waste regulations, 30 Texas Administrative Code Chapter 330 (30 TAC §330.61(i)(4)). Additionally we are requesting information regarding any traffic or location restrictions or proposed roadway improvements in the vicinity of the site.

The site entrance is located on BR 45 (N Central Street), approximately 3,100 feet south of Malloy Bridge Road. The primary access route to the Skyline Landfill facility is BR 45. Enclosed Figure 1 shows the location of the site prepared from Texas Department of Transportation maps.

Listed below are specific issues that we would like TxDOT to confirm or address in written form:

- Traffic volume projections: Please provide an annual traffic volume growth rate for the following roadways in the vicinity of the site. This information will be used to compare the traffic anticipated to be generated by the Skyline Landfill with the TxDOT traffic projections:
    1. BR 45 (Central Street)
    2. IH 45
    3. FM 660
    4. FM 983
    5. FM 664
- Please provide the capacity determined by TxDOT for the roadways listed above in the vicinity of the site.

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Austin, Texas 78701
512-904-3700

- Please provide any information regarding planned maintenance or construction improvements in the vicinity of the site, specifically on roadways listed above. Also please include any existing information regarding traffic volume counts and studies performed in the vicinity of the site.
- Please provide information on any load-zoned roadways in the vicinity of the site that have gross vehicle weight limits less than 80,000 pounds.
- Please provide any special design criteria that may be required for the operation of the landfill.
- Please provide existing cross-section data showing travel lane and shoulder widths for the roadways listed above in the vicinity of the site.

We appreciate your review of this information and your written response. Please feel free to contact Mike McInturff or me if you have any questions.

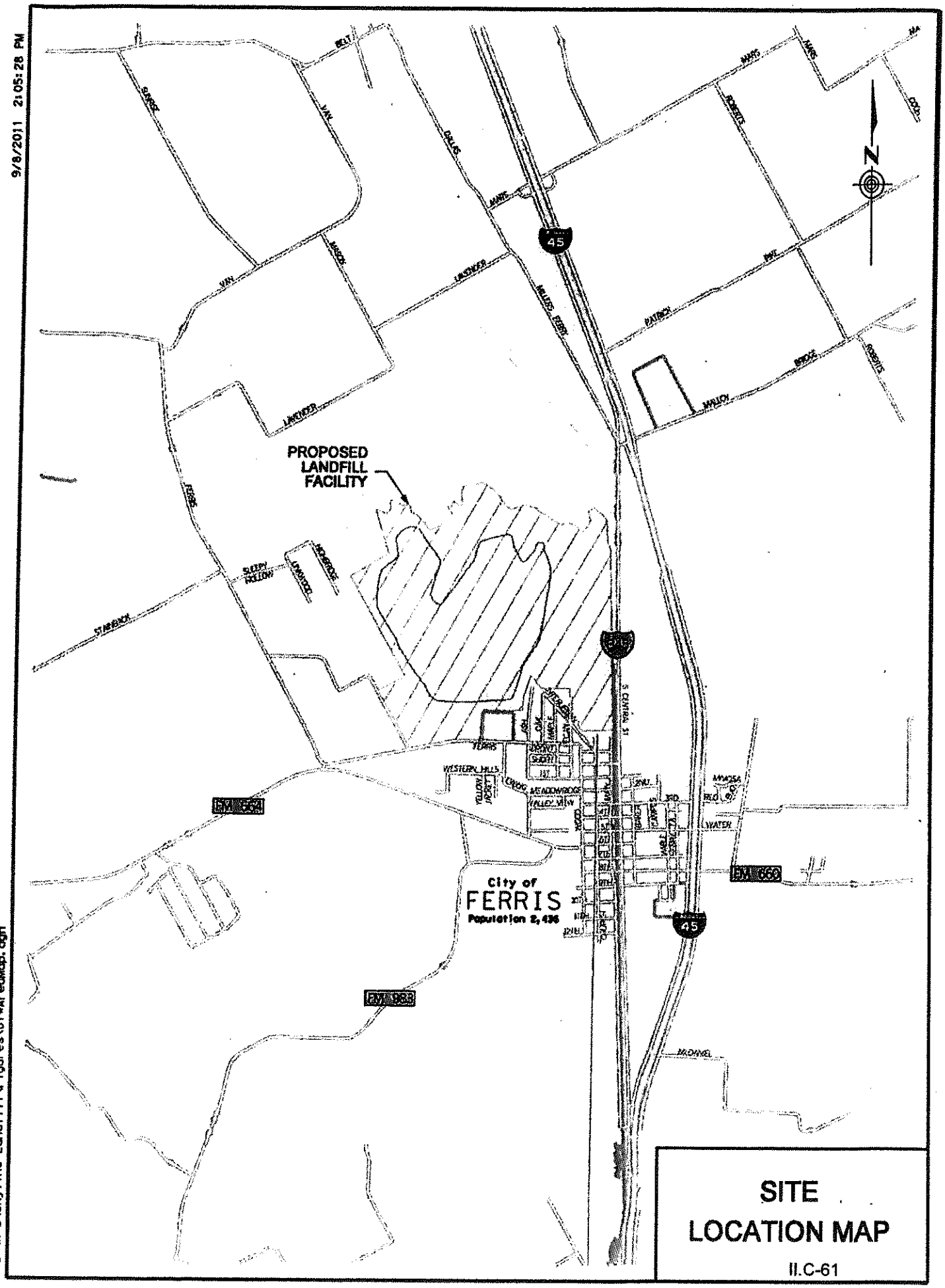
Sincerely,

Timothy Grimes, P.E., PTOE
Project Engineer

Enclosure

cc: Mike McInturff, P.E., PTOE, HDR
Kenneth Welch, P.E., Biggs & Matthews Environmental

504 Lavaca Street, #1175
Austin, Texas 78701
512-904-3700



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SITE LOCATION MAP

II.C-61

October 10, 2011

Mr. Eric Strong
City Manager
City of Ferris, Texas
100 Town Plaza
Ferris, Texas 75125

Subject: Skyline Landfill, Ferris, Texas

Dear Mr. Strong:

Waste Management of Texas, Inc. is preparing a permit application for the proposed expansion of the Skyline Landfill located in Ferris, Texas. The purpose of this letter is to document coordination with the City of Ferris consistent with the requirements of the municipal solid waste regulations, 30 Texas Administrative Code Chapter 330 (30 TAC §330.61(i)(4)). Additionally we are requesting information regarding any traffic or location restrictions or proposed roadway improvements in the vicinity of the site.

The site entrance is located on N Central Street (BR 45), approximately 3,100 feet south of Malloy Bridge Road. The primary access route to the Skyline Landfill facility is N Central Street. Enclosed Figure 1 shows the location of the site prepared from Texas Department of Transportation maps.

Listed below are specific issues that we would like the City to confirm or address in written form:

- Traffic volume projections: Please provide an annual traffic volume growth rate for the following roadways in the vicinity of the site. This information will be used to compare the traffic anticipated to be generated by the Skyline Landfill with the City's traffic projections:
    1. Central Street
    2. 5th Street
    3. E 6th Street
    4. W 8th Street
- Please provide the capacity determined by the City for the roadways listed above within the City limits, if available.

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Austin, Texas 78701
512-904-3700

- Please provide any information regarding planned maintenance or construction improvements in the vicinity of the site, specifically along the roadways listed above. Also please include any existing information regarding traffic volume counts and studies performed in the vicinity of the site.
- Please provide information on any load-zoned roadways in the vicinity of the site that have gross vehicle weight limits less than 80,000 pounds.
- Please provide any special design criteria that may be required for the operation of the landfill.

We appreciate your review of this information and your written response. Please feel free to contact Mike McInturff or me if you have any questions.

Sincerely,

Timothy Grimes, P.E., PTOE
Project Engineer

Enclosure

cc: Mike McInturff, P.E., PTOE, HDR
Kenneth Welch, P.E., Biggs & Matthews Environmental

504 Lavaca Street, #1175
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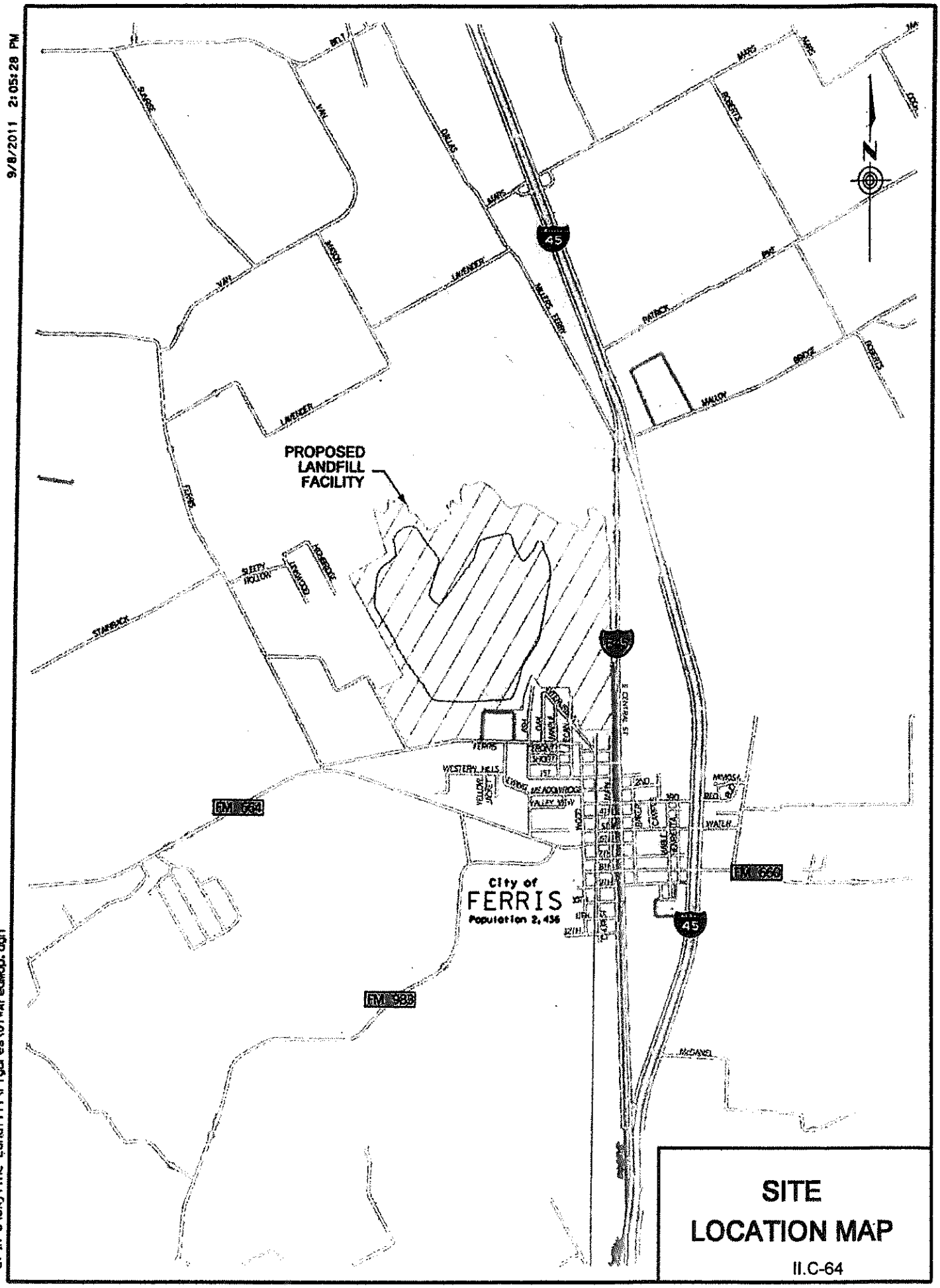

SITE LOCATION MAP

II.C-64

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October 10, 2011

Ms. Crystol Birdwell
City Secretary
City of Wilmer, Texas
128 N Dallas Avenue
Wilmer, Texas 75172

Subject: Skyline Landfill, Ferris, Texas

Dear Ms. Birdwell:

Waste Management of Texas, Inc. is preparing a permit application for the proposed expansion of the Skyline Landfill located in Ferris, Texas. The purpose of this letter is to document coordination with the City of Wilmer consistent with the requirements of the municipal solid waste regulations, 30 Texas Administrative Code Chapter 330 (30 TAC §330.61(i)(4)). Additionally we are requesting information regarding any traffic or location restrictions or proposed roadway improvements in the vicinity of the site.

The site entrance is located on N Central Street (BR 45), approximately 3,100 feet south of Malloy Bridge Road. The primary access route to the Skyline Landfill facility is N Central Street. Enclosed Figure 1 shows the location of the site prepared from Texas Department of Transportation maps.

Listed below are specific issues that we would like the City to confirm or address in written form:

- Traffic volume projections: Please provide an annual traffic volume growth rate for S Dallas Avenue in the vicinity of the site.
- Please provide the capacity determined by the City for S Dallas Avenue, if available, in the vicinity of the site.
- Please provide any information regarding planned maintenance or construction improvements in the vicinity of the site. Also please include any existing information regarding traffic volume counts and studies performed in the vicinity of the site.
- Please provide information on any load-zoned roadways in the vicinity of the site that have gross vehicle weight limits less than 80,000 pounds.

504 Lavaca Street, #1175
Austin, Texas 78701
512-904-3700

- Please provide any special design criteria that may be required for the operation of the landfill.

We appreciate your review of this information and your written response. Please feel free to contact Mike McInturff or me if you have any questions.

Sincerely,

Timothy Grimes, P.E., PTOE
Project Engineer

Enclosure

cc: Mike McInturff, P.E., PTOE, HDR
Kenneth Welch, P.E., Biggs & Matthews Environmental

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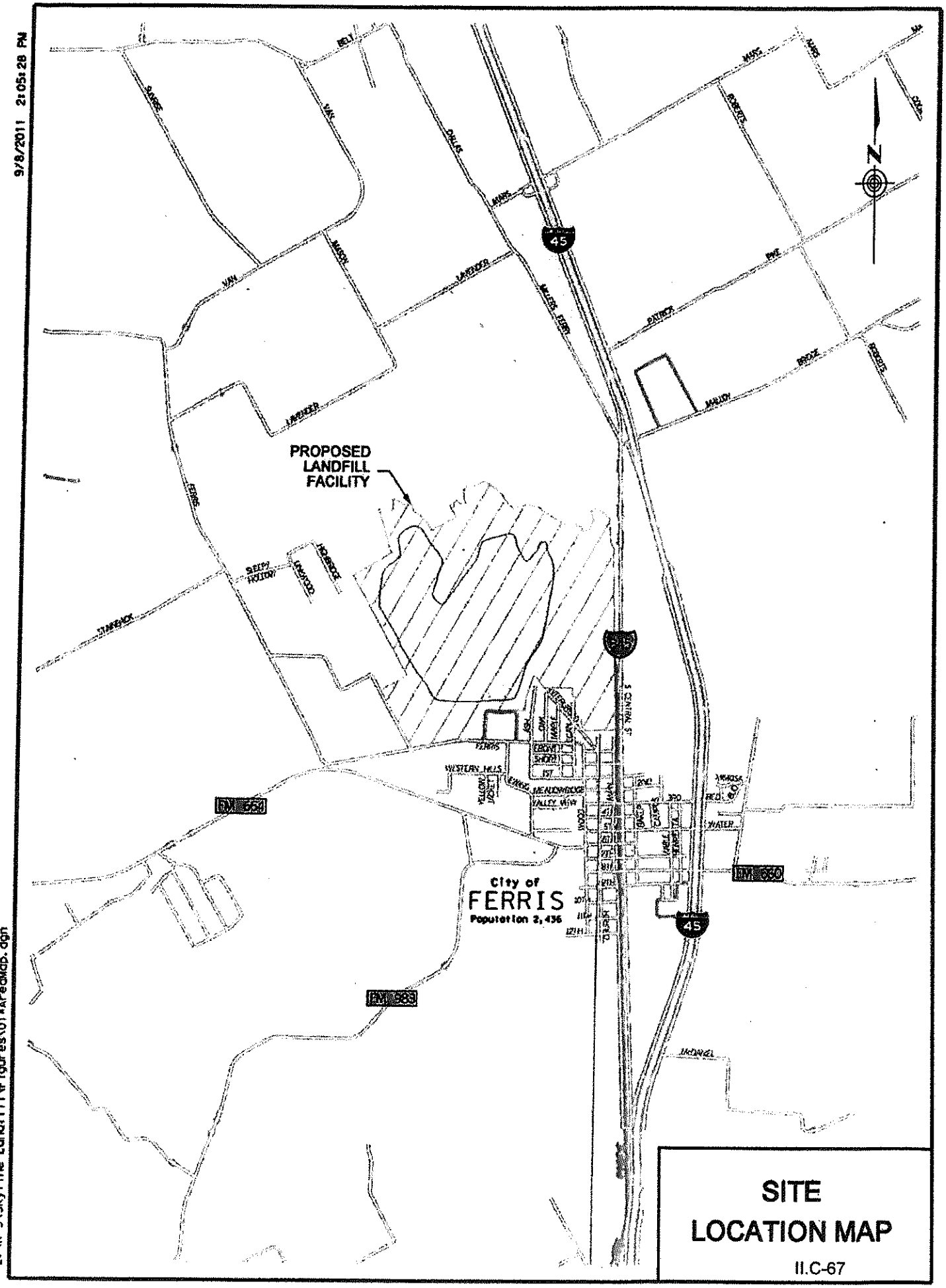

SITE LOCATION MAP

II.C-67

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October 10, 2011

Ms. Alberta L. Blair, P.E.
Public Works Director
Dallas County, Texas
411 Elm Street, 4th Floor
Dallas, Texas 75202

Subject: Skyline Landfill, Ferris, Texas

Dear Ms. Blair:

Waste Management of Texas, Inc. is preparing a permit application for the proposed expansion of the Skyline Landfill located in Ferris, Texas. The purpose of this letter is to document coordination with Dallas County consistent with the requirements of the municipal solid waste regulations, 30 Texas Administrative Code Chapter 330 (30 TAC §330.61(i)(4)). Additionally we are requesting information regarding any traffic or location restrictions or proposed roadway improvements in the vicinity of the site.

The site entrance is located on BR 45 (N Central Street), approximately 3,100 feet south of Malloy Bridge Road. The primary access route to the Skyline Landfill facility is BR 45. Enclosed Figure 1 shows the location of the site prepared from Texas Department of Transportation maps.

Listed below are specific issues that we would like the County to confirm or address in written form:

- Traffic volume projections: Please provide an annual traffic volume growth rate for the following roadways in the vicinity of the site. This information will be used to compare the traffic anticipated to be generated by the Skyline Landfill with the County's traffic projections:
    1. Malloy Bridge Road
    2. S Dallas Avenue
- Please provide the capacity determined by the County for the roadways listed above, if available.
- Please provide any information regarding planned maintenance or construction improvements in the vicinity of the site, specifically along the roadways listed above. Also please include any existing information regarding traffic volume counts and studies performed in the vicinity of the site.

504 Lavaca Street, #1175
Austin, Texas 78701
512-804-3700

- Please provide information on any load-zoned roadways in the vicinity of the site that have gross vehicle weight limits less than 80,000 pounds.
- Please provide any special design criteria that may be required for the operation of the landfill.

We appreciate your review of this information and your written response. Please feel free to contact Mike McInturff or me if you have any questions.

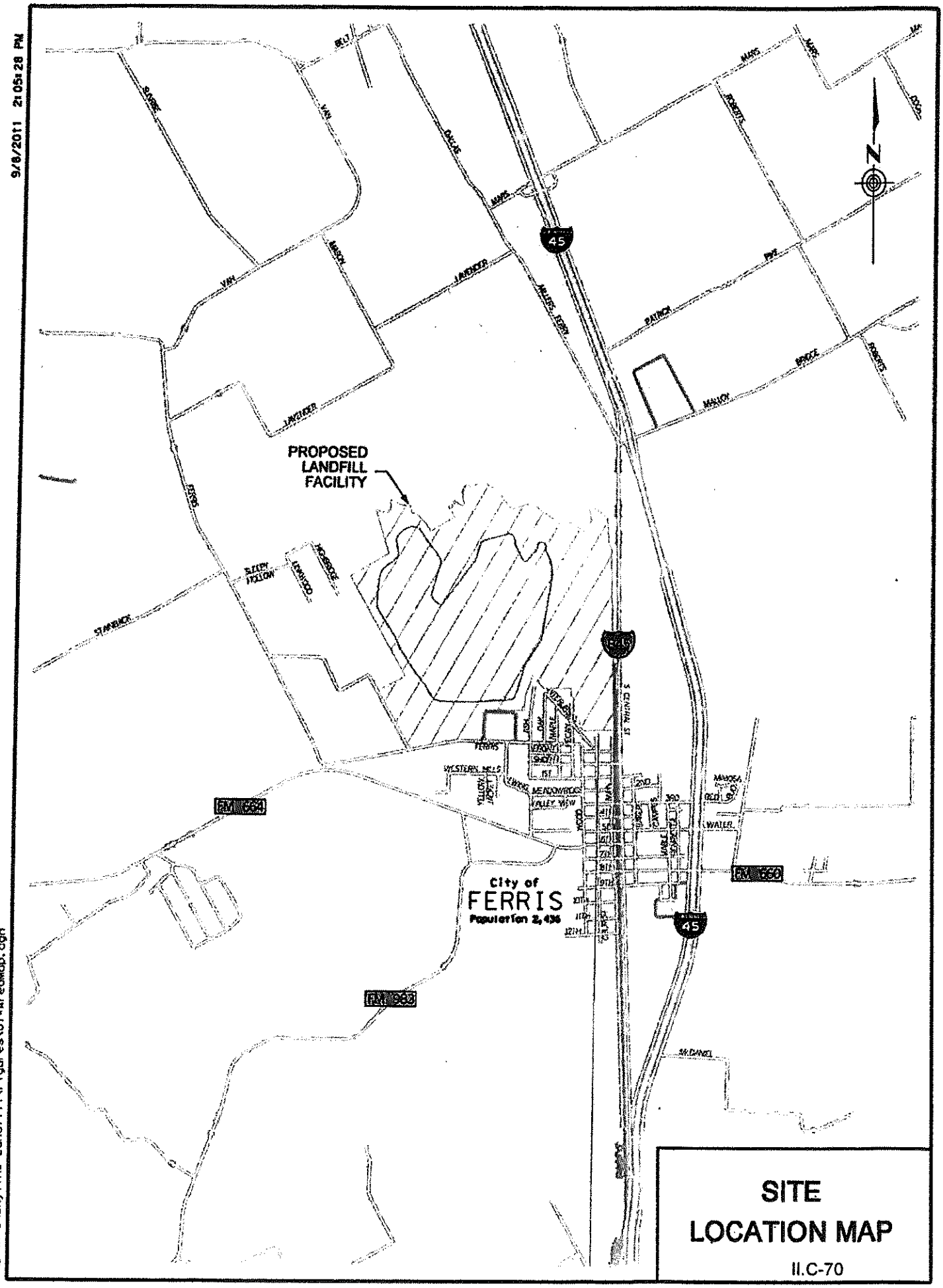
Sincerely,

Timothy Grimes, P.E., PTOE
Project Engineer

Enclosure

cc: Mike McInturff, P.E., PTOE, HDR
Kenneth Welch, P.E., Biggs & Matthews Environmental

504 Lavaca Street, #1175
Austin, Texas 78701
512-604-3700



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SITE LOCATION MAP

II.C-70

October 10, 2011

Mr. Joe White, P.E.
County Engineer
Ellis County, Texas
109 S Jackson Street
Waxahachie, Texas 75165

Subject: Skyline Landfill, Ferris, Texas

Dear Mr. White:

Waste Management of Texas, Inc. is preparing a permit application for the proposed expansion of the Skyline Landfill located in Ferris, Texas. The purpose of this letter is to document coordination with Ellis County consistent with the requirements of the municipal solid waste regulations, 30 Texas Administrative Code Chapter 330 (30 TAC §330.61(i)(4)). Additionally we are requesting information regarding any traffic or location restrictions or proposed roadway improvements in the vicinity of the site.

The site entrance is located on BR 45 (N Central Street), approximately 3,100 feet south of Malloy Bridge Road. The primary access route to the Skyline Landfill facility is BR 45. Enclosed Figure 1 shows the location of the site prepared from Texas Department of Transportation maps.

Listed below are specific issues that we would like the County to confirm or address in written form:

- Traffic volume projections: Please provide an annual traffic volume growth rate for the following roadways in the vicinity of the site. This information will be used to compare the traffic anticipated to be generated by the Skyline Landfill with the County's traffic projections:
    1. FM 660
    2. FM 983
    3. FM 664
- Please provide the capacity determined by the County for the roadways listed above, if available.

504 Lavaca Street, #1175
Austin, Texas 78701
512-904-3700

- Please provide any information regarding planned maintenance or construction improvements in the vicinity of the site, specifically along the roadways listed above. Also please include any existing information regarding traffic volume counts and studies performed in the vicinity of the site.
- Please provide information on any load-zoned roadways in the vicinity of the site that have gross vehicle weight limits less than 80,000 pounds.
- Please provide any special design criteria that may be required for the operation of the landfill.

We appreciate your review of this information and your written response. Please feel free to contact Mike McInturff or me if you have any questions.

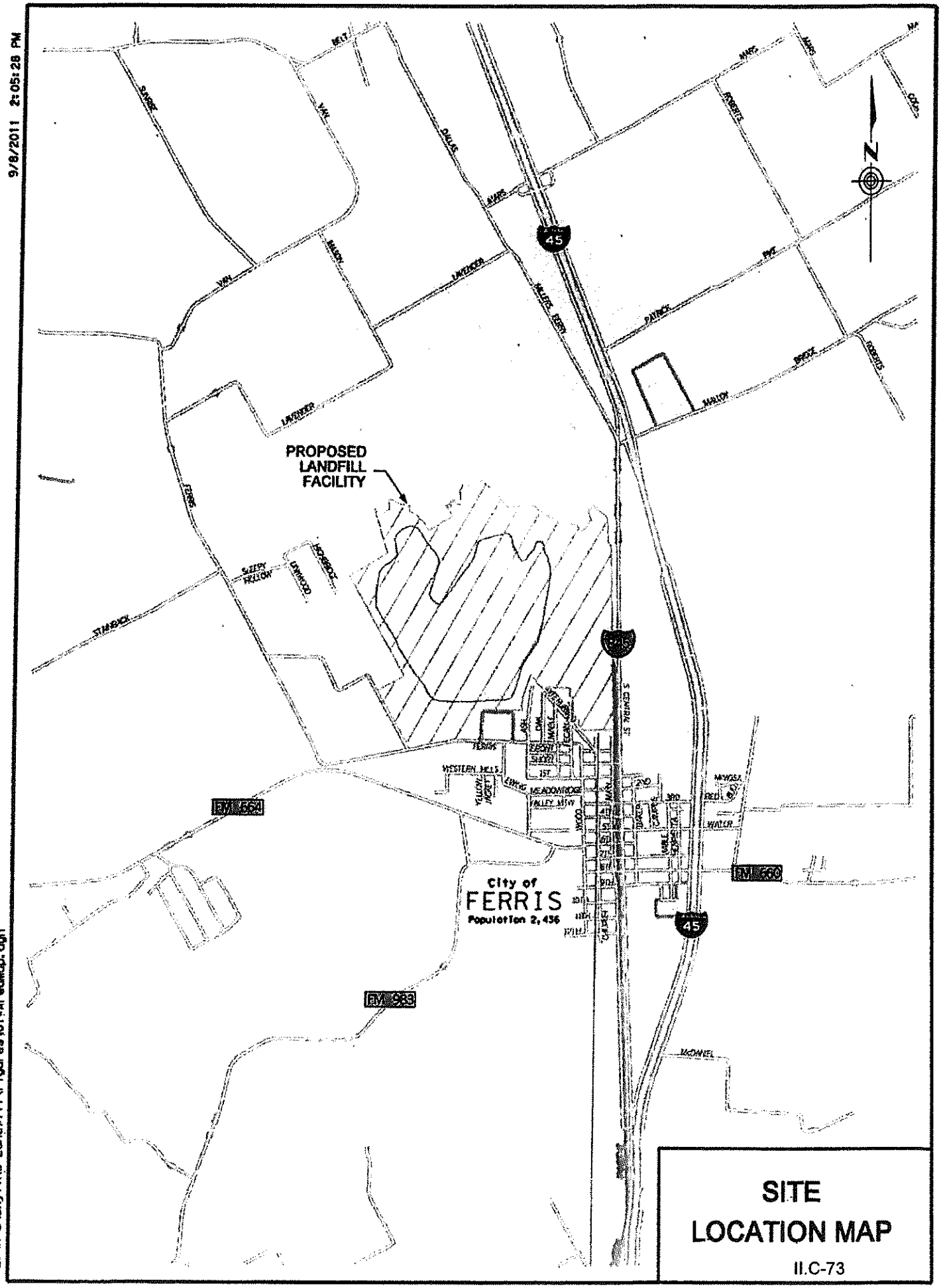
Sincerely,

Timothy Grimes, P.E., PTOE
Project Engineer

Enclosure

cc: Mike McInturff, P.E., PTOE, HDR
Kenneth Welch, P.E., Biggs & Matthews Environmental

504 Lavaca Street, #1175
Austin, Texas 78701
512-904-3700



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SITE LOCATION MAP

II.C-73

October 10, 2011

Ms. Dondi Markgraf
Director of Maintenance and Transportation
Ferris ISD
P.O. Box 459
Ferris, Texas 75125-0459

Subject: Ferris ISD School Bus Routes

Dear Ms. Markgraf:

HDR Engineering, Inc. is in the process of completing a transportation study for a development project within the Ferris Independent School District. It is required, as part of the study, to evaluate the impacts of site traffic on school bus routes in the area. Please provide any information you may have regarding bus routes on the following roadway segments within the district:

- Central Street, from IH 45 N to IH 45 S
- Malloy Bridge Road, from N Central Street to Roberts Road
- S Dallas Avenue, from Lavender Road to Malloy Bridge Road
- IH 45, from Mars Road to S Central Street
- 5th Street, from N Wood St to Birch Road
- E 6th Street, from S Central Street to S Baker Street
- FM 983, from S Central Street to Bluff Springs Road
- FM 664, from FM 983 to Tanner Farm Road
- W 8th Street, from S Wood Street to S Central Street
- FM 660, from S Central Street to Bear Creek Drive

504 Lavaca Street, #1175
Austin, Texas 78701
512-904-3700

We appreciate your review of this information and your written response. Please feel free to contact Mike McInturff or me if you have any questions.

Sincerely,

Timothy Grimes, P.E., PTOE
Project Engineer

cc: Mike McInturff, P.E., PTOE, HDR
Kenneth Welch, P.E., Biggs & Matthews Environmental

504 Lavaca Street, #1175
Austin, Texas 78701
512-904-3700

October 10, 2011

Mr. Doug Becker
Director of Student Transportation
Dallas ISD
3700 Ross Avenue
Dallas, Texas 75204

Subject: Dallas ISD School Bus Routes

Dear Mr. Becker:

HDR Engineering, Inc. is in the process of completing a transportation study for a development project adjacent to the boundary of Dallas Independent School District, in Ferris, Texas. It is required, as part of the study, to evaluate the impacts of site traffic on school bus routes in the area. Please provide any information you may have regarding bus routes on the following roadway segments within the district:

- S Dallas Avenue, from Lavender Road to Malloy Bridge Road
- IH 45, from Mars Road to Malloy Bridge Road

We appreciate your review of this information and your written response. Please feel free to contact Mike McInturff or me if you have any questions.

Sincerely,

Timothy Grimes, P.E., PTOE
Project Engineer

cc: Mike McInturff, P.E., PTOE, HDR
Kenneth Welch, P.E., Biggs & Matthews Environmental

504 Lavaca Street, #1175
Austin, Texas 78701
512-904-3700

October 10, 2011

Mr. James Thomas
Transportation Supervisor
Lancaster ISD
1003 N Dallas Avenue
Lancaster, Texas 75146

Subject: Lancaster ISD School Bus Routes

Dear Mr. Thomas:

HDR Engineering, Inc. is in the process of completing a transportation study for a development project adjacent to the boundary of Lancaster Independent School District, in Ferris, Texas. It is required, as part of the study, to evaluate the impacts of site traffic on school bus routes in the area. Please provide any information you may have regarding bus routes on S Dallas Avenue, between Lavender Road and Patrick Pike Road (near Ferris) within the district.

We appreciate your review of this information and your written response. Please feel free to contact Mike McInturff or me if you have any questions.

Sincerely,

Timothy Grimes, P.E., PTOE
Project Engineer

cc: Mike McInturff, P.E., PTOE, HDR
Kenneth Welch, P.E., Biggs & Matthews Environmental

504 Lavaca Street, #1175
Austin, Texas 78701
512-904-3700

Texas Department of Transportation

124 FM 876
Waxahachie, Texas 75167
(972) 938-1570
October 26, 2011

Timothy Grimes, P.E., PTOE
Project Engineer
HDR
504 Lavaca Street, #1175
Austin, Texas 78701

Re: Skyline Landfill, Ferris, Texas

Dear Mr. Grimes,

Please make reference to your letter dated October 10, 2011 requesting information pertinent to the expansion of the subject facility. I offer the following comments to your specific issues:

- Traffic volume projections - I direct HDR to the TxDOT website (http://www.txdot.gov/travel/) and the North Central Texas Council of Governments website (http://www.nctcog.org/trans/data/tcins/) where you may access available traffic data.
- Roadway Capacity - I direct HDR to the latest edition of TRB Highway Capacity Manual for determining this value.
- Load Zoned Roadways - I direct HDR to the TxDOT website (http://www.txdot.gov/travel/) where you may access available load zoning information.
- Typical Sections - I direct HDR to the Dallas District Library where the as-built constructions plans are kept on file. The physical address is:

  Dallas District Office
  TxDOT
  4777 E Highway 80
  Mesquite, TX 75150-6643

Sincerely,

William J. Pierce, P.E.
Area Engineer

WJP

ELLIS COUNTY ENGINEERING DEPARTMENT
109 South Jackson Street, Waxahachie, Texas 75165

November 21, 2011

Mr. Timothy Grimes, P.E., PTOE
HDR
504 Lavaca Street, #1175
Austin, Texas 78701

Subject: Ellis County Response Concerning Skyline Landfill Proposed Expansion

Dear Mr. Grimes:

Thank you for your October 10th letter concerning Waste Management of Texas wish to expand the Skyline Landfill. The bulk of the expansion appears to be within Dallas County with only minor adjustments within the City of Ferris municipal boundaries. Ellis County and the City of Ferris officials are of the opinion that the proposed expansion will have minimal impact within our jurisdiction.

We are providing a copy of our Solid Waste Facility Siting Ordinance adopted by the Ellis County Commissioners Court in August, 2007 (Minute Order #298.07).

Please be aware of the proposed Loop 9 corridor crossing the proposed expansion area. Additional information on this project can be found at loop9.org website.

FM 664 is currently part of a corridor study being conducted by TxDOT. The section of road in your area is anticipated to be realigned to the south in order to reduce pedestrian/vehicle conflicts in the downtown area.

Your request for traffic volume projections, maintenance, planned improvements, counts, load-zones and special design criteria for FM's and B45 is under the jurisdiction of TxDOT. You may contact Mr. Bill Pierce, Ellis County Area Office for the above information.

Our Thoroughfare Plan designates FM 664 & FM 660 as Principal Arterials (6-lane) roadways. FM 983 is designated as a Minor Arterial (4-lane). Capacity estimates will be based on the NCTCOG model estimates.

If I can be of additional help, please contact me at 214 793-5489.

Sincerely,

Barbra L. Leftwich
County Planner

cc Commissioner Dennis Robinson, Pct. 1
Joe White, County Engineer
Bill Pierce, TxDOT Area Engineer
Eric Strong, City of Ferris

F18 FROM 5-001-0614-0802 EQUIPMENT, 5-001-0614-0808 AUTO GAS/OIL, 5-001-0614-0809 AUTO REPAIR, 5-001-0614-0812 RADIO TO 5-001-0614-0803 FURNITURE/FIXTURES, 5-001-0614-0801 SUPPLIES, 5-001-0614-0703 TELEPHONE – STEVE MCKINNEY, CONSTABLE PCT. 4

SIMPLIFIED PLAT :

2.1 SIMPLIFIED PLAT – GARCIA'S PECAN GROVE ADDITION, 1 LOT, CLEMENTE AND RAQUEL GARCIA, PCT. 1.

2.2 SIMPLIFIED PLAT – TELICO NORTH ESTATES, 2 LOTS, ROBERT HERSCHMANN, JR., PCT. 2.

2.3 SIMPLIFIED PLAT – MARION PROPERTY, 1 LOT, MEDFORD MARION, PCT. 3.

2.4 SIMPLIFIED PLAT – MADDIE'S PLACE, 2 LOTS, CHRISTOPHER WATSON, PCT. 3

2.5 SIMPLIFIED PLAT – WILBER ESTATES, 2 LOTS, BARRY AND EVELYN WILBER, PCT. 3

MOTION TO APPROVE CONSENT AGENDA BY COMMISSIONER DODSON, SECOND BY COMMISSIONER SIMS CARRIES UNANIMOUSLY

ADMINISTRATIVE:

3.1 PRESENTATION OF CERTIFICATE TO COMMISSIONER DENNIS ROBINSON FOR ATTENDANCE AT THE 48TH ANNUAL COUNTY JUDGES & COMMISSIONERS' CONTINUING EDUCATION CONFERENCE BY THE V. G. YOUNG INSTITUTE OF COUNTY GOVERNMENT.

- MARK ARNOLD, ELLIS COUNTY CO-OP EXTENSION SERVICE

3.2 PRESENTATION AND INFORMATION UPDATE ON NASCO (NORTH AMERICA'S SUPER CORRIDOR COALITION, INC).

- RACHEL CONNELL AND TIFFANY MELVIN, NASCO

NO ACTION 3.3 CONSIDERATION AND ACTION TO APPROVE AN INTERLOCAL AGREEMENT BETWEEN THE CITY OF MANSFIELD, TEXAS AND ELLIS COUNTY, TEXAS, AND REINVESTMENT ZONE NUMBER ONE, CITY OF MANSFIELD, TEXAS FOR PARTICIPATION IN THE TAX INCREMENT ZONE FOR A PERIOD FROM JANUARY 1, 2006 THROUGH DECEMBER 31, 2030.

- BARBRA LEFTWICH, ELLIS COUNTY PLANNER

MINUTE ORDER NO 298.07 APPROVING AN ELLIS COUNTY SOLID WASTE FACILITY SITING ORDINANCE SPECIFYING AREAS IN UNINCORPORATED ELLIS COUNTY WHERE SOLID WASTE DISPOSAL IS NOT PROHIBITED, AS PREPARED BY R. W. BECK, INC., CHANGING REQUIREMENT OF 1 MILE TO ¼ MILE FROM TRIBUTARIES (ROSS DAVIS, ENGINEERING TECHNICIAN)

MOTION TO APPROVE BY COMMISSIONER ROBINSON, SECOND BY COMMISSIONER DODSON CARRIES 3/1, WITH COMMISSIONER SIMS OPPOSING—WOULD LIKE TO SEE BUFFER LARGER

Ellis County, Texas

County Solid Waste Facility Siting Ordinance

FINAL REPORT

July 18, 2007

Submitted By:
R. W. Beck, Inc.
5806 Mesa Drive, Suite 310
Austin, Texas 78731
(512) 450-0991

This study was funded through a solid waste management grant provided by the Texas Commission on Environmental Quality through the North Central Texas Council of Governments. The funding does not necessarily indicate endorsement or support of the study's findings and recommendations.

July 18, 2007

R·W·BECK

Ms. Barbra Leftwich
Ellis County Planner
101 West Main Street
Waxahachie, TX 75165

Subject: Ellis County Solid Waste Facility Siting Ordinance – Final Report

Dear Ms. Leftwich:

R. W. Beck, Inc. (R. W. Beck) is pleased to provide Ellis County (County) with a final copy of the "Ellis County Solid Waste Facility Siting Ordinance." R. W. Beck would like to thank County staff and officials who have provided input, data and coordination efforts for this project.

If there are any questions or comments concerning this report, please contact either Mr. Scott Pasternak or Ms. Katie Brown. Both can be reached at (512) 450-0991.

Very truly yours,

R. W. Beck, Inc.

R. W. Beck, Inc.

Enclosure

5806 Mesa Drive, Suite 310 Austin, TX 78731 Phone (512) 450-0991 Fax (512) 450-0515

ELLIS COUNTY, TEXAS
COUNTY SOLID WASTE FACILITY SITING ORDINANCE

Table of Contents

List of Appendices

SECTION 1
ELLIS COUNTY, TEXAS COUNTY SOLID WASTE FACILITY SITING ORDINANCE

1.1 General Description

North Central Texas Council of Governments (NCTCOG), under the direction of the Texas Commission on Environmental Quality (TCEQ), has developed a regional conformance evaluation process to address land use issues and local community concerns related to the siting of solid waste facilities within the region. As part of the regional conformance evaluation process, NCTCOG has determined that the adoption of county solid waste facility siting ordinances (consistent with §364.012 of the Texas Health and Safety Code) is currently the most viable option for integrating specific county land use into the regional solid waste planning and decision making process. Where counties within the region have adopted a local siting ordinance, NCTCOG will defer to the county ordinance concerning land use when making facility conformance recommendations to the TCEQ.

Ellis County, as part of the North Central Texas region, has taken initiative to develop and adopt such an ordinance with technical and financial assistance from NCTCOG[1]. The ordinance will give the county greater control over potential solid waste siting issues within its jurisdiction by allowing the county to prohibit the disposal of municipal or industrial solid waste within the county where disposal would represent a threat to public health, safety or welfare.

The county solid waste facility siting ordinance will designate particular areas of the county in which the disposal of municipal or industrial solid waste is not prohibited. To accomplish this, there is a need to identify areas that are either suitable or not suitable for the disposal of solid waste based on a variety of public health, safety and land use criteria. The ordinance cannot be used to prohibit the siting of solid waste facilities throughout the entire county and, therefore, will specifically designate one or more areas within the jurisdiction where municipal or industrial waste disposal is permissible.

To complete this analysis, Ellis County retained R. W. Beck, which has assisted the NCTCOG and other Texas counties in addressing their municipal solid waste facility issues.

[1] This study was funded through a solid waste management grant provided by the Texas Commission on Environmental Quality through the North Central Texas Council of Governments. The funding does not necessarily indicate endorsement or support of the study's findings and recommendations.

1.2 Implementation Process

R. W. Beck, in coordination with staff from NCTCOG and Ellis County, used the following process in the development and implementation of the Ellis County siting ordinance:

- Conducted preliminary research to identify potentially relevant siting issues for Ellis County including legal, public health and safety and land use concerns.
- Held a meeting with County staff and officials to review potential siting issues and discuss additional criteria for siting of solid waste facilities.
- Performed GIS land use analysis based on criteria of exclusionary areas, public health, safety, welfare, county land use patterns and expected future development.
- Produced maps based on the GIS analysis identifying areas of the county as either suitable or unsuitable for the development of solid waste facilities.

Following review and comment on the draft report, County staff and officials met with R. W. Beck to review findings and further develop recommendations for areas considered suitable for siting of solid waste facilities.

Ellis County will need to take the following steps to complete this project:

- Commissioners' Court will go through the process to adopt the ordinance (outlined in Section 1.5).

R. W. Beck has advised the Commissioners' Court as to the next steps that must be taken in order to adopt the ordinance and will be available to the County to answer any questions regarding that process.

1.2.1 Preliminary Research

In our preliminary research, R. W. Beck identified all Texas counties that currently have a solid waste facility siting ordinance. Each of these existing ordinances were reviewed to determine the particular criteria and standards utilized in their development. Based on the review of existing ordinances, our research into applicable federal and state laws and our knowledge of common land use planning practices, R. W. Beck identified the following categories of potential siting criteria to be addressed in the development of Ellis County's siting ordinance.

1.2.1.1 Exclusionary Criteria

The Texas Administrative Code (30 TAC §330, Subchapter M) outlines a number of conditions under which a site will be considered unsuitable for the disposal of municipal or industrial solid waste. These conditions are referred to as exclusionary siting criteria for the purposes of this analysis, and include the following considerations:

- Airport safety;
- Floodplains;

- Groundwater;
- Endangered or threatened species;
- Wetlands;
- Fault areas;
- Seismic impact zones; and
- Unstable areas.

The criteria outlined in 30 TAC §330, Subchapter M are closely linked to public health, safety and welfare and serve as a logical starting point for this analysis.

1.2.1.2 Land Use Criteria

It is also necessary to identify general areas of the county that are unsuitable for the disposal of solid waste based on local development and land use characteristics. Both current and future land use criteria should be utilized in this process to ensure that potential solid waste facilities are sited in locations compatible not only with current local development, but also with projected future development.

Current Land Use

Current land use criteria may include local characteristics such as: population density, residential development, the locations of existing solid waste facilities and industries, areas with a significant concentration of schools or churches, the locations of recreational sites, historical sites, major roads, pipelines and environmentally sensitive natural features. It should also include the delineation of areas in which the county does not have jurisdiction (e.g. within the boundaries of a city or its extraterritorial jurisdiction). These areas must be excluded from the siting analysis.

Future Land Use

Future land use criteria may include factors such as: compatibility with proposed or existing local development or open space plans, projected population growth rates and the general directions of current and future development within the county.

1.3 Meeting with County Staff and Officials

Prior to beginning the analysis, R. W. Beck met with Ellis County staff and officials to discuss the various federal exclusionary siting criteria and possible local land use issues to be considered. The meeting provided valuable information on specific local solid waste facility siting concerns that needed to be addressed in the development of the county's ordinance. It also allowed R. W. Beck to assess the availability of local data sources and obtain those sources that would be helpful in the siting analysis.

Based on this meeting, R. W. Beck identified the following local land use criteria to be key issues in the development of Ellis County's siting ordinance:

- Environmental protection of Bardwell Reservoir and surrounding areas;
- Protection of the Trinity River and major creeks; and

- Consideration of areas of projected future residential growth and development.

1.4 Facility Siting Analysis

R. W. Beck conducted the solid waste facility siting analysis for Ellis County utilizing primarily GIS data and software. Identification of suitable areas was achieved through a process of elimination in which certain areas of the county were systematically identified as being unsuitable based on exclusionary criteria, public health, safety, welfare, county land use patterns and expected future development. Each area found to be unsuitable based on a particular criteria was shown as a layer on a GIS map of the county. When all layers are simultaneously laid over the county basemap, the areas remaining represent areas of the county that are potentially suitable for the siting of a solid waste facility.

Some data for Ellis County was difficult to obtain, particularly in a GIS compatible format.[2] The scarcity of data presented certain challenges and limitations in our siting analysis. However, R. W. Beck was able to gather and use data from a wide variety of sources to conduct a planning-level GIS analysis that satisfactorily achieves the county's needs for the purposes of this siting ordinance.

1.4.1.1 Exclusionary Criteria

As mentioned previously, 30 TAC §330, Subchapter M outlines several conditions under which a site should be considered unsuitable for the disposal of municipal solid waste. These exclusionary conditions include:

- Airport safety;
- Floodplains;
- Groundwater;
- Endangered or threatened species;
- Wetlands;
- Fault areas;
- Seismic impact zones; and
- Unstable areas.

R. W. Beck researched each of these issues as they apply to Ellis County. Our research and conclusions are discussed in detail in the following sections.

Airports

Under the location restrictions outlined in 30 TAC §330.545, solid waste facilities should generally not be located within 10,000 feet of any airport that is utilized by jet aircraft or within 5,000 feet of any airport runway end used only by piston-type

[2] GIS data sets published by a variety of governmental entities are currently not as readily available for Ellis County as compared to many larger and more populous counties.

aircraft. This requirement was designed to improve airport safety by reducing the likelihood of bird hazards that may damage aircraft and cause injury to occupants.

Ellis County currently has two airports, Ennis Municipal Airport and Mid-Way Regional Airport, both of which receive jet aircraft. Ennis Municipal Airport is located within the southeastern portion of the County within the incorporated area of the City of Ennis. R. W. Beck has identified the Ennis Municipal Airport runway and a 10,000 foot buffer around the runway as unsuitable for the siting of a solid waste facility based on the standards outlined in 30 TAC §330.545.

Mid-Way Regional Airport is located within the northwestern portion of the County between the cities of Waxahachie and Midlothian. R. W. Beck has identified the Mid-Way Regional Airport runway and a 10,000 foot buffer around the runway as unsuitable for the siting of a solid waste facility based on the standards outlined in 30 TAC §330.545.

Figure A.2 identifies the locations of Ennis Municipal Airport and Mid-Way Regional Airport and their respective 10,000 foot buffers.

Floodplains

In order to protect human health and the environment, solid waste facilities should generally not be located within the 100-year floodplain. 30 TAC §330.547 outlines municipal solid waste location restrictions as they relate to floodplains.

Ellis County, being home to Bardwell Reservoir, Lake Waxahachie, a portion of Lake Joe Pool, and being bound on the east by the Trinity River, has a substantial amount of land lying within the 100-year floodplain.

The Federal Emergency Management Agency (FEMA) does not currently have floodplains information for Ellis County available in a GIS format. Due to this limitation, R. W. Beck consulted a printed FEMA map of floodplains. Based on a review of the floodplains map, R. W. Beck generated a reasonable approximation of Ellis County floodplains in GIS by placing appropriately sized buffers around major creeks, lakes and rivers within the county. This approximation was used in the siting analysis to simulate county floodplains. Figure A.3 identifies the location of floodplains within the county.

Groundwater

Restrictions on the location of municipal solid waste facilities as it relates to their potential impacts on groundwater (30 TAC §330.549), currently relate only to areas located over the recharge zone of the Edwards Aquifer. This particular location restriction is not applicable to Ellis County as no portion of the County is located within the Edwards Aquifer recharge zone.

Endangered or Threatened Species

Under the location restrictions outlined in 30 TAC §330.551, solid waste facilities should generally not be located where they would result in the destruction or adverse modification of the critical habitat of endangered or threatened species, or cause or contribute to the taking of any such species.

While Ellis County is thought to be home to 26 types of endangered or threatened species, habitat location data for these species are currently unavailable in a digital format from the Texas Parks and Wildlife Department. While a lack of available data has necessitated that endangered or threatened species not be examined in detail as part of the present analysis, the County may wish to revise this analysis to incorporate any digital data related to this topic should it become available in the future.

Wetlands

Under the location restrictions outlined in 30 TAC §330.553, solid waste facilities should generally not be located within wetlands. Official wetlands data for Ellis County are currently unavailable in a digital format from the U.S. Fish and Wildlife Service. However, Ellis County staff were able to provide R. W. Beck with GIS files of the U.S. Department of Agriculture (USDA) wetlands within the County for use in this analysis. Figure A.4 identifies the locations of all USDA wetlands within the County.

R. W. Beck would recommend that the County consider updating the ordinance to also reflect all U.S. Fish and Wildlife Service wetlands data, should it become available in a digital format in the future.

Fault Lines

30 TAC §330.555 stipulates that solid waste facilities should not be located within 200 feet of a fault that has experienced displacement within the last 10,000 years. Based on information from the Texas Bureau of Economic Geology, there are two fault lines, the Ouachita Tectonic Front and the Gulf Basin Margin, located within Ellis County. These fault lines were last active approximately 144-65 million years ago and 543-248 million years ago respectively. Therefore, these fault locations would not directly restrict the location of a solid waste facility within the county.

Seismic Impact Zones and Unstable Areas

R. W. Beck has determined based on maps and information from the U.S. Geological Survey (USGS) that Ellis County does not contain any seismic impact zones or unstable areas as defined under 30 TAC §330.557-559.

1.4.1.2 Land Use Criteria

R. W. Beck worked closely with Ellis County staff and officials to identify specific land use issues to be addressed in the solid waste facility siting analysis. Seven current land use criteria were identified as critical to the Ellis County suitability analysis. The following sections describe each of the selected suitability criteria and outline R. W. Beck's research and analysis of each issue. These criteria represent the siting issues that were most important for Ellis County based on specific local characteristics and concerns.

Current Land Use Criteria

Areas Not Under County Jurisdiction

The first step in the land use portion of the siting suitability analysis was to exclude from the suitable area those locations that do not fall under Ellis County's jurisdiction with respect to §364.012 of the Texas Health and Safety Code. The law states that a siting ordinance cannot apply to areas of the county located within a municipality or the extraterritorial jurisdiction (ETJ) of a municipality. Therefore, all municipalities and their current ETJs were eliminated from the suitability analysis due to the fact that the county ordinance is not legally applicable to facility siting decisions in those locations. Figure A.5 identifies the extent of all city limits and ETJs within the county.

Lake Joe Pool

Lake Joe Pool is located in the southern part of the Dallas/Fort Worth Metroplex and encompasses a portion of the northwest corner of Ellis County. The lake is operated by the Trinity River Authority for conservation, flood control, recreation, and municipal water supply. The lake is fed by Mountain Creek and Walnut Creek and drains north into Mountain Creek leading into Mountain Creek Lake. Lake Joe Pool and the surrounding areas are important features of Ellis County that warrant special public health and safety protections. The lake serves as a primary raw water source for the City of Midlothian, as well as several other local entities that have water interests in the lake. In addition, it also serves as a popular local recreational amenity.

In recognition of the importance of protecting Lake Joe Pool and the surrounding areas, R. W. Beck utilized GIS to generate a one mile buffer around the lake and eliminated this region from the suitable area. Figure A.6 identifies the unsuitable areas surrounding Lake Joe Pool.

Lake Waxahachie

Lake Waxahachie is another environmentally sensitive feature located within central Ellis County just south of Waxahachie. The lake is owned and operated by Ellis County Water Control and Improvement District Number One. The lake is used for municipal and industrial uses, including as a drinking water source, making its protection of particular importance to public health and safety. In addition, it is also a popular local recreational amenity.

In recognition of the importance of protecting Lake Waxahachie and the surrounding areas, the project team utilized GIS to generate a one mile buffer around the lake and removed the selected region from the suitable area. Figure A.6 identifies the unsuitable areas surrounding Lake Waxahachie.

Bardwell Reservoir

Bardwell Reservoir is another environmentally sensitive feature located in the Trinity River basin between Bardwell and Ennis in south central Ellis County. The reservoir is owned by the United States government and operated by the Trinity River Authority. Water from the reservoir serves as a source of drinking water for Waxahachie, Ennis,

and other surrounding communities, making its protection of particular importance to public health and safety. In addition, it is also a popular local recreational amenity.

In recognition of the importance of protecting Bardwell Reservoir and the surrounding areas, the project team utilized GIS to generate a one mile buffer around the lake and removed the selected region from the suitable area. Figure A.6 identifies the unsuitable areas surrounding Bardwell Reservoir.

Trinity River

The Trinity River, which runs along the eastern border of Ellis County, is also a significant environmental feature that warrants public health and safety protections due to the fact that it serves as a drinking water source for certain downstream customers. In recognition of the importance of protecting the quality of the Trinity River and those lands directly adjacent to it, the project team utilized GIS to generate a one mile buffer along the river and removed the selected region from the suitable area. Figure A.6 identifies the unsuitable areas surrounding the Trinity River.

Major Creeks

R. W. Beck generated a ¼ mile buffer around the following major creeks within the County:

- Big Onion Creek
- Chambers Creek
- Cottonwood Creek
- Grove Creek
- Little Onion Creek
- Mill Creek
- Mountain Creek
- Old Ten Mile Creek
- Red Oak Creek
- Richland Creek
- Waxahachie Creek

These areas were then eliminated from the suitable area. Each of the above creeks serve as a recreational and scenic resource for the citizens of Ellis County, and flow downstream to a variety of key water bodies within the region that serve as drinking water sources for the regional population. The buffer is designed to further protect the watershed of area lakes and rivers by managing the areas that drain into them. Figure A.7 identifies the unsuitable areas surrounding the county's major creeks.

Dedicated Parks and Open Space

R. W. Beck used GIS data provided by NCTCOG to identify dedicated parks and open space within Ellis County. These areas were then removed from the suitable area. In order to prevent potentially undesirable noise and odor issues that may be associated with municipal solid waste facilities, R. W. Beck also included a 500 foot buffer around all identified park and open space areas. Based on R. W. Beck's industry experience, 500 feet is generally a sufficient attenuation distance for noise and odor that may be associated with such facilities. Figure A.8 identifies these unsuitable areas.

Residential Land Use

R. W. Beck used 2005 GIS land use data, obtained from NCTCOG, to identify all areas currently defined as residential in nature. All areas identified as having residential land use within the County were eliminated from the suitable area. In addition, in order to provide existing residences with protection from possible noise and odor issues that may be associated with municipal solid waste facilities, R. W. Beck included a 500 foot buffer around all residential areas identified in this analysis. Based on R. W. Beck's industry experience, 500 feet is generally a sufficient attenuation distance for noise and odor that may be associated with such facilities. Figure A.9 identifies these unsuitable areas.

Population Density

R. W. Beck used GIS data to analyze population densities within Ellis County. Areas found to have higher population densities were considered to be unsuitable for the location of solid waste facilities.

To conduct the analysis, R. W. Beck used 2000 U.S. Census data to identify County Census tracts with population densities greater than 100 people per square mile. This particular figure was selected based on two primary factors: 1) the figure represents a natural break in the population density data for the county; and 2) areas of the county where population densities are currently greater than 100 people per square mile correspond closely with areas in which county officials project significant future growth and development will occur.

While R. W. Beck recognizes that 100 people per square mile is a relatively low population density, more than half of Ellis County has a density of less than that figure. These lower density areas are more suitable for solid waste facilities than those where growth has occurred and is expected to continue into the future.

Fifteen out of a total of 22 Census tracts located within Ellis County were eliminated from the suitable area based on this criterion. Most of the tracts that were eliminated are located the more developed northwestern portion of the County. A number of other tracts that encompass portions of the City of Ennis were also determined to be unsuitable based on this criterion. Figure A.10 identifies those tracts with population densities greater than 100 people per square mile.

Future Land Use Criteria

County Growth and Development Patterns

During the course of this project, County staff and officials elected not to provide R. W. Beck with any information related to the specific locations of projected future residential growth and development within the County. R. W. Beck would recommend that the County consider updating the ordinance with such information where appropriate in the future.

1.4.1.3 Maps Identifying Suitable and Unsuitable Areas

The final result of this process of elimination is a map detailing the suitable and unsuitable areas for the location of a solid waste facility in Ellis County. Figure A.11 identifies these suitable and unsuitable areas.

It is important to remember that this is a planning level analysis designed to assist the County in identifying areas that are expected to be most suitable as the location for a solid waste facility based on selected criteria for exclusionary areas, public health, safety, welfare, county land use patterns and expected future development. This map is not intended to imply that all locations within the suitable area will necessarily be appropriate as the site for a solid waste facility.

The map in Figure A.11 is designed to serve as the basis for Ellis County's solid waste facility siting ordinance. R. W. Beck believes that the methods employed in this analysis produce a comprehensive, objective and defensible basis for the development of county solid waste facility siting ordinance.

1.5 Next Steps

The next step for Ellis County is to develop and adopt an ordinance in accordance with §364.012 of the Texas Health and Safety Code based on the analysis included in this document. Additional information concerning how to develop and adopt an ordinance is also available in Section 3 of NCTCOG's *Regional and Local Review of Municipal Solid Waste Facility Permits and Registrations.* As outlined in §364.012 of the Texas Health and Safety Code, the County will need to take the following steps prior to adoption of an ordinance:

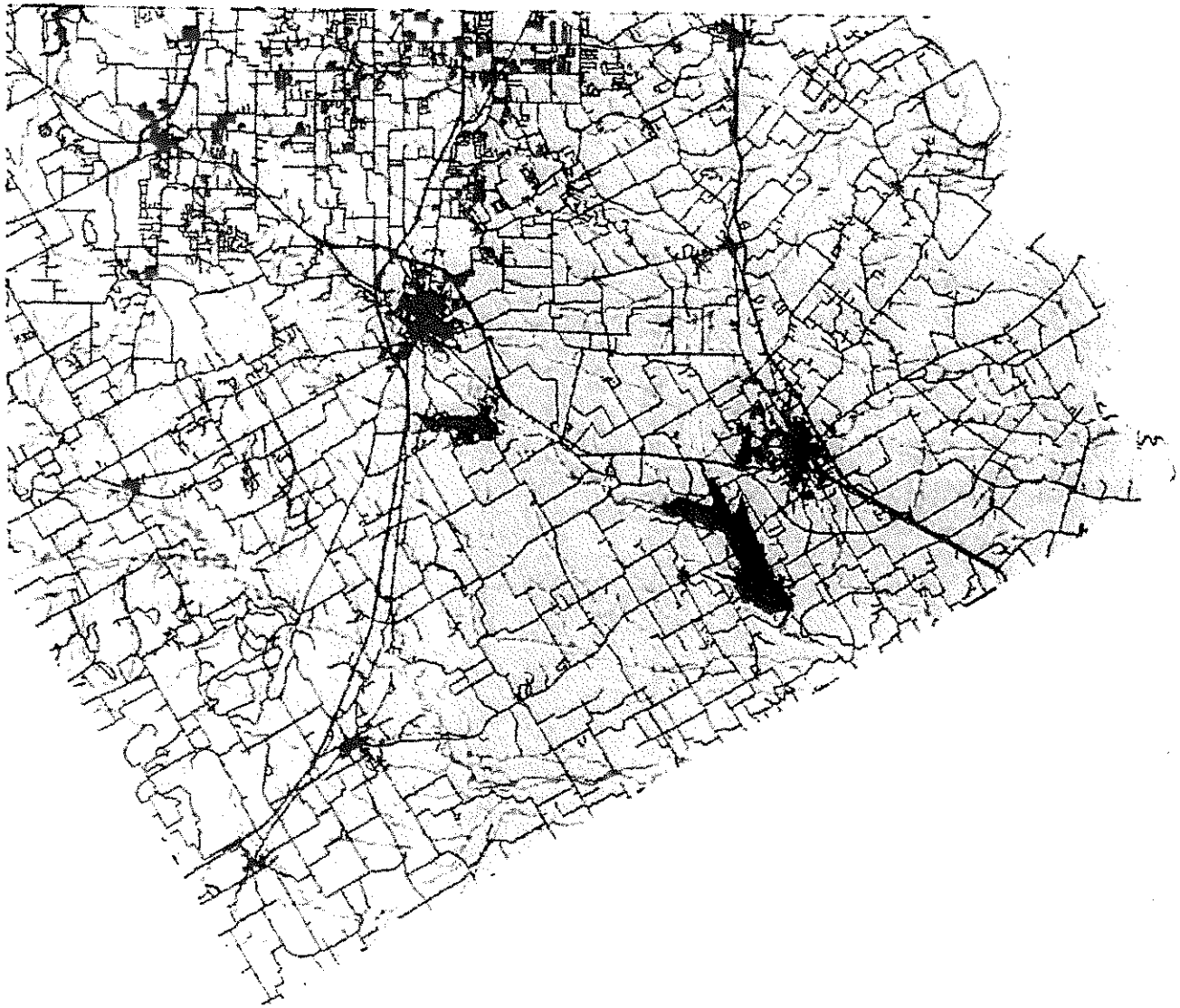
- An ordinance may be passed on first reading, but the proposed ordinance must be published in a newspaper of general circulation in the county for two consecutive weeks before the Commissioner's Court considers the proposed ordinance. The publication must contain:
  - A statement of the time, place, and date that the Commissioner's Court will consider the proposed ordinance; and
  - Notice that an interested citizen of the county may testify at the hearing.
- A public hearing must be held on a proposed ordinance before it is considered by the Commissioner's Court, and any interested citizen of the county shall be allowed to testify.

R. W. Beck has provided assistance to the County in the adoption process as outlined in the scope of work for this project. Specifically, R. W. Beck:

- Made a presentation to the Commissioners' Court regarding areas of the County that are suitable and unsuitable for siting of a municipal solid waste facility;
- Assisted in drafting the ordinance (see enclosed draft ordinance – Appendix B);
- Advised the Court concerning steps required to adopt the ordinance; and
- Will be available to answer any questions the County may have regarding the process for adoption of the ordinance.

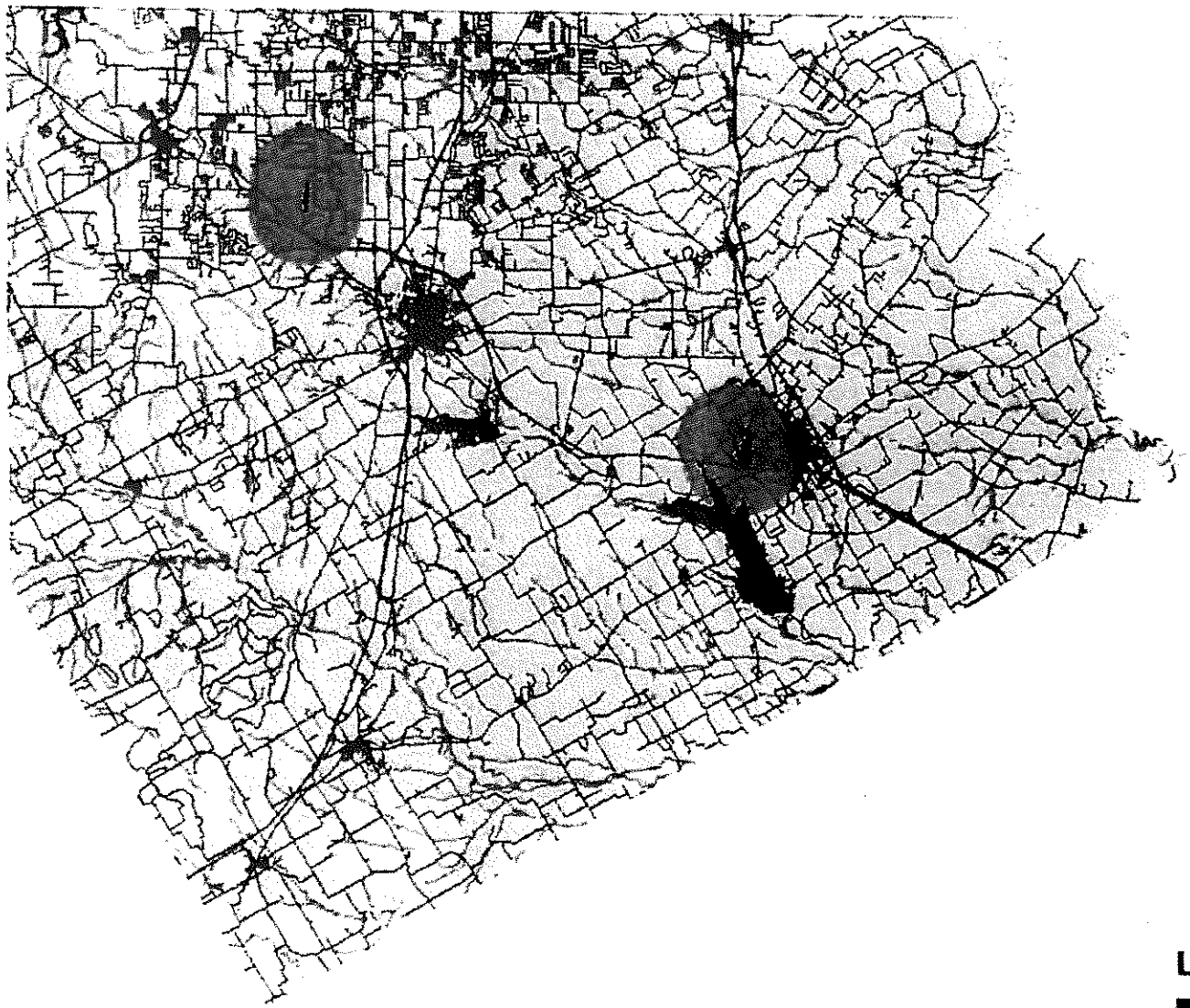
Appendix A
Maps

Figure A.1: Ellis County Basemap



N

Figure A.2: Airports and 10,000 ft. Buffer



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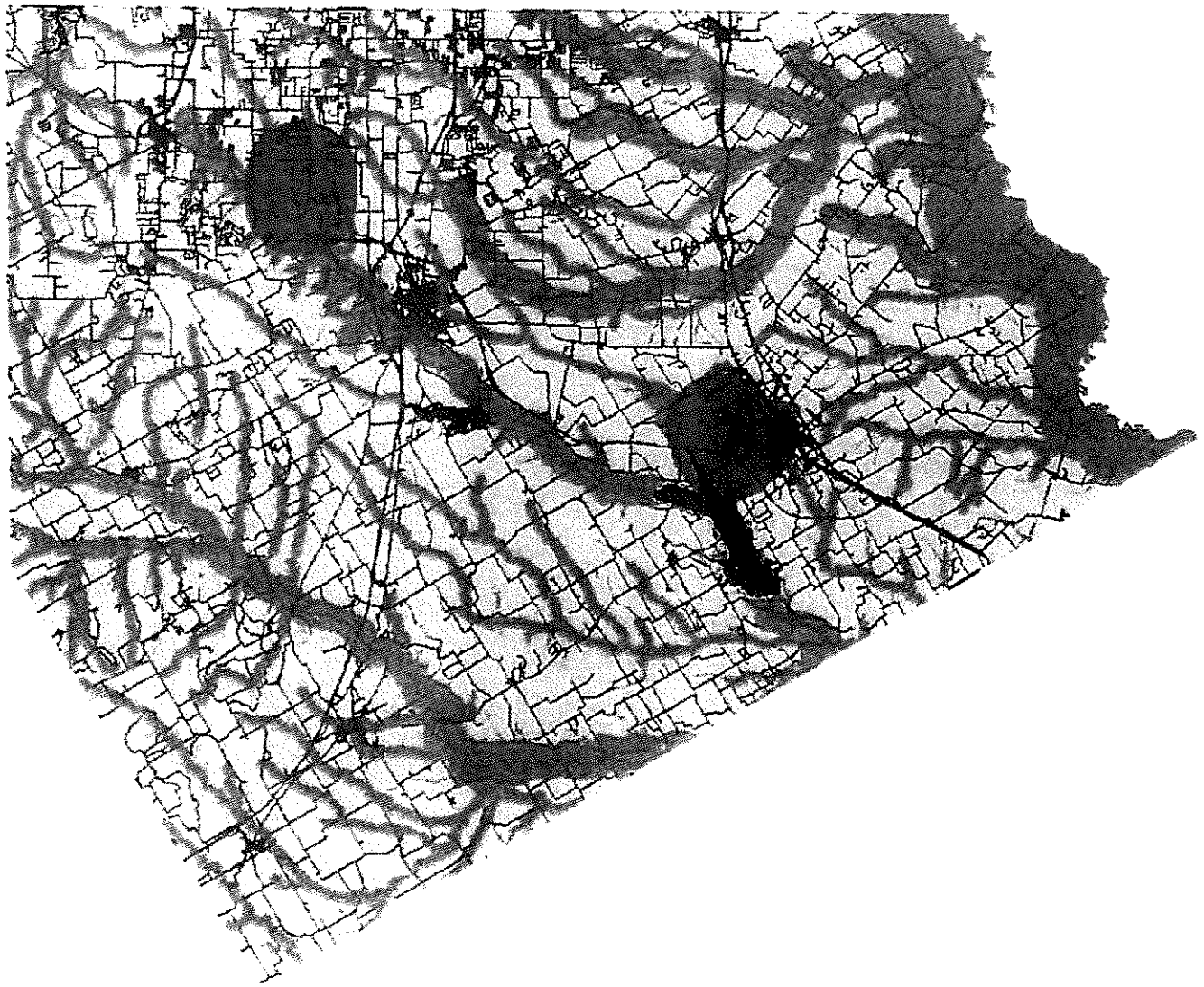
Legend

Airports

10,000 ft. Airport Buffer

Figure A.3: 100-Year Floodplain Approximation



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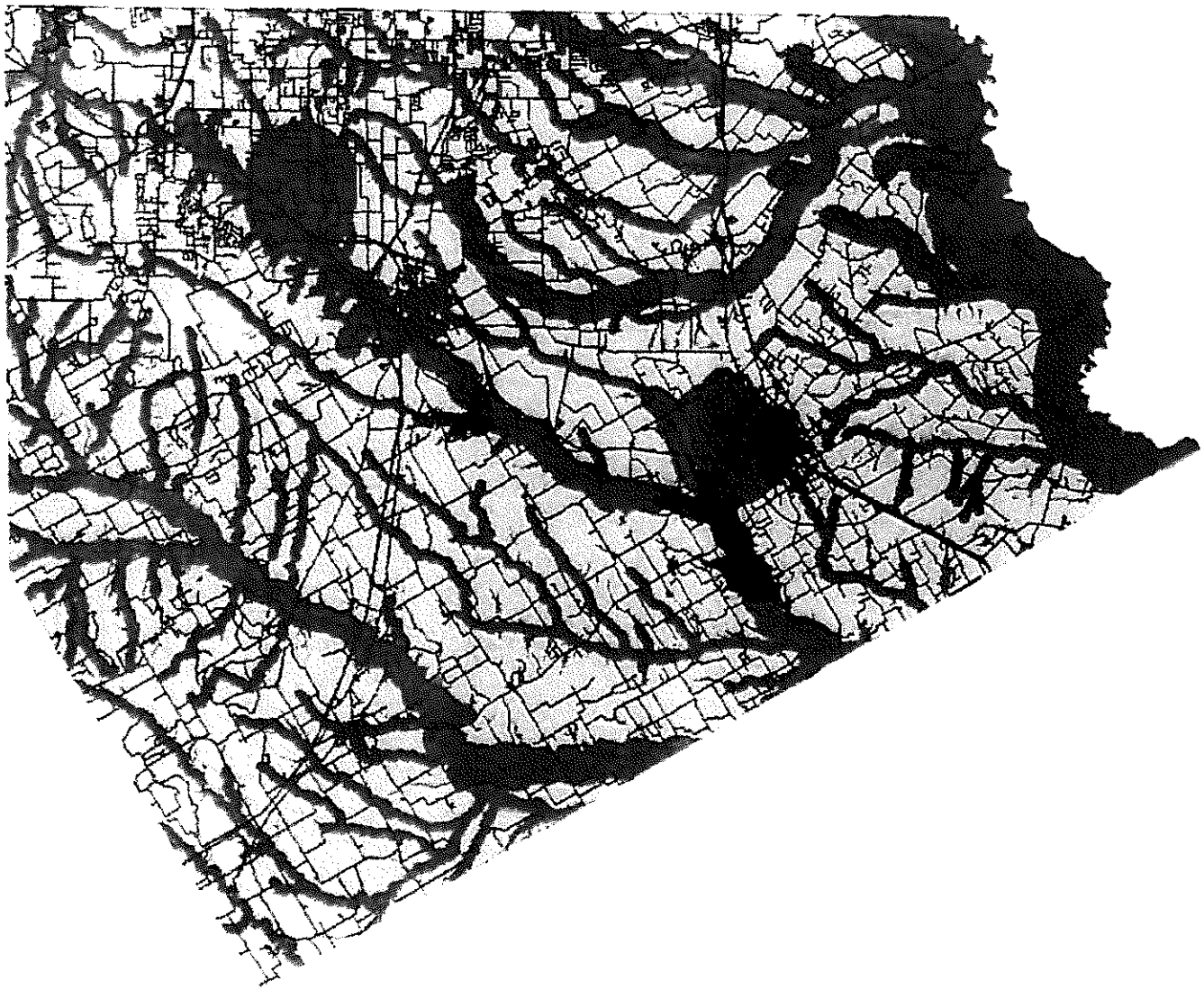
II.C-98

Legend

Unsuitable Area

Floodplain

Figure A.4: USDA Wetlands



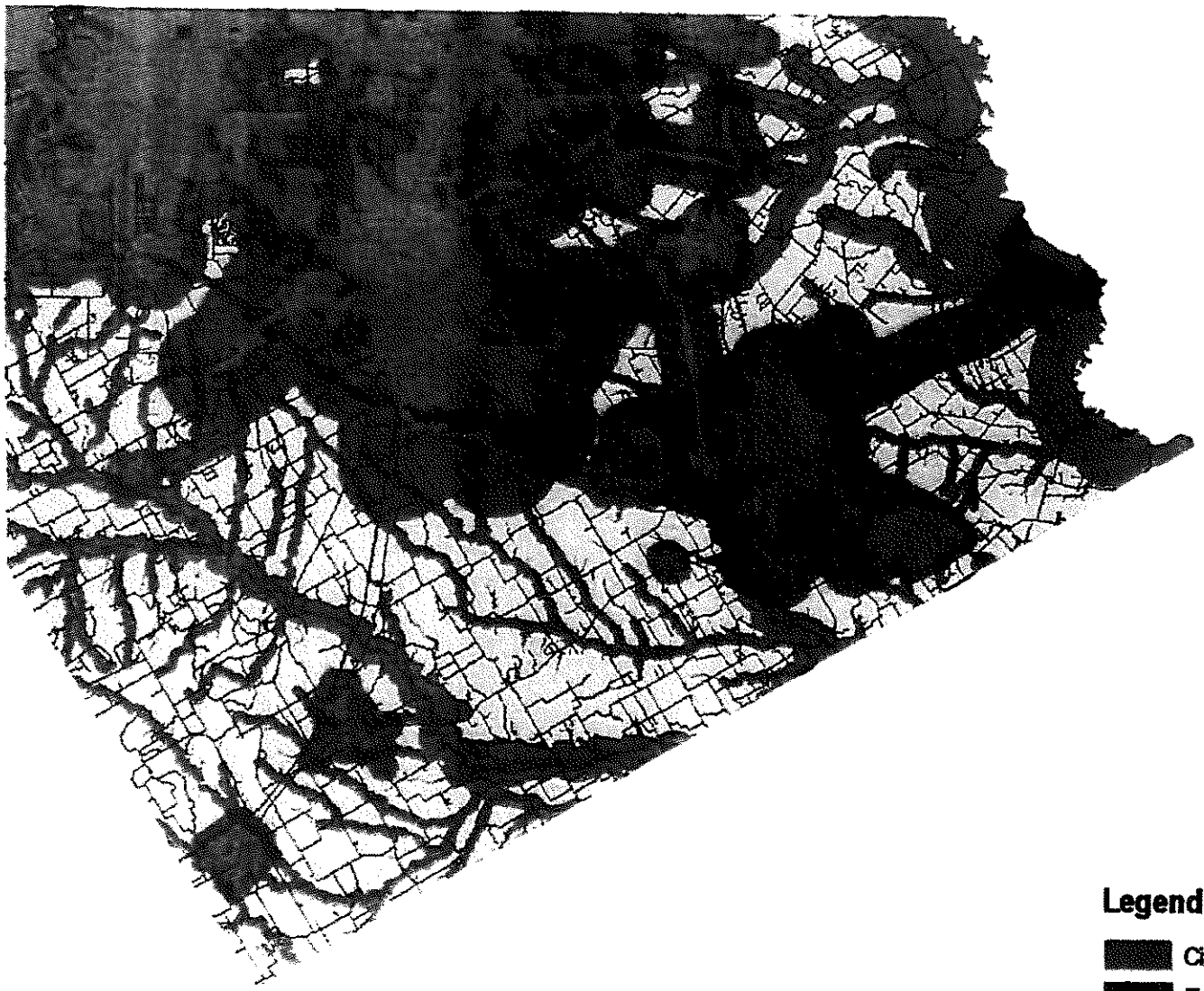
N

Legend

USDA Wetlands

Unsuitable Area

Figure A.5: Areas Outside of County Jurisdiction

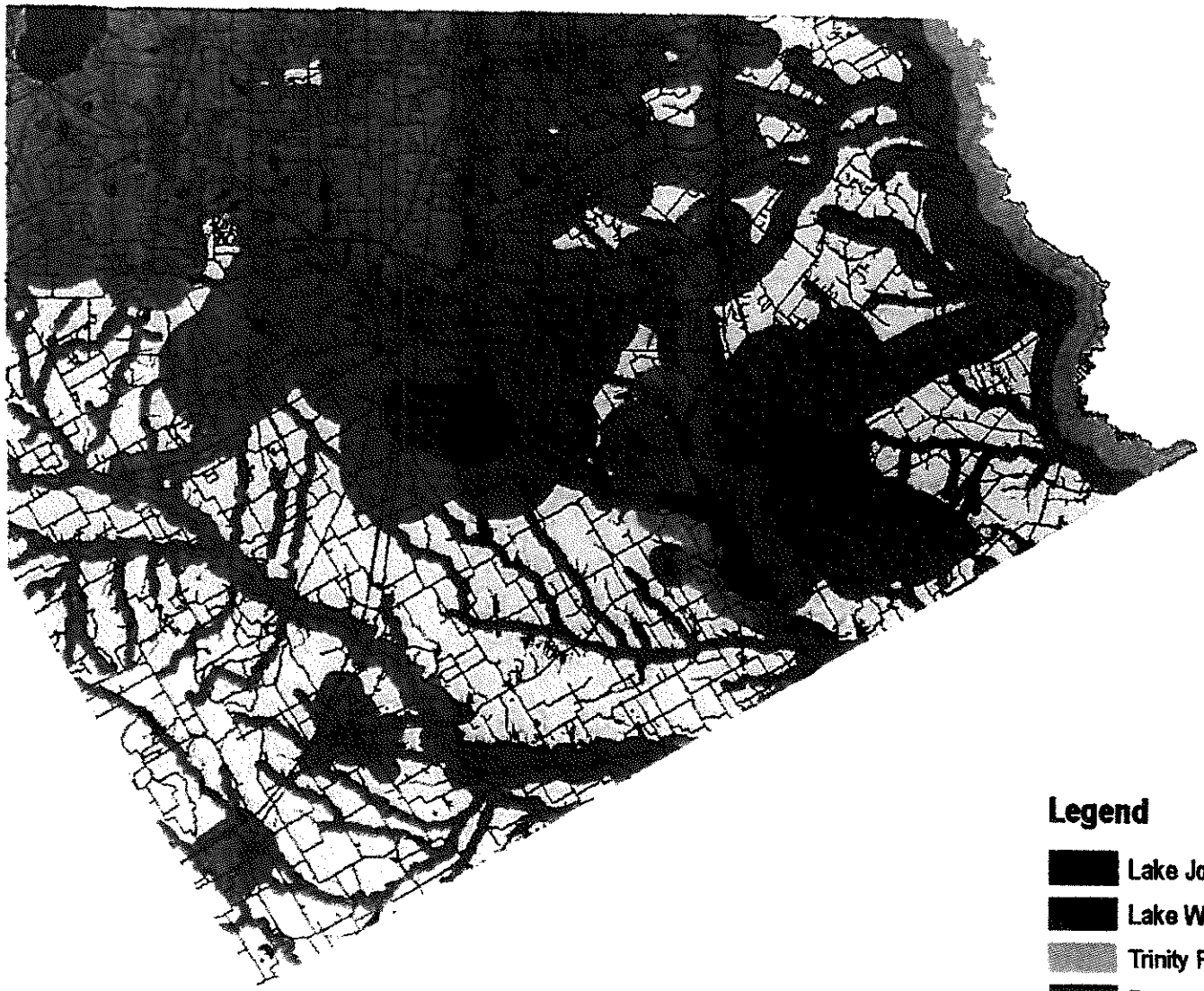


Legend

- City Limits
- Extraterratorial Jurisdictions
- Unsuitable Area

N

Figure A.6:
Lake Joe Pool, Lake Waxahachie, Bardwell Reservoir and Trinity River Buffers



Legend

- Lake Joe Pool Buffer (1 mile)
- Lake Waxahachie Buffer (1 mile)
- Trinity River Buffer (1 mile)
- Bardwell Reservoir Buffer (1 mile)
- Unsuitable Area

N

Figure A.7: Major Creeks Buffer

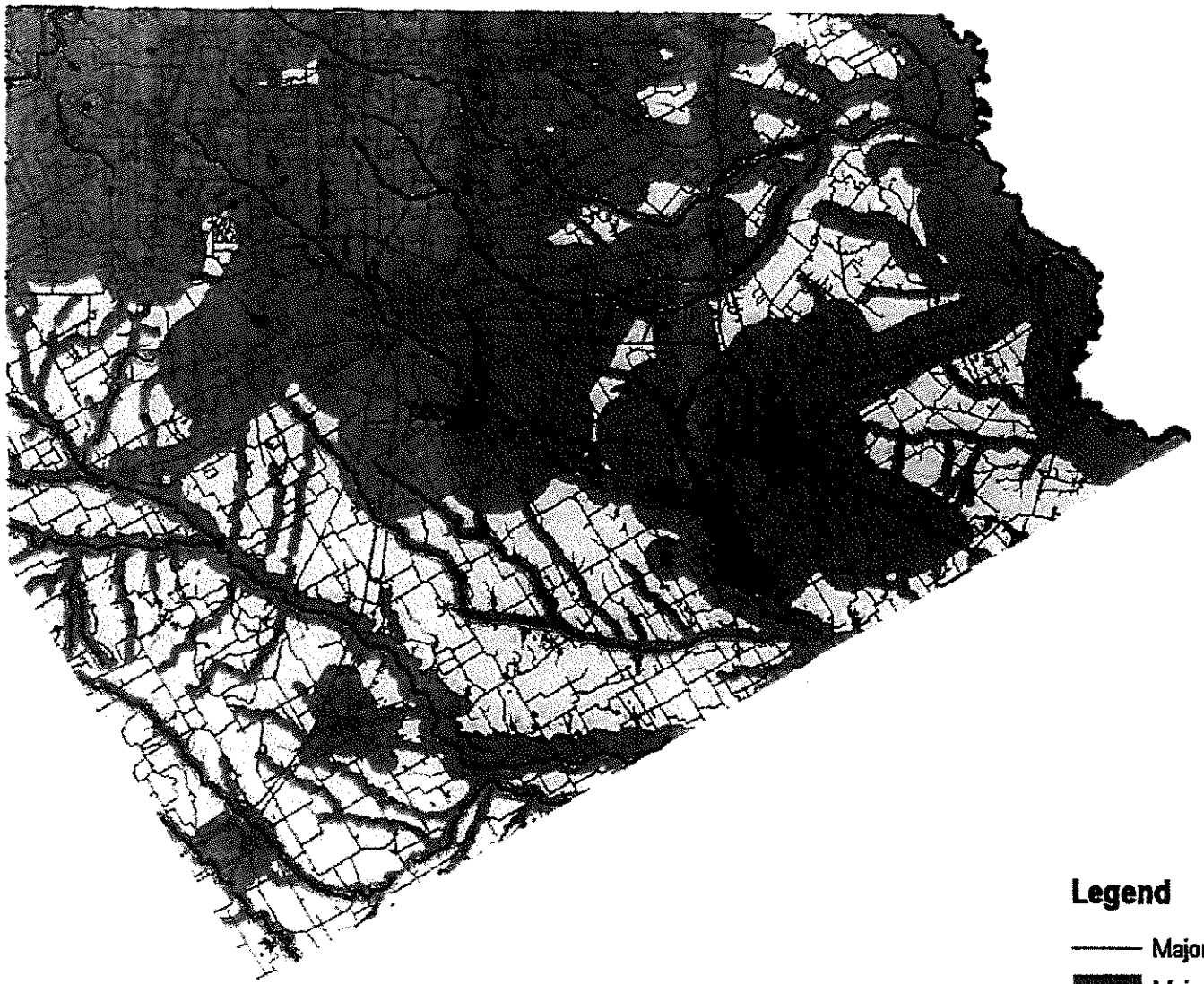
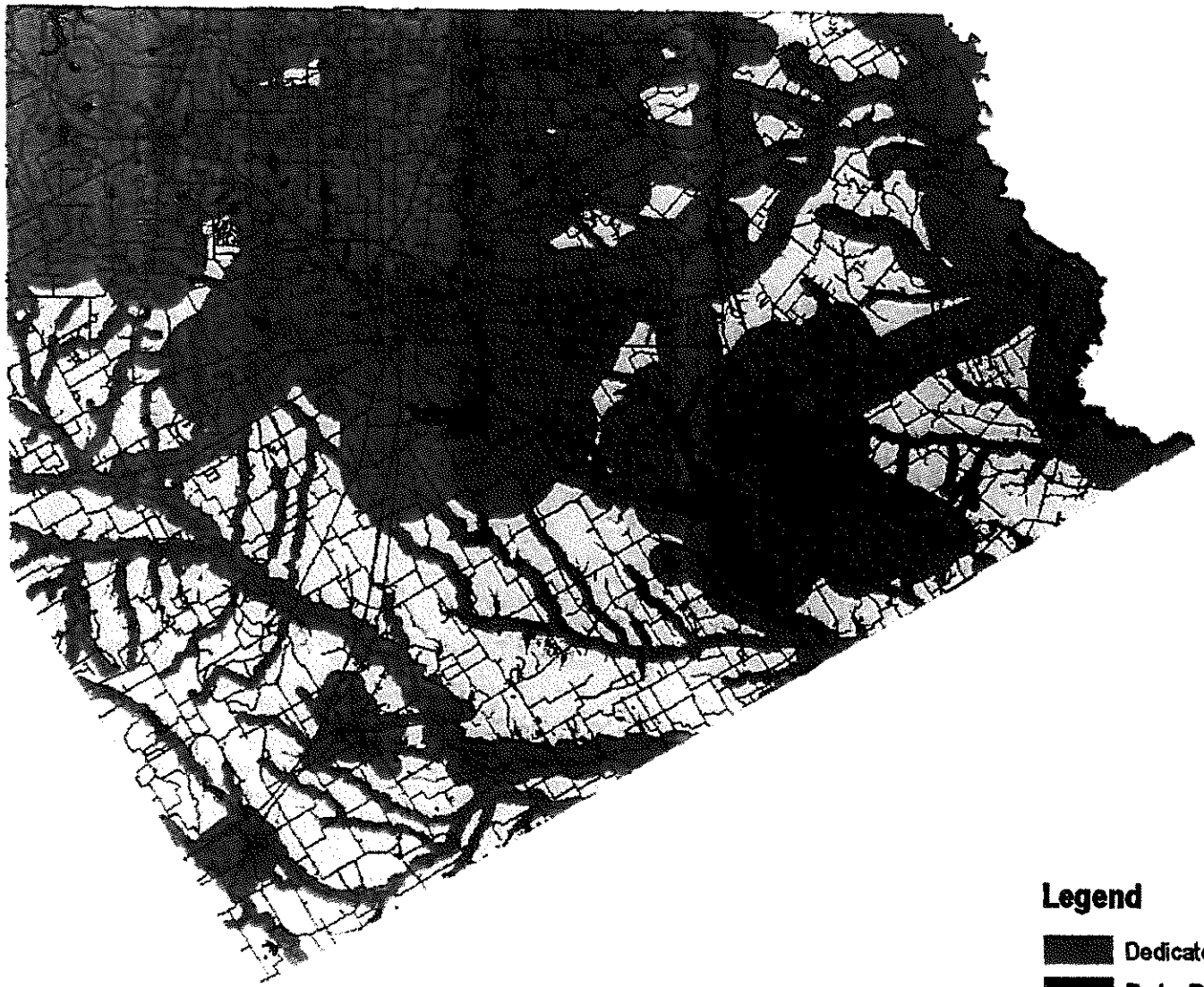


Figure A.8: Dedicated Parks and Open Space

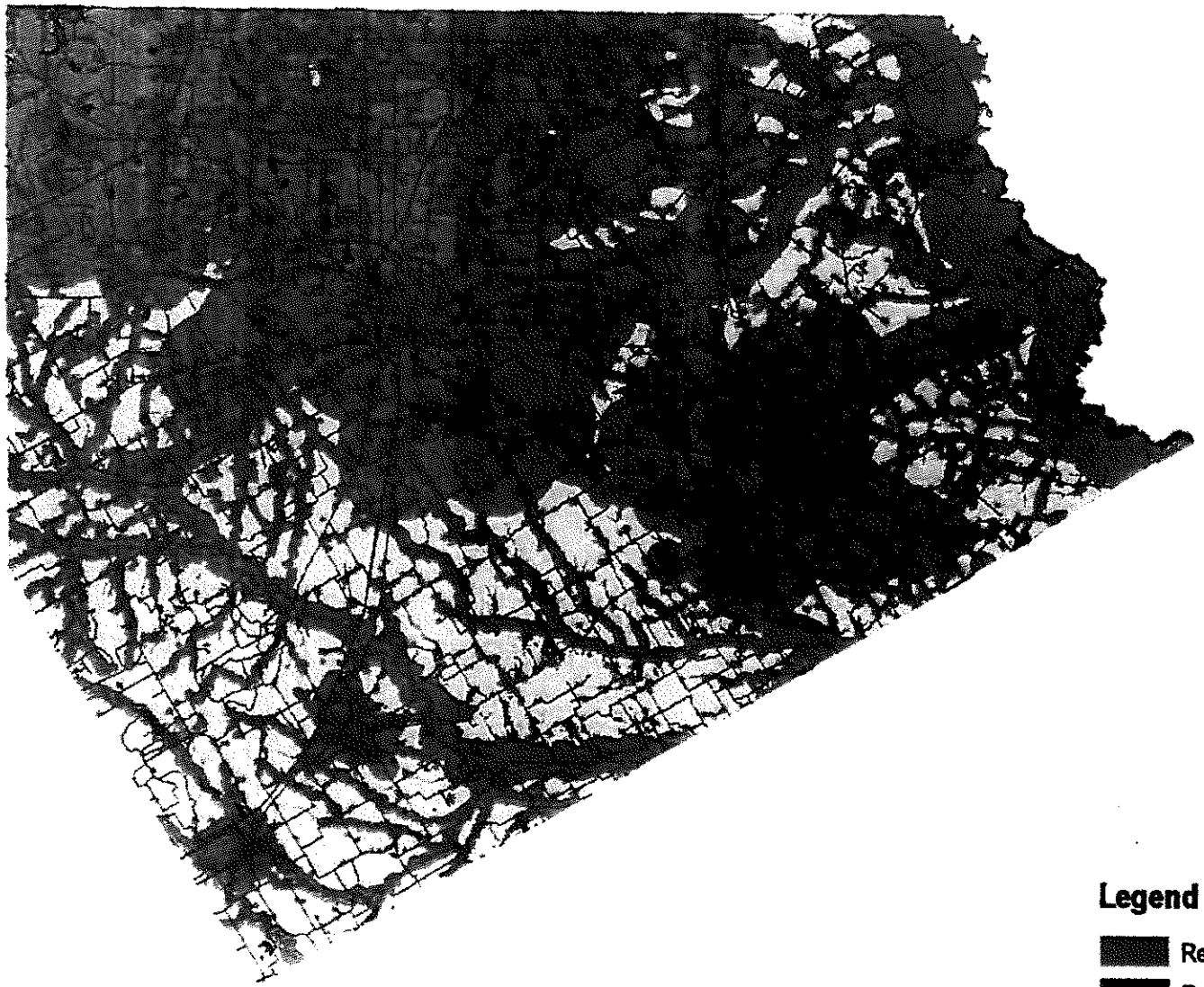


Legend

- Dedicated Parks and Open Space
- Parks Buffer (500 feet)
- Unsuitable Area

N

Figure A.9: 2005 Residential Land Use and 500 ft Buffer



Legend

- Residential Land Use
- Residential Buffer (500 feet)
- Unsuitable Area

N

Figure A.10: Population Density Greater than 100 People per Sqaure Mile

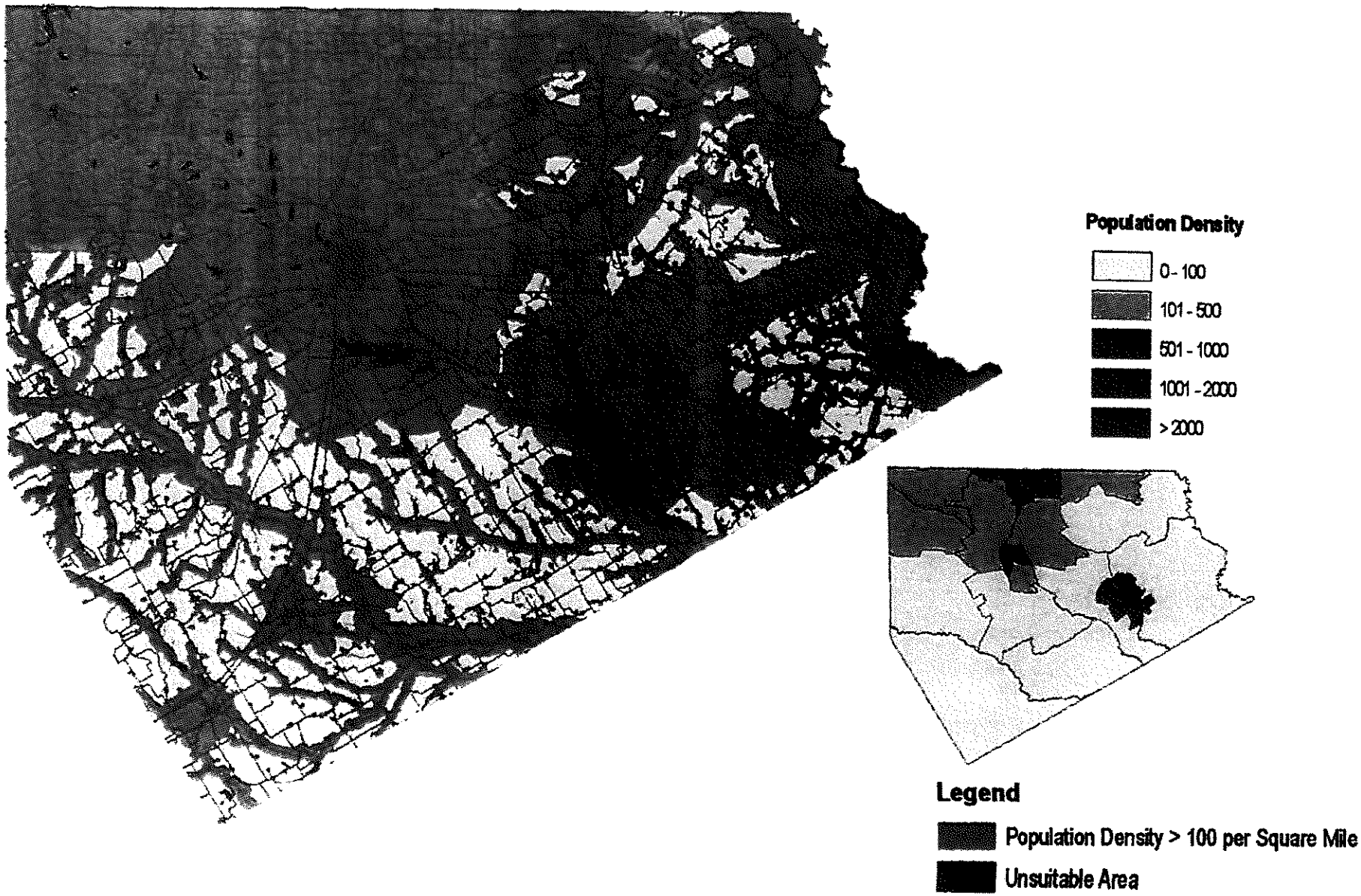
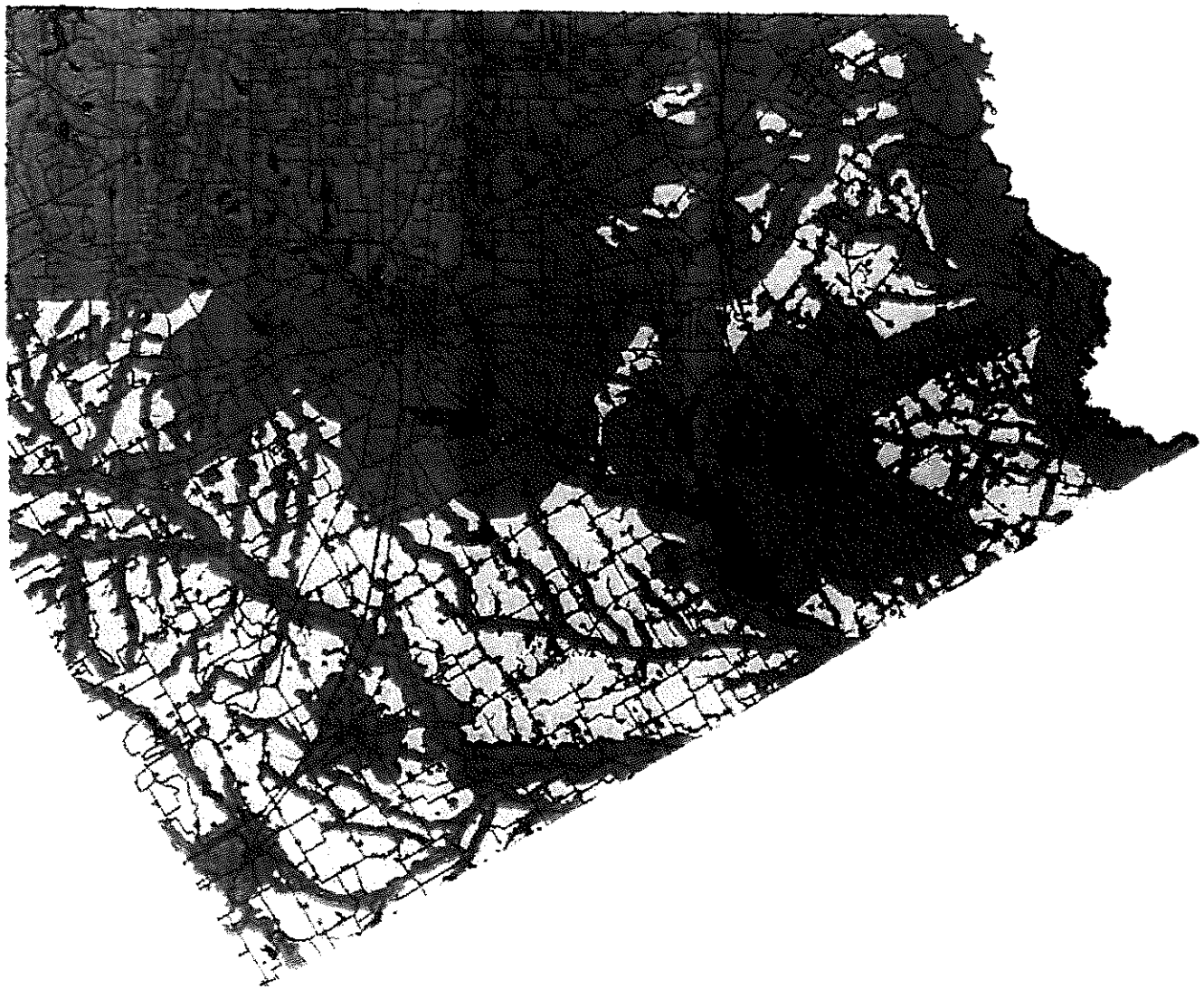


Figure A.11: Composite of All Unsuitable Areas



Legend

Unsuitable Area

Suitable Area

N

Appendix B
Ordinance

ORDER PROHIBITING SOLID WASTE DISPOSAL IN ELLIS COUNTY

SECTION 1

GENERAL PROVISIONS AND FINDINGS

WHEREAS, the Commissioners Court of Ellis County, Texas has both the responsibility and authority to protect the public health, safety and general welfare by prohibiting solid waste disposal in the unincorporated areas of Ellis County, except for those areas designated as solid waste disposal sites, pursuant to the authority of the Texas Health and Safety Code, 364.112; and,

WHEREAS, solid waste disposal, especially the disposal of solid waste in landfills, is an activity that has high potential to negatively impact the health, safety and welfare of any community; and,

WHEREAS, this court believes and hereby finds that further development or establishment of landfills in certain areas of the county would constitute an unacceptable risk and threat to public health, safety and welfare for the reasons stated below, among others, to wit;

The Court finds that the presence of solid waste disposal facilities in general may negatively influence property values; and

The Court further finds that solid waste disposal activities in the county could hamper economic development; and

The Court finally finds that substances contained within a landfill, especially in a hazardous or industrial landfill, could escape into the air or waterways, including subsurface waterways, significant threats to the public health, safety and welfare exist.

SECTION II

DEFINITIONS

The following words and terms, when used in this Court Order, shall have the following meanings, unless the contest clearly indicates otherwise.

INDUSTRIAL SOLID WASTE: Solid waste resulting from or incidental to a process of industry or manufacturing, mining, or agricultural operations.

MUNICIPAL SOLID WASTE: Solid waste resulting from or incidental to municipal, community, institutional, or recreational activities, and includes garbage, rubbish, ashes, street cleanings, dead animals, abandoned automobiles and other solid waste other than industrial solid waste.

SOLID WASTE: Subject to the limitations of 42 U.S.C., 6903 (27) and 40 C.F.R. 261.4 (a), garbage, rubbish, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, municipal, commercial, mining, and agriculture operations and from community and institutional activities. The term:

(A) Does not include:

(i) Solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows, or industrial discharges subject to regulation by permit issued under Chapter 26, Water Code;

(ii) Soil, dirt, rock, sand, and other natural or man-made inert solid materials used to fill land if the object of the fill is to make the land suitable for the construction of surface improvements; or

(iii) Waste materials that result from activities associated with the exploration, development, or production of oil or gas or geothermal resources and other substance or material regulated by the Railroad Commission of Texas, unless the waste, substance, or material results from activities associated with gasoline plants, natural gas liquids, processing plants, pressure maintenance plants, or re-pressurizing plants and is hazardous waste as defined by the EPA under the federal Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act; and,

(B) Does include hazardous substances.

SOLID WASTE FACILITY: All contiguous land, including structures, appurtenances, and other improvements on the land, used for processing, storing, or disposing of solid waste. The term includes a publicly or privately owned solid waste facility consisting of processing, storage, transfer or disposal operational units such as one or more landfills, surface impoundment's or a combination of units.

SECTION III

APPROVED AREAS FOR DISPOSAL OF SOLID WASTE IN THE UNINCORPORATED AREAS OF ELLIS COUNTY

For the above reasons, and pursuant to the provisions of 364.112 of the Texas Health and Safety Code, the Commissioners Court of Ellis County hereby ORDAINS, RESOLVES, ORDERS AND ESTABLISHES the following COURT ORDER:

IT IS ORDAINED AND ORDERED that the disposal of solid waste within Ellis County, Texas is not prohibited in the following area:

See attached Map as described in the "County Solid Waste Facility Siting Ordinance" final report and recorded in Vol._____ Page_____of the minutes of the Ellis County Commissioners Court.

SECTION IV

CIVIL REMEDIES AND PENALTIES

The Commissioners Court of Ellis County, Texas may bring a legal action to enjoin violations of this court order and seek judgment for any civil penalties.

SECTION V

SEVERABILITY

If any portion of this order is deemed to be in violation of the statues or the constitution of this state or the United States by a court of competent jurisdiction, said portion shall be severed, and the remaining portions of this order shall remain in full force and effect.

On this the _____day of _____, 2007, the Commissioners Court of Ellis County, Texas executed this Order approving the Court Order Prohibiting Solid Waste Disposal in Ellis County.

_____
Judge Chad Adams

_____
Commissioner Dennis Robinson

_____
Commissioner Bill Dodson

_____
Commissioner Heath Sims

_____
Commissioner Ron Brown

ATTEST:

_____
Cindy Polley, County Clerk

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Prepared by: SAB
Date: 1/31/2012

Skyline Landfill
TRAFFIC PROJECTIONS

Checked by: KJW
Date: 1/31/2012

Required: Estimate the total traffic projection for the proposed configuration.

Assumptions:

1. The waste acceptance rate and incoming vehicles will increase at an annual rate of 1.4%.
2. Beginning Waste Accepted - Feb. 2010 to Feb. 2011 = 1,040,000 tons
3. The facility accepts waste 312 days per year (6 days a week).
4. Year 1 incoming landfill trucks based on average of 9.6 tons/vehicle from January 2010 to July 2011.

Solution:

2010 Waste: 1,040,000 tons
Days Operating 312

Landfill Waste Acceptance			Landfill Traffic				Hauling Facility Traffic				Total Traffic	
			Landfill Trucks		Landfill Staff/Others		Hauling Facility Trucks		Hauling Facility Staff/Others		Total Vehicles	
Year	Annual Waste (tons)	Daily Waste (tons/day)	Incoming Veh/Day	Total Veh Trips/Day	Incoming Veh/Day	Total Veh Trips/Day	Exiting Veh/Day	Total Veh Trips/Day	Incoming Veh/Day	Total Veh Trips/Day	Incoming Veh/Day	Total Veh Trips/Day
1	1,040,000	3,333	347	694	35	70	60	60	90	180	472	1004
2	1,054,560	3,380	352	704	35	71	64	64	91	183	479	1019
3	1,069,324	3,427	357	714	36	72	62	62	93	186	486	1033
4	1,084,294	3,475	362	724	36	73	63	63	94	188	492	1047
5	1,099,474	3,524	367	734	37	74	65	65	95	190	499	1062
6	1,114,867	3,573	372	744	38	75	64	64	96	192	506	1077
7	1,130,475	3,623	377	755	38	76	65	65	98	196	513	1092
8	1,146,302	3,674	383	765	39	77	66	66	98	196	520	1107
9	1,162,350	3,725	388	776	39	78	67	67	101	201	528	1123
10	1,178,623	3,778	394	787	40	79	68	68	102	204	535	1138
11	1,195,124	3,831	399	798	40	80	69	69	103	207	543	1154
12	1,211,856	3,884	405	809	41	82	70	70	105	210	550	1170
13	1,228,821	3,939	410	821	41	83	71	71	106	213	558	1187
14	1,246,025	3,994	416	832	42	84	72	72	108	216	566	1204
15	1,263,469	4,050	422	844	43	85	73	73	109	219	574	1220
16	1,281,158	4,106	428	855	43	86	74	74	111	222	582	1237
17	1,299,094	4,164	434	867	44	87	75	75	112	225	590	1255
18	1,317,281	4,222	440	880	44	89	76	76	114	228	598	1272
19	1,335,723	4,281	446	892	45	90	77	77	115	231	606	1290
20	1,354,424	4,341	452	904	46	91	78	78	117	234	614	1308
21	1,373,385	4,402	459	917	46	92	79	79	118	236	624	1324
22	1,392,613	4,464	465	930	47	94	80	80	120	240	632	1344
23	1,412,109	4,526	471	943	48	95	81	81	122	244	641	1363
24	1,431,879	4,589	478	956	48	96	83	83	124	248	650	1383

Prepared by: SAB
Date: 1/31/2012

Skyline Landfill
TRAFFIC PROJECTIONS

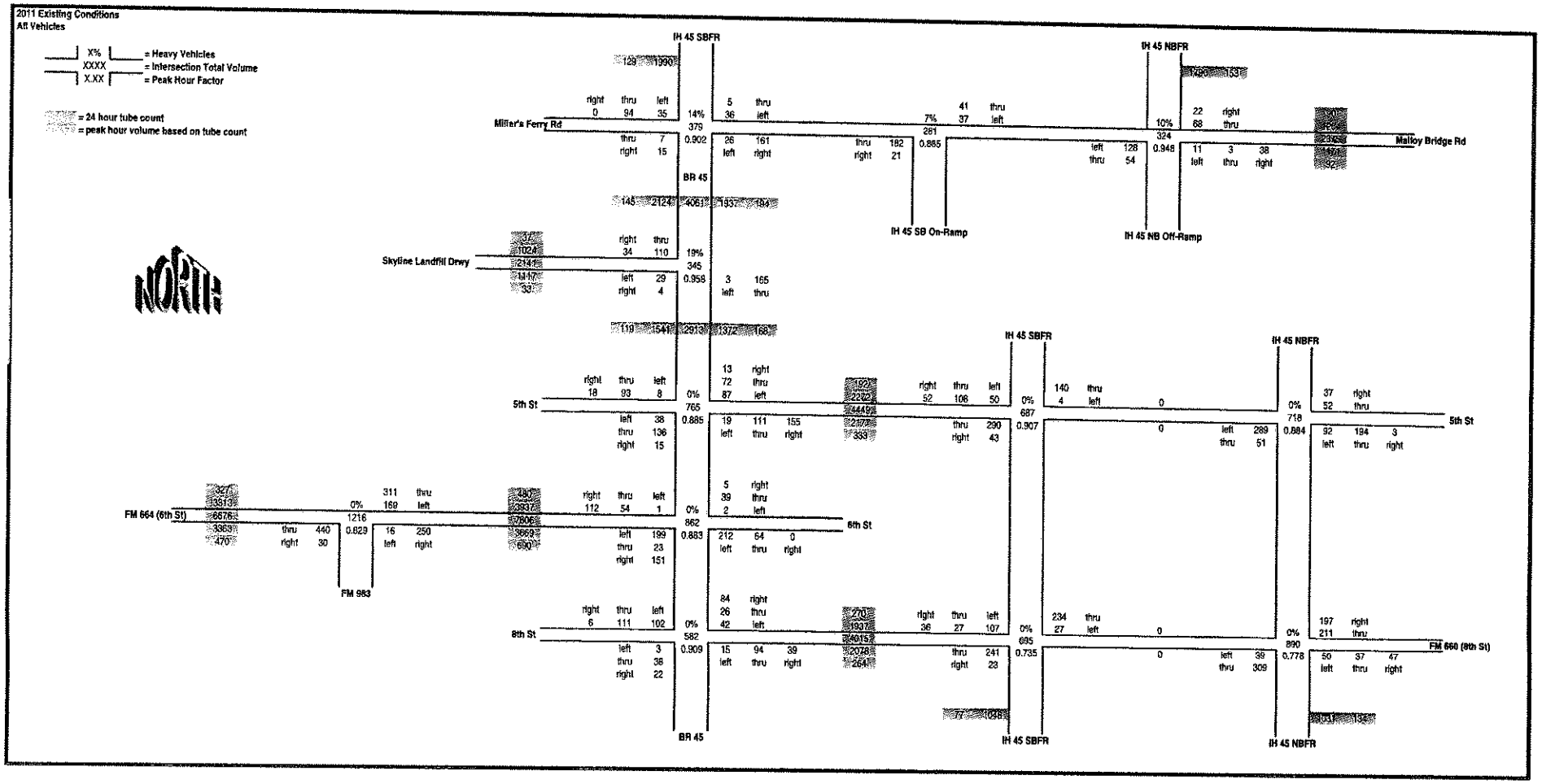
Checked by: KJW
Date: 1/31/2012

Landfill Waste Acceptance			Landfill Traffic				Hauling Facility Traffic				Total Traffic	
			Landfill Trucks		Landfill Staff/Others		Hauling Facility Trucks		Hauling Facility Staff/Others		Total Vehicles	
Year	Annual Waste (tons)	Daily Waste (tons/day)	Incoming Veh/Day	Total Veh Trips/Day	Incoming Veh/Day	Total Veh Trips/Day	Exiting Veh/Day	Total Veh Trips/Day	Incoming Veh/Day	Total Veh Trips/Day	Incoming Veh/Day	Total Veh Trips/Day
25	1,451,925	4,654	485	970	49	98	84	84	35	35	653	1402
26	1,472,252	4,719	492	983	50	99	85	85	36	36	663	1422
27	1,492,864	4,785	498	997	50	100	86	86	36	36	670	1442
28	1,513,764	4,852	505	1011	51	102	87	87	36	36	679	1462
29	1,534,957	4,920	512	1025	52	103	89	89	36	36	689	1482
30	1,556,446	4,989	520	1039	52	105	90	90	36	36	698	1503
31	1,578,236	5,058	527	1054	53	106	91	91	37	37	708	1524
32	1,600,331	5,129	534	1069	54	108	92	92	36	37	716	1546
33	1,622,736	5,201	542	1084	55	109	94	94	40	41	731	1567

Skyline Ferris Traffic Study

DISTRIBUTION SPREADSHEET

AM Peak

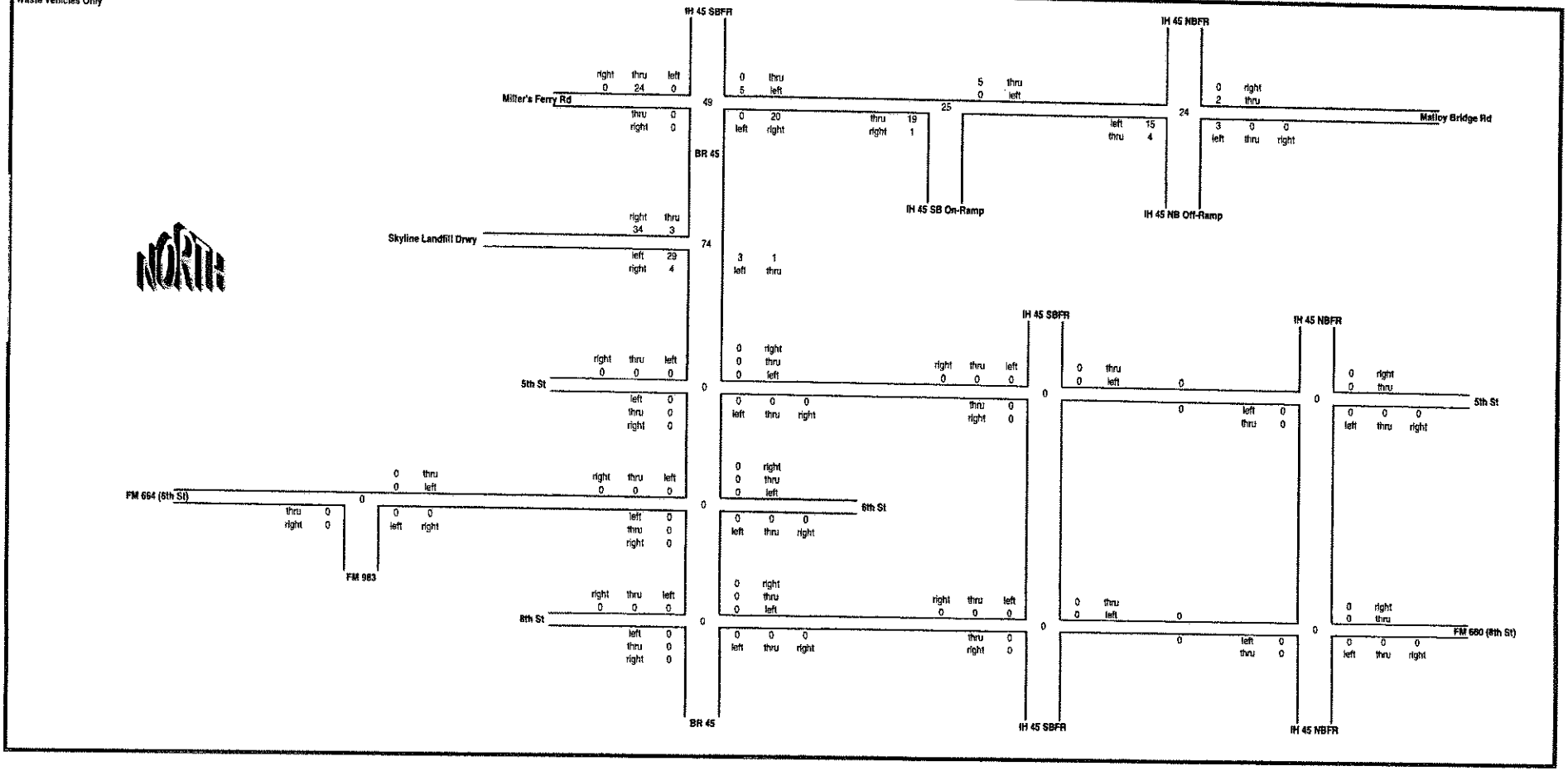


Skyline Ferris Traffic Study

DISTRIBUTION SPREADSHEET

AM Peak

2011 Existing Conditions
Waste Vehicles Only

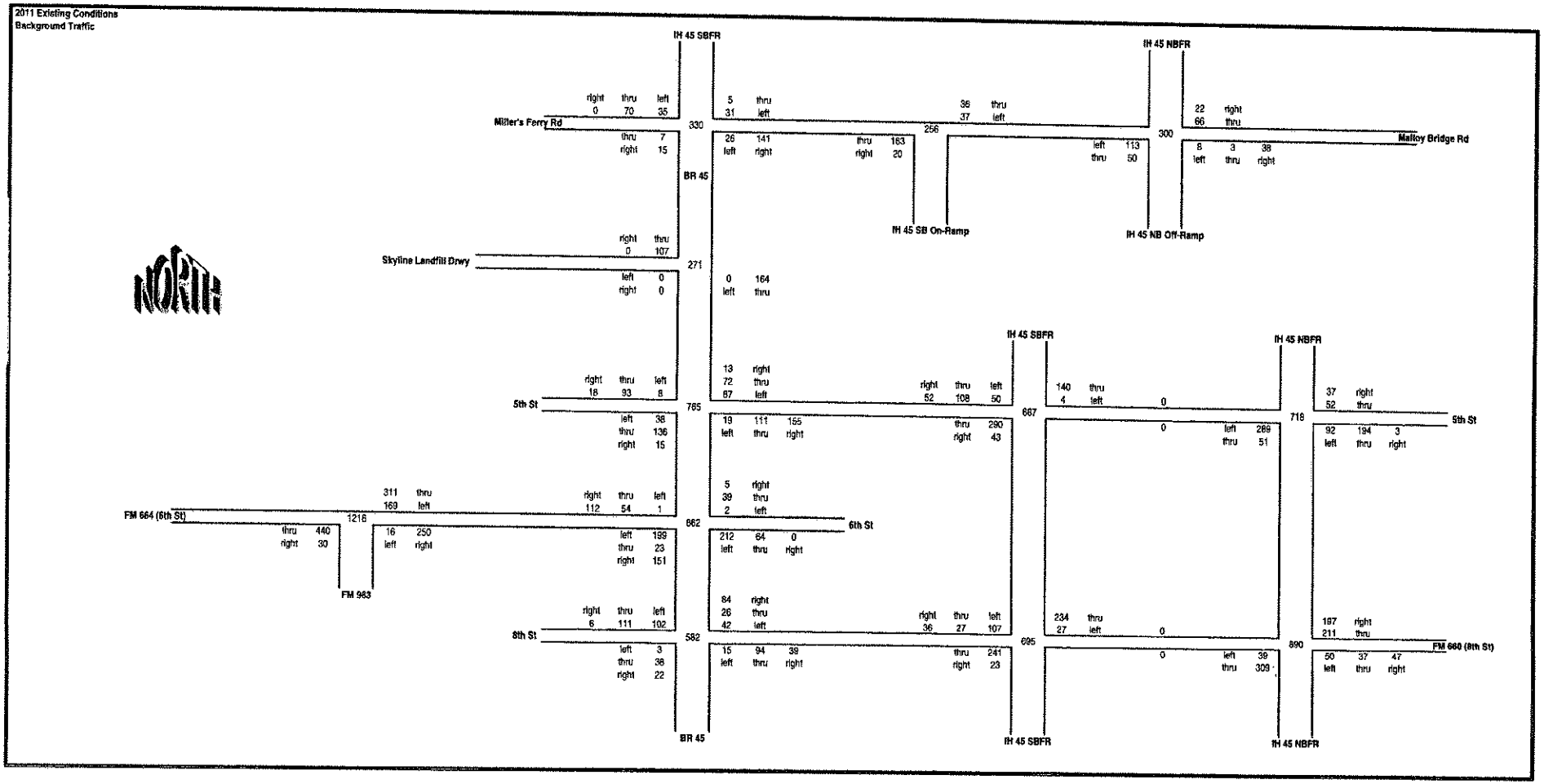


Skyline Ferris Traffic Study

DISTRIBUTION SPREADSHEET

AM Peek

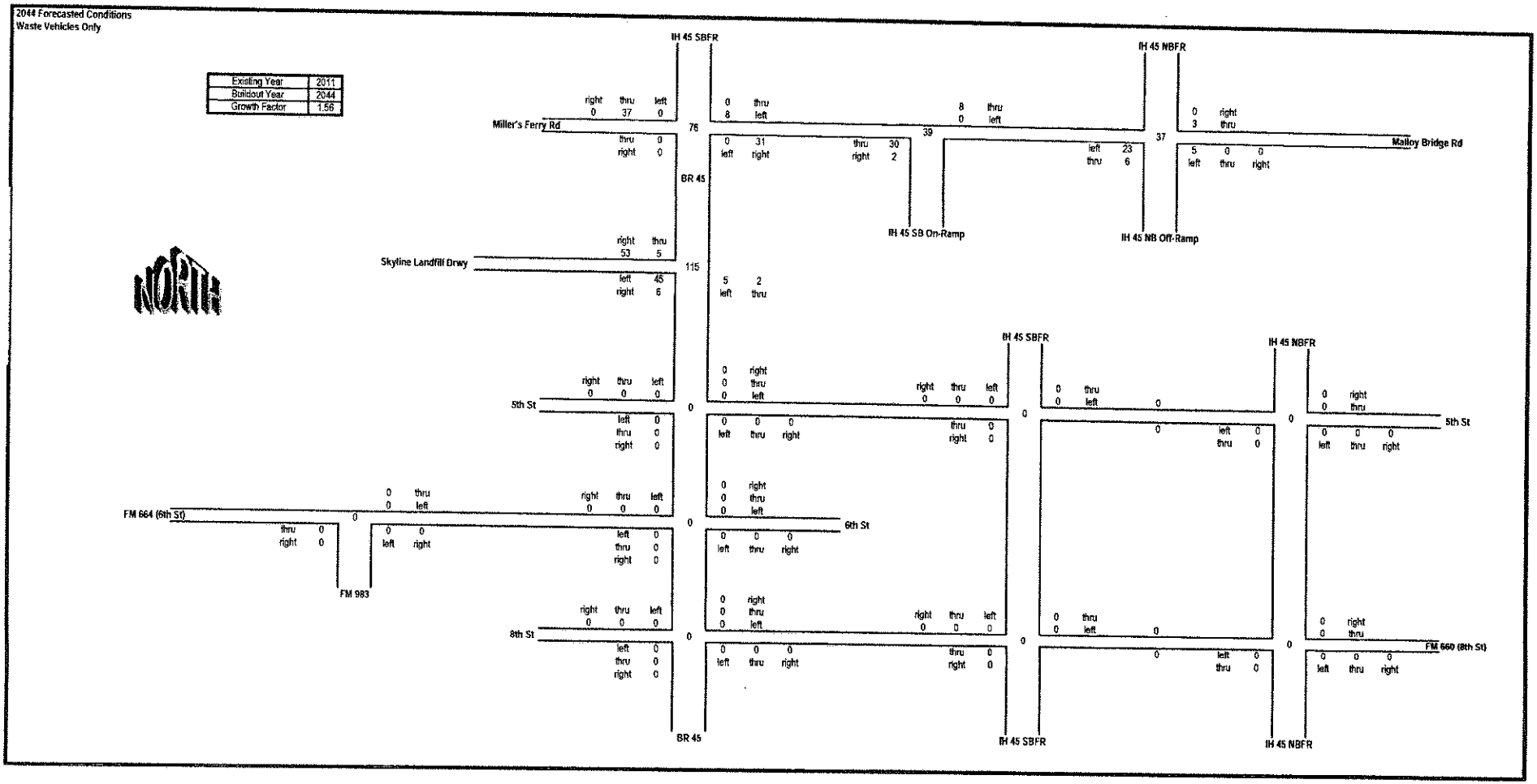
2011 Existing Conditions
Background Traffic



Skyline Ferris Traffic Study

DISTRIBUTION SPREADSHEET

AM Peak



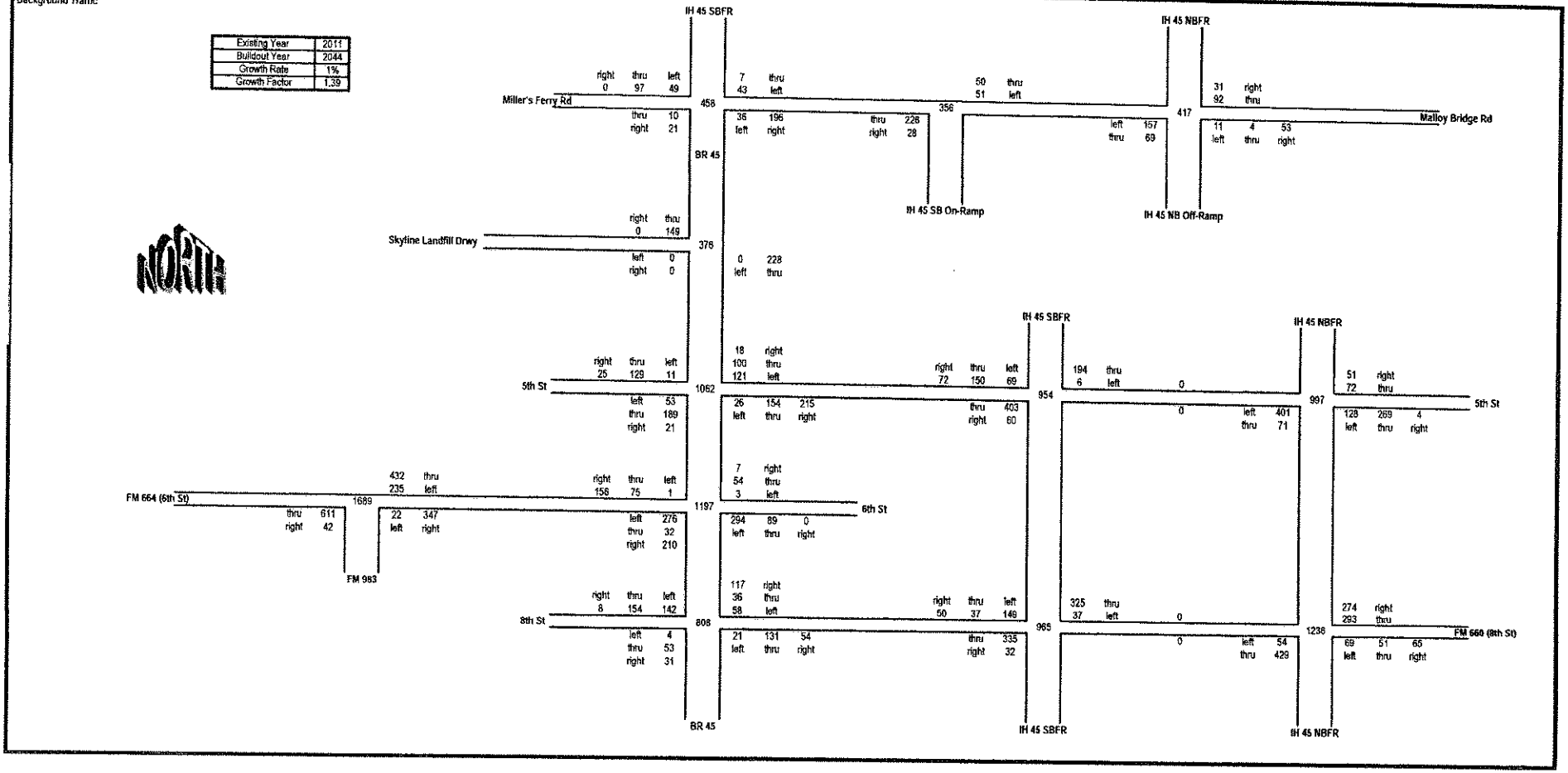
Skyline Ferris Traffic Study

DISTRIBUTION SPREADSHEET

AM Peak

2044 Forecasted Conditions
Background Traffic

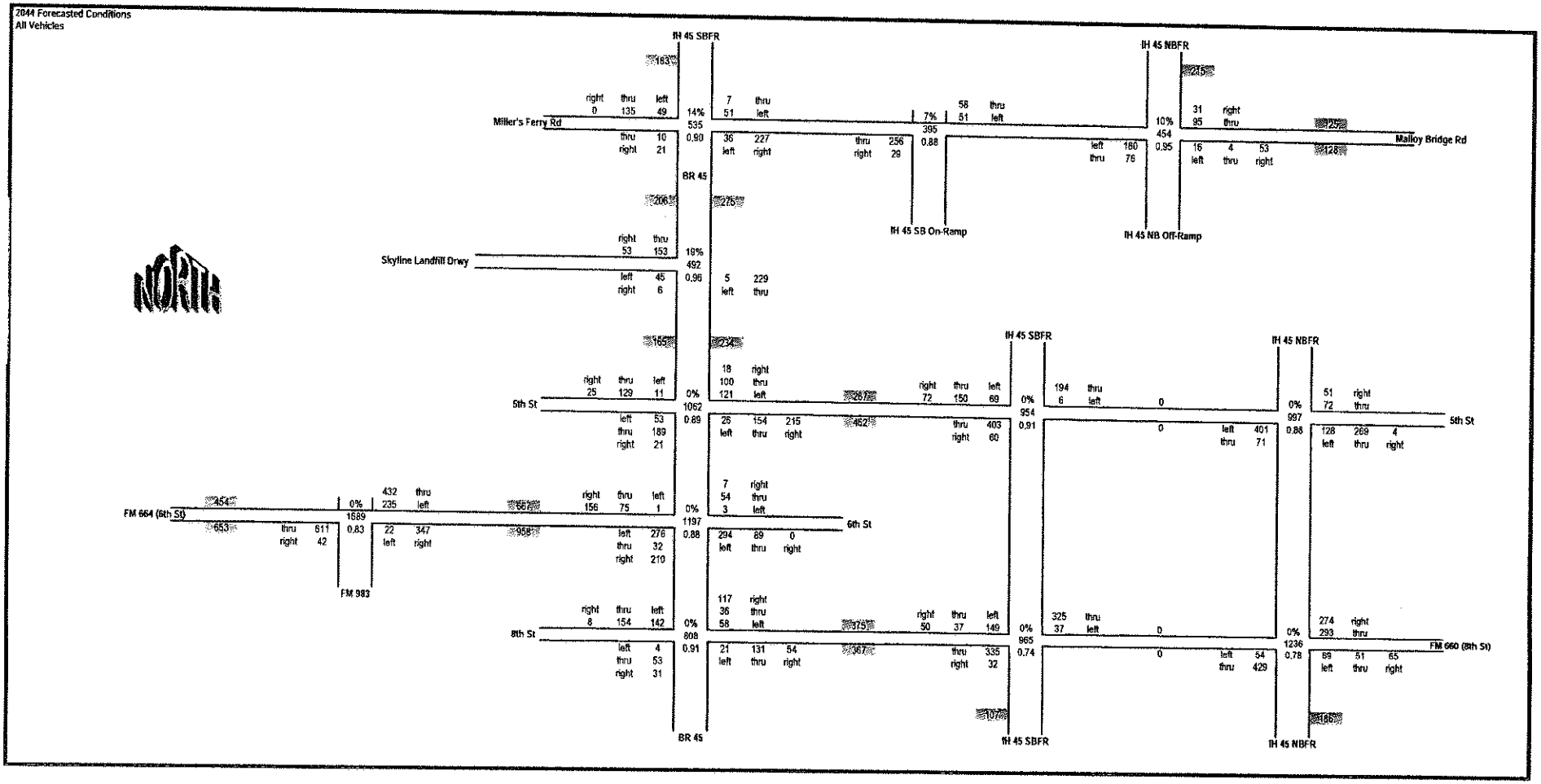
Existing Year	2011
Buildout Year	2044
Growth Rate	1%
Growth Factor	1.39



Skyline Ferris Traffic Study

DISTRIBUTION SPREADSHEET

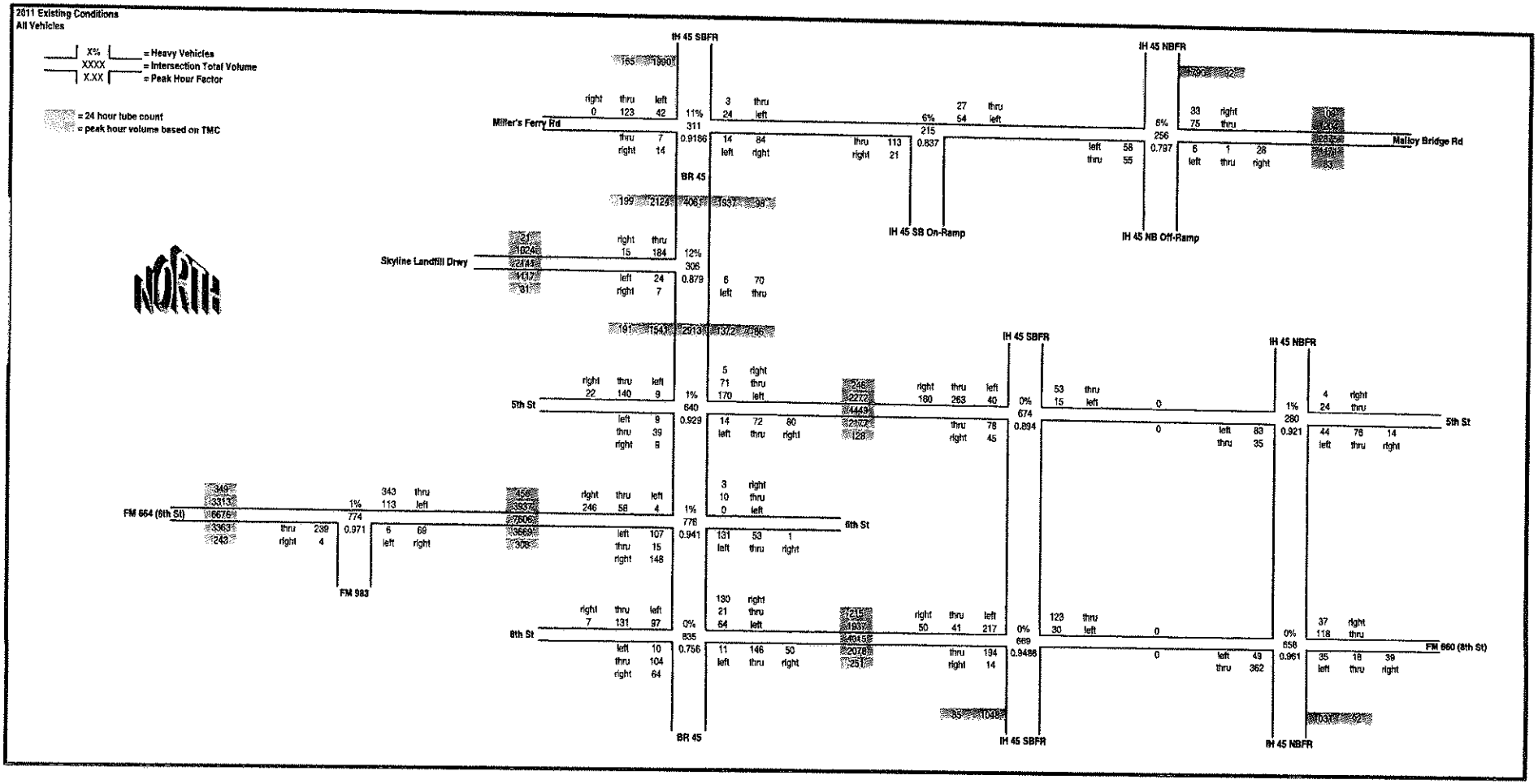
AM Peak



Skyline Ferris Traffic Study

DISTRIBUTION SPREADSHEET

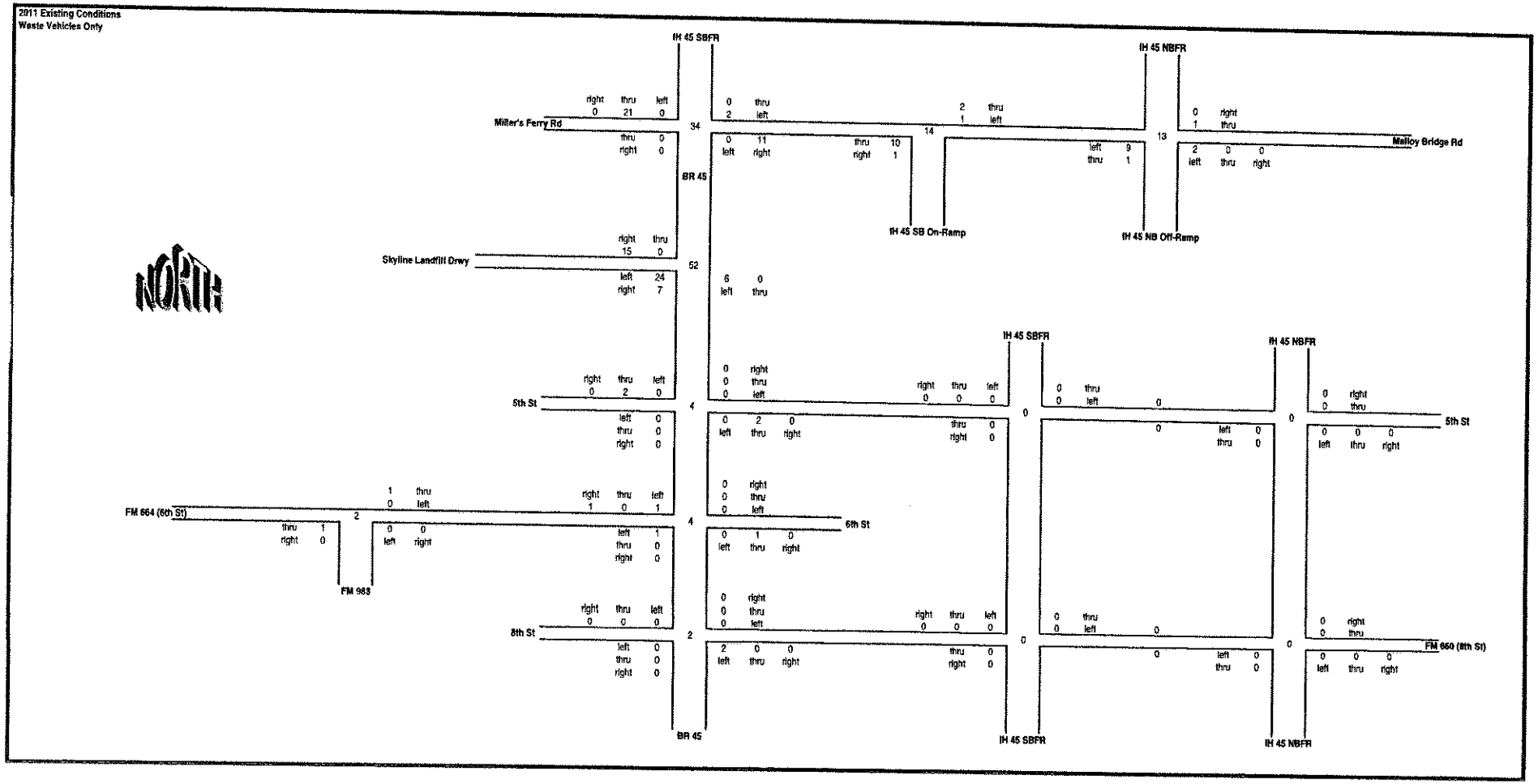
PM Peak



Skyline Ferris Traffic Study

DISTRIBUTION SPREADSHEET

PM Peak

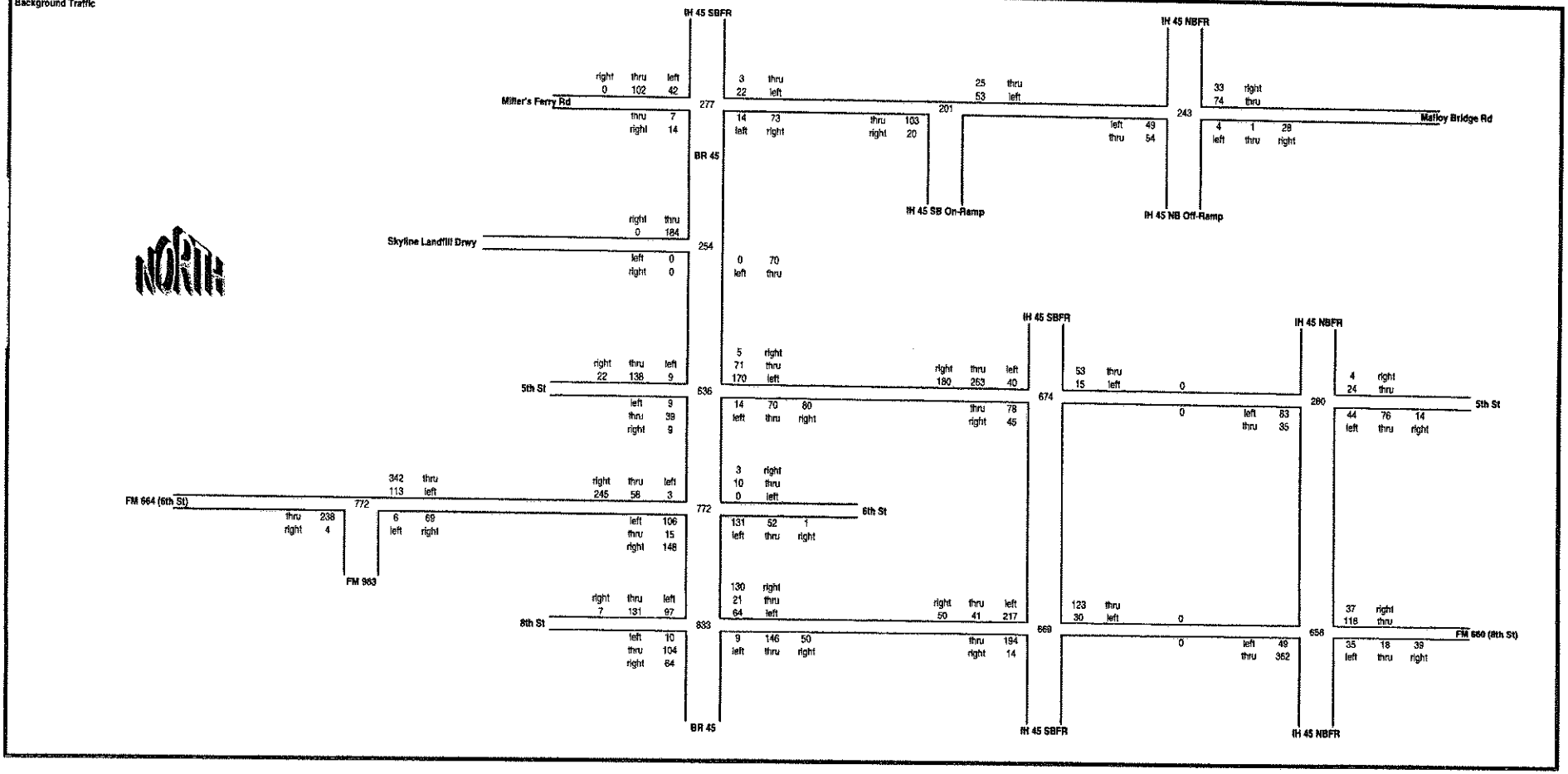


Skyline Ferris Traffic Study

DISTRIBUTION SPREADSHEET

PM Peak

2011 Existing Conditions
Background Traffic



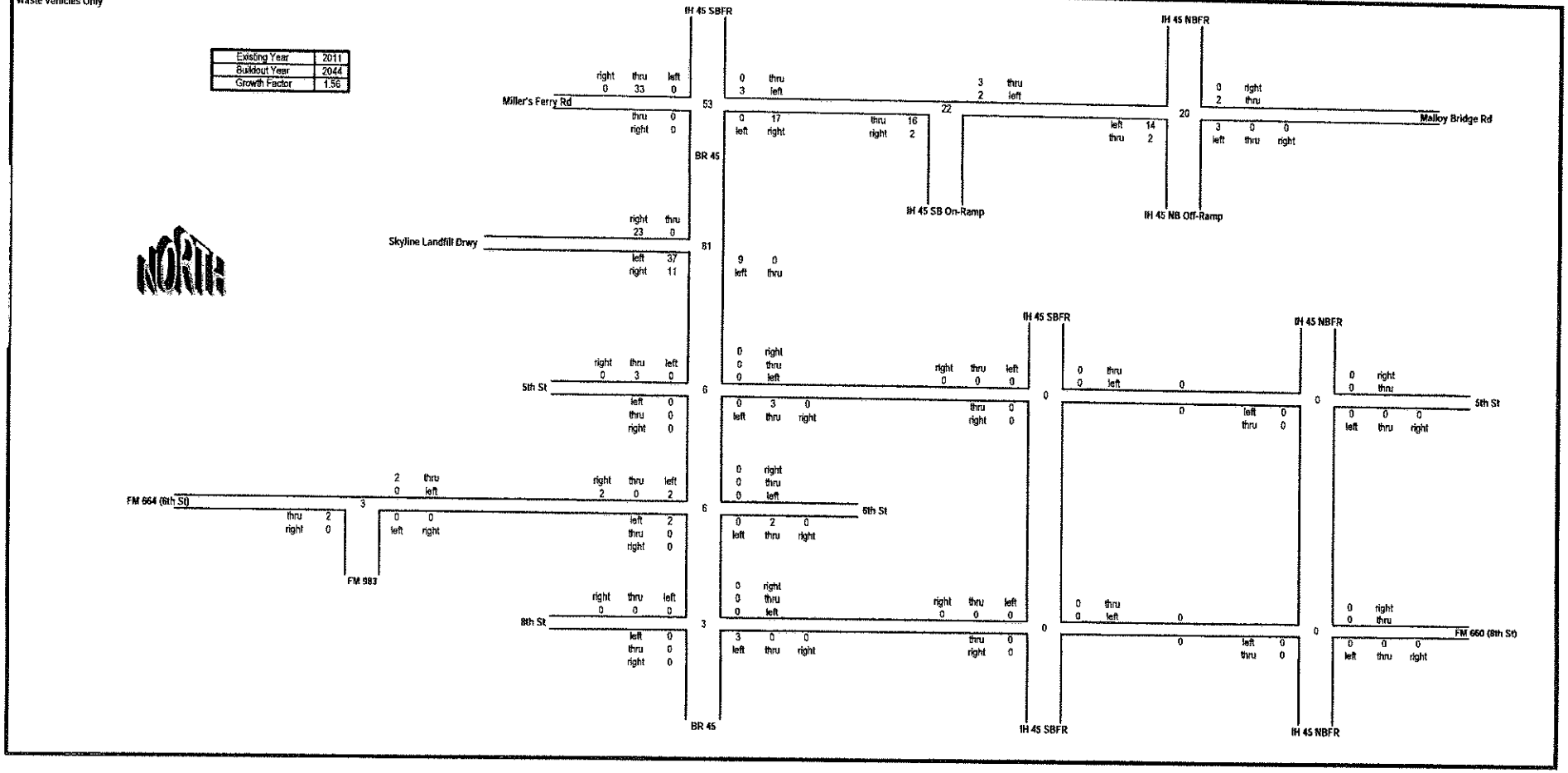
Skyline Ferris Traffic Study

DISTRIBUTION SPREADSHEET

PM Peak

2044 Forecasted Conditions
Waste Vehicles Only

Existing Year	2011
Buildout Year	2044
Growth Factor	1.56



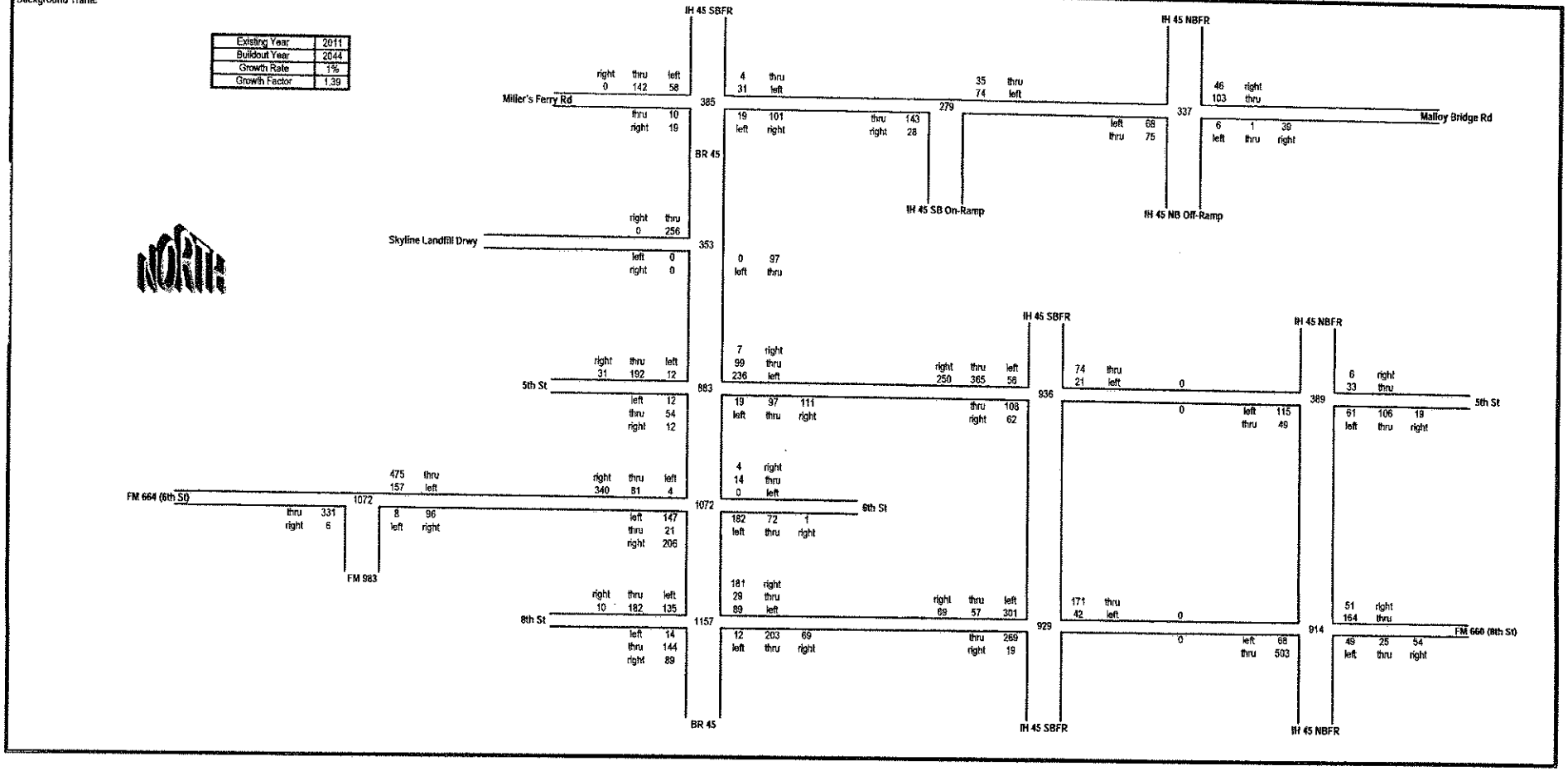
Skyline Ferris Traffic Study

DISTRIBUTION SPREADSHEET

PM Peak

2044 Forecasted Conditions
Background Traffic

Existing Year	2011
Buildout Year	2044
Growth Rate	1%
Growth Factor	1.39

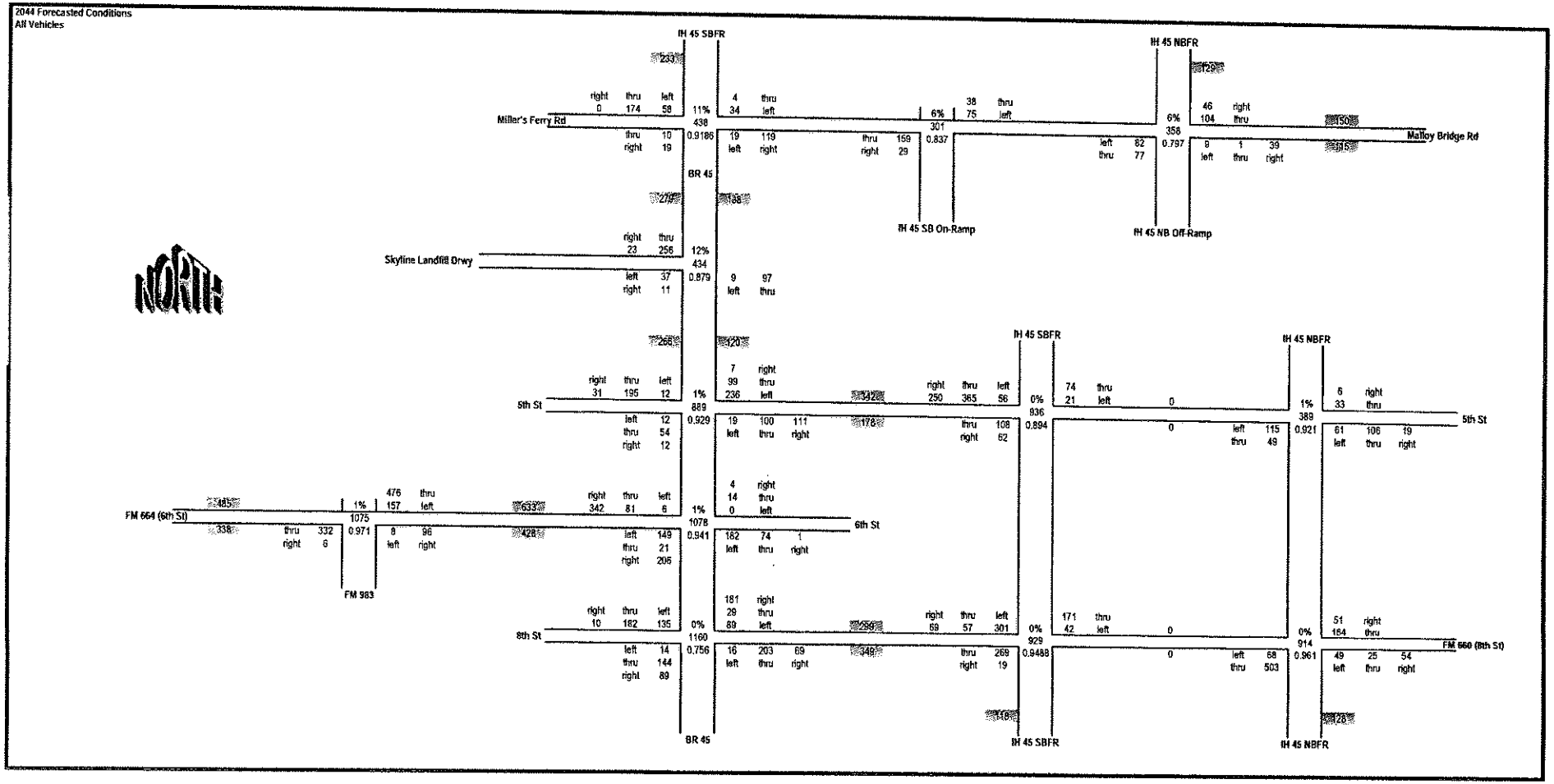


Skyline Ferris Traffic Study

DISTRIBUTION SPREADSHEET

PM Peak

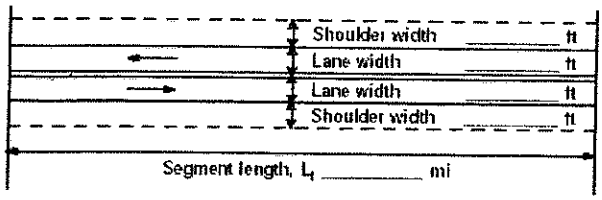
2044 Forecasted Conditions
All Vehicles



TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TAG	Highway	5th Street
Agency or Company	HDR	From/To	All
Date Performed	11/10/2011	Jurisdiction	City of Ferris
Analysis Time Period	AM Peak Hour	Analysis Year	2011

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	525 veh/h
Directional split	63 / 37
Peak-hour factor, PHF	0.89
No-passing zone	100
% Trucks and Buses , P_T	1 %
% Recreational vehicles, P_R	0%
Access points/ mi	35

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.993
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	594
v_p * highest directional split proportion[2] (pc/h)	374

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	45.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	4.2 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	32.0 mi/h	Adj. for access points, f_A (Exhibit 20-6)	8.8 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	32.0 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	3.9
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	23.5

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.999
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	590
v_p * highest directional split proportion[2] (pc/h)	372
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	40.5
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	20.8
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	61.3

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	C
Volume to capacity ratio v/c $v/c=V_p/3,200$	0.19
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	106
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	378
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	4.5

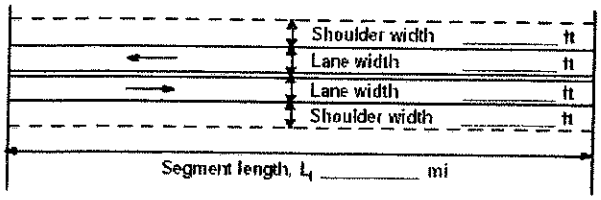
Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TAG	Highway	BR 45
Agency or Company	HDR	From/To	Malloy Bridge to Landfill Drwy
Date Performed	11/10/2011	Jurisdiction	TxDOT
Analysis Time Period	AM Peak Hour	Analysis Year	2011

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	339 veh/h
Directional split	57 / 43
Peak-hour factor, PHF	0.90
No-passing zone	100
% Trucks and Buses , P_T	19 %
% Recreational vehicles, P_R	0%
Access points/ mi	3

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.883
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	427
v_p * highest directional split proportion[2] (pc/h)	243

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	52.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	0.4 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	50.8 mi/h	Adj. for access points, f_A (Exhibit 20-6)	0.8 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	50.8 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	4.4
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	43.1

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.981
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	384
v_p * highest directional split proportion[2] (pc/h)	219
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	28.6
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	23.0
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	51.6

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	B
Volume to capacity ratio v/c v/c=V_p/ 3,200	0.13
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	57
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	203
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	1.3

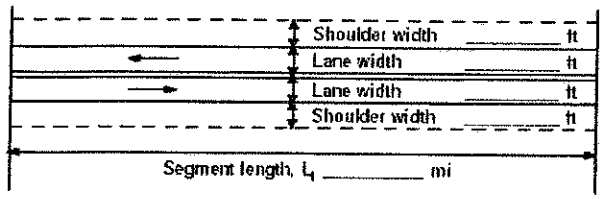
Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TAG	Highway	BR 45
Agency or Company	HDR	From/To	8th Street/Landfill Driveway
Date Performed	11/10/2011	Jurisdiction	TxDOT
Analysis Time Period	AM Peak Period	Analysis Year	2011

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	287 veh/h
Directional split	59 / 41
Peak-hour factor, PHF	0.89
No-passing zone	100
% Trucks and Buses , P_T	19 %
% Recreational vehicles, P_R	0%
Access points/ mi	9

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.883
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF * f_G * f_{HV})$	365
v_p * highest directional split proportion[2] (pc/h)	215

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	52.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	0.4 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	49.3 mi/h	Adj. for access points, f_A (Exhibit 20-6)	2.3 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	49.3 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	4.3
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	42.2

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.981
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF * f_G * f_{HV})$	329
v_p * highest directional split proportion[2] (pc/h)	194
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	25.1
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	22.8
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	47.9

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	B
Volume to capacity ratio v/c $v/c=V_p/3{,}200$	0.11
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	81
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	287
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	1.9

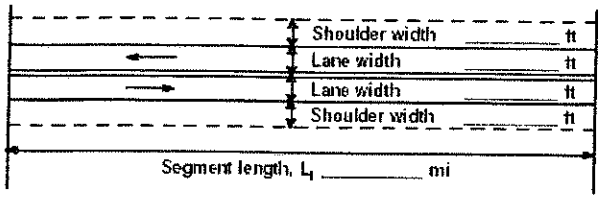
Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TAG	Highway	FM 660
Agency or Company	HDR	From/To	BR 45/Legendary Ln
Date Performed	11/10/2011	Jurisdiction	TxDOT
Analysis Time Period	AM Peak Period	Analysis Year	2011

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	534 veh/h
Directional split	51 / 49
Peak-hour factor, PHF	0.74
No-passing zone	100
% Trucks and Buses , P_T	1 %
% Recreational vehicles, P_R	0%
Access points/ mi	23

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.2
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.998
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	723
v_p * highest directional split proportion[2] (pc/h)	369

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	45.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	5.3 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	34.0 mi/h	Adj. for access points, f_A (Exhibit 20-6)	5.8 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	34.0 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	3.3
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	25.0

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.999
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	722
v_p * highest directional split proportion[2] (pc/h)	368
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	47.0
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	17.3
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	64.3

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	C
Volume to capacity ratio v/c $v/c=V_p/3,200$	0.23
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	180
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	534
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	7.2

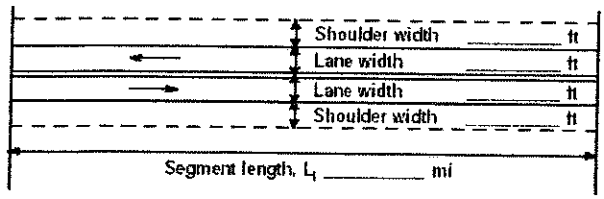
Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	FM 664	Highway	FM 664
Agency or Company	HDR	From/To	Tanner Farm Rd/FM 983
Date Performed	11/10/2011	Jurisdiction	TxDOT
Analysis Time Period	AM Peak Period	Analysis Year	2011

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	797 veh/h
Directional split	59 / 41
Peak-hour factor, PHF	0.83
No-passing zone	87
% Trucks and Buses , P_T	1 %
% Recreational vehicles, P_R	0%
Access points/ mi	8

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.2
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} f_{HV}=1/ (1+ $P_T(E_T$-1)+$P_R(E_R$-1))	0.998
Two-way flow rate[1], v_p (pc/h) v_p=V/ (PHF * f_G * f_{HV})	962
v_p * highest directional split proportion[2] (pc/h)	568

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	52.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	0.0 mi/h
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	50.0 mi/h	Adj. for access points, f_A (Exhibit 20-6)	2.0 mi/h
		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	50.0 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	2.4
Average travel speed, ATS (mi/h) ATS=FFS-0.00776v_p-f_{np}	40.1

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} f_{HV}=1/ (1+ $P_T(E_T$-1)+$P_R(E_R$-1))	0.999
Two-way flow rate[1], v_p (pc/h) v_p=V/ (PHF * f_G * f_{HV})	961
v_p * highest directional split proportion[2] (pc/h)	567
Base percent time-spent-following, BPTSF(%) BPTSF=100(1-$e^{-0.000879v_p}$)	57.0
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	12.3
Percent time-spent-following, PTSF(%) PTSF=BPTSF+$f_{d/np}$	69.4

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	D
Volume to capacity ratio v/c v/c=V_p/ 3,200	0.30
Peak 15-min veh-miles of travel,VMT_{15} (veh- mi) VMT_{15}= 0.25L_t(V/PHF)	423
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) VMT_{60}=V*L_t	1403
Peak 15-min total travel time, TT_{15}(veh-h) TT_{15}= VMT_{15}/ATS	10.5

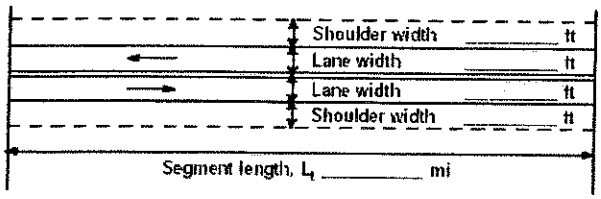
Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TAG	Highway	FM 983
Agency or Company	HDR	From/To	Bluff Springs Rd/BR 45
Date Performed	11/10/2011	Jurisdiction	TxDOT
Analysis Time Period	AM Peak Hour	Analysis Year	2011

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	1170 veh/h
Directional split	59 / 41
Peak-hour factor, PHF	0.83
No-passing zone	100
% Trucks and Buses , P_T	1 %
% Recreational vehicles, P_R	0%
Access points/ mi	26

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.999
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	1411
v_p * highest directional split proportion[2] (pc/h)	832

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	45.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	1.7 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	36.8 mi/h	Adj. for access points, f_A (Exhibit 20-6)	6.5 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	36.8 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	1.7
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	24.2

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	1410
v_p * highest directional split proportion[2] (pc/h)	832
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	71.0
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	8.0
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	79.1

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	D
Volume to capacity ratio v/c $v/c=V_p/3{,}200$	0.44
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	352
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	1170
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	14.6

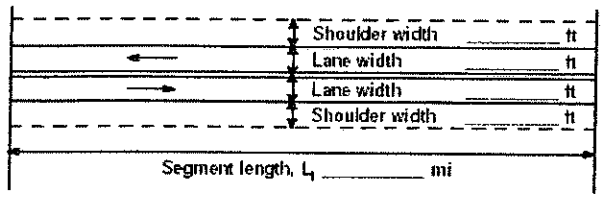
Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TAG	Highway	Malloy Bridge Road
Agency or Company	HDR	From/To	BR 45/Roberts Rd
Date Performed	11/10/2011	Jurisdiction	Dallas County
Analysis Time Period	PM Peak Hour	Analysis Year	2011

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	191 veh/h
Directional split	57 / 43
Peak-hour factor, PHF	0.80
No-passing zone	21
% Trucks and Buses , P_T	6 %
% Recreational vehicles, P_R	0%
Access points/ mi	8

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.960
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	249
v_p * highest directional split proportion[2] (pc/h)	142

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	60.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	1.3 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	56.7 mi/h	Adj. for access points, f_A (Exhibit 20-6)	2.0 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	56.7 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	0.9
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	53.9

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.994
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	240
v_p * highest directional split proportion[2] (pc/h)	137
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	19.0
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	11.7
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	30.7

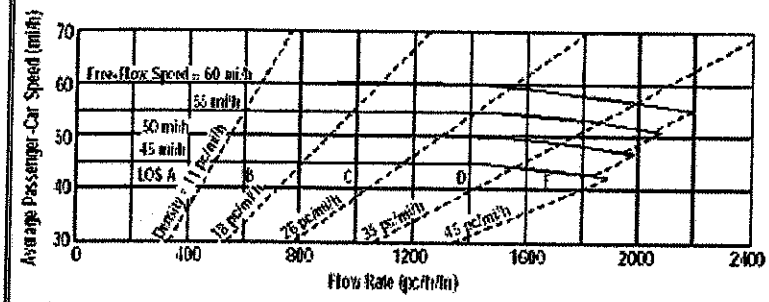
Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	A
Volume to capacity ratio v/c $v/c=V_p/3{,}200$	0.08
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	60
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	191
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	1.1

Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	TAG
Agency or Company	HDR
Date Performed	11/10/2011
Analysis Time Period	AM Peak Hour

Site Information

Highway/Direction to Travel	IH 45 NBFR
From/To	Malloy Bridge Rd/Mars Rd
Jurisdiction	TxDOT
Analysis Year	2011

Project Description Skyline Landfill Ferris

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	153	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	10
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.952

Speed Inputs

Lane Width, LW (ft)	11.0
Total Lateral Clearence, LC (ft)	2.0
Access Points, A (A/mi)	7
Median Type, M	Divided
FFS (measured)	
Base Free-Flow Speed, BFFS	60.0

Calc Speed Adj and FFS

f_{LW} (mi/h)	1.9
f_{LC} (mi/h)	3.6
f_A (mi/h)	1.8
f_M (mi/h)	0.0
FFS (mi/h)	52.8

Operations

Operational (LOS)

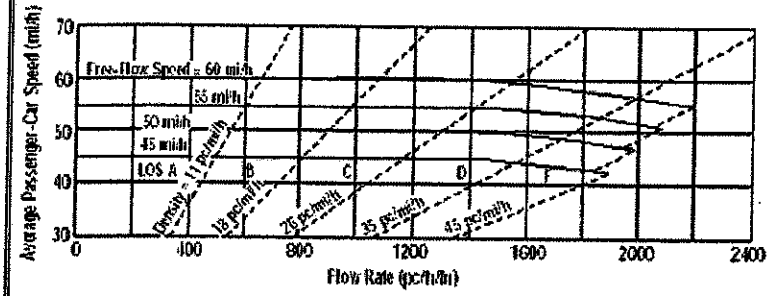
Flow Rate, v_p (pc/h/ln)	84
Speed, S (mi/h)	52.8
D (pc/mi/ln)	1.6
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	TAG
Agency or Company	HDR
Date Performed	11/10/2011
Analysis Time Period	AM Peak Hour

Site Information

Highway/Direction to Travel	IH 45 NBFR
From/To	BR 45/FM 660
Jurisdiction	TxDOT
Analysis Year	2011

Project Description Skyline Landfill Ferris

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	134	Peak-Hour Factor, PHF	0.78
AADT(veh/h)		%Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.995

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	0.0
Access Points, A (A/mi)	6
Median Type, M	Divided
FFS (measured)	
Base Free-Flow Speed, BFFS	52.0

Calc Speed Adj and FFS

f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	5.4
f_A (mi/h)	1.5
f_M (mi/h)	0.0
FFS (mi/h)	45.1

Operations

Operational (LOS)

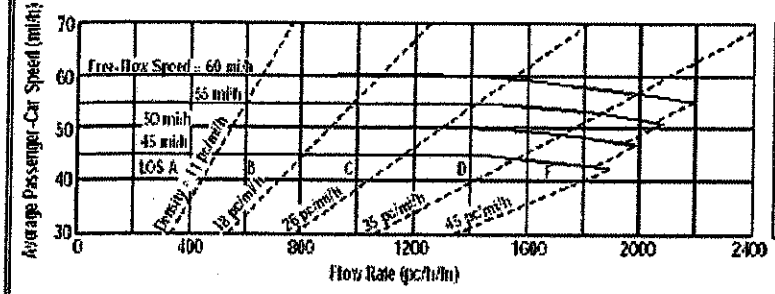
Flow Rate, v_p (pc/h/ln)	86
Speed, S (mi/h)	45.1
D (pc/mi/ln)	1.9
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	TAG
Agency or Company	HDR
Date Performed	11/10/2011
Analysis Time Period	PM Peak Hour

Site Information

Highway/Direction to Travel	IH 45 SBFR
From/To	Mars Rd/Malloy Bridge Rd
Jurisdiction	TxDOT
Analysis Year	2011

Project Description Skyline Landfill Ferris

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	165	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		%Trucks and Buses, P_T	11
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.948

Speed Inputs

Lane Width, LW (ft)	11.0
Total Lateral Clearence, LC (ft)	4.0
Access Points, A (A/mi)	7
Median Type, M	Divided
FFS (measured)	
Base Free-Flow Speed, BFFS	60.0

Calc Speed Adj and FFS

f_{LW} (mi/h)	1.9
f_{LC} (mi/h)	1.8
f_A (mi/h)	1.8
f_M (mi/h)	0.0
FFS (mi/h)	54.5

Operations

Operational (LOS)

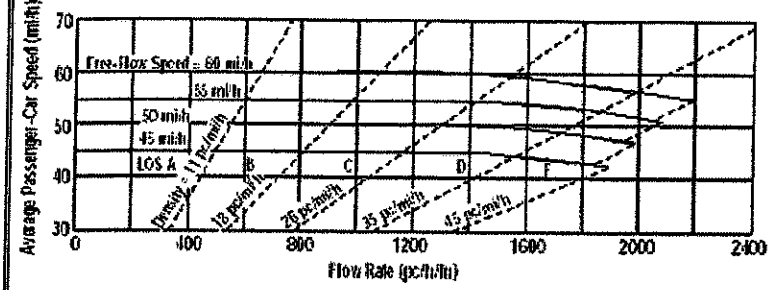
Flow Rate, v_p (pc/h/ln)	94
Speed, S (mi/h)	54.5
D (pc/mi/ln)	1.7
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, II, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	TAG
Agency or Company	HDR
Date Performed	11/10/2011
Analysis Time Period	PM Peak Hour

Site Information

Highway/Direction to Travel	IH 45 SBFR
From/To	FM 660/BR 45
Jurisdiction	TxDOT
Analysis Year	2011

Project Description Skyline Landfill Ferris

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	85	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.995

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	0.0
Access Points, A (A/mi)	13
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	44
Speed, S (mi/h)	45.0
D (pc/mi/ln)	1.0
LOS	A

Design

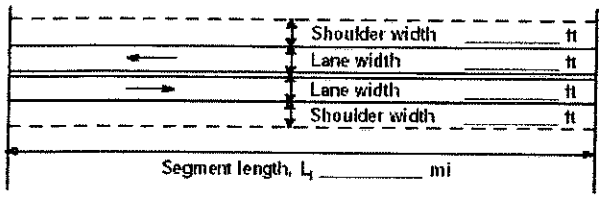
Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TAG	Highway	5th Street
Agency or Company	HDR	From/To	All
Date Performed	2/1/2012	Jurisdiction	City of Ferris
Analysis Time Period	AM Peak Hour	Analysis Year	2044

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	730 veh/h
Directional split	63 / 37
Peak-hour factor, PHF	0.89
No-passing zone	100
% Trucks and Buses , P_T	1 %
% Recreational vehicles, P_R	0%
Access points/ mi	35

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.2
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.998
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	822
v_p * highest directional split proportion[2] (pc/h)	518

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	45.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	4.2 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	32.0 mi/h	Adj. for access points, f_A (Exhibit 20-6)	8.8 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	32.0 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	3.0
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	22.7

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.999
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	821
v_p * highest directional split proportion[2] (pc/h)	517
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	51.4
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	14.2
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	65.6

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	C
Volume to capacity ratio v/c $v/c=V_p/3{,}200$	0.26
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	148
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	526
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	6.5

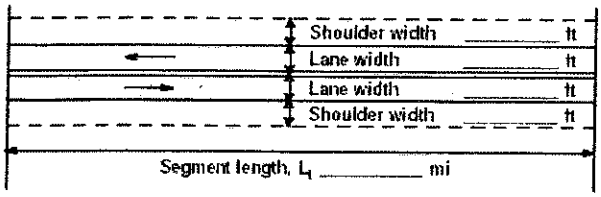
Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TAG	Highway	BR 45
Agency or Company	HDR	From/To	Malloy Bridge to Landfill Drwy
Date Performed	2/1/2012	Jurisdiction	TxDOT
Analysis Time Period	AM Peak Hour	Analysis Year	2044

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	483 veh/h
Directional split	57 / 43
Peak-hour factor, PHF	0.90
No-passing zone	100
% Trucks and Buses , P_T	19 %
% Recreational vehicles, P_R	0%
Access points/ mi	3

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.2
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.963
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	557
v_p * highest directional split proportion[2] (pc/h)	317

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	52.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	0.4 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	50.8 mi/h	Adj. for access points, f_A (Exhibit 20-6)	0.8 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	50.8 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	4.0
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	42.5

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.981
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	547
v_p * highest directional split proportion[2] (pc/h)	312
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	38.2
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	21.3
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	59.4

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	C
Volume to capacity ratio v/c $v/c=V_p/3,200$	0.17
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	81
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	290
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	1.9

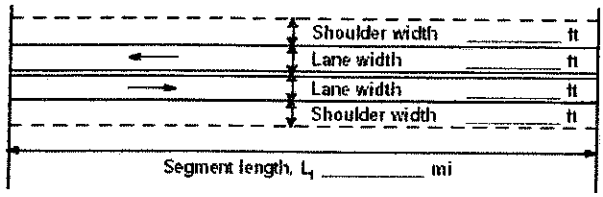
Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TAG	Highway	BR 45
Agency or Company	HDR	From/To	8th Street/Landfill Driveway
Date Performed	2/1/2012	Jurisdiction	TxDOT
Analysis Time Period	AM Peak Period	Analysis Year	2044

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	401 veh/h
Directional split	59 / 41
Peak-hour factor, PHF	0.89
No-passing zone	100
% Trucks and Buses , P_T	19 %
% Recreational vehicles, P_R	0%
Access points/ mi	9

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.883
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	510
v_p * highest directional split proportion[2] (pc/h)	301

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	52.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	0.4 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	49.3 mi/h	Adj. for access points, f_A (Exhibit 20-6)	2.3 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	49.3 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	4.2
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	41.2

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.981
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	459
v_p * highest directional split proportion[2] (pc/h)	271
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	33.2
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	21.9
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	55.1

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	C
Volume to capacity ratio v/c v/c=V_p/ 3,200	0.16
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	113
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	401
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	2.7

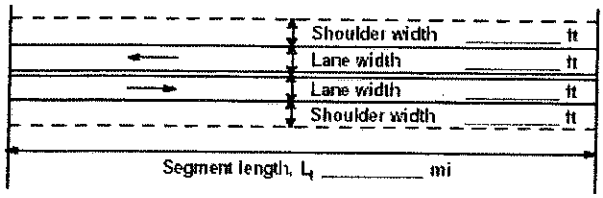
Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TAG	Highway	FM 660
Agency or Company	HDR	From/To	BR 45/Legendary Ln
Date Performed	2/1/2012	Jurisdiction	TxDOT
Analysis Time Period	AM Peak Period	Analysis Year	2044

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	742 veh/h
Directional split	51 / 49
Peak-hour factor, PHF	0.74
No-passing zone	100
% Trucks and Buses , P_T	1 %
% Recreational vehicles, P_R	0%
Access points/ mi	23

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.2
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.998
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	1005
v_p * highest directional split proportion[2] (pc/h)	513

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	45.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	5.3 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	34.0 mi/h	Adj. for access points, f_A (Exhibit 20-6)	5.8 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	34.0 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	2.6
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	23.6

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.999
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	1004
v_p * highest directional split proportion[2] (pc/h)	512
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	58.6
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	12.8
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	71.4

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	D
Volume to capacity ratio v/c $v/c=V_p/3{,}200$	0.31
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	251
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	742
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	10.7

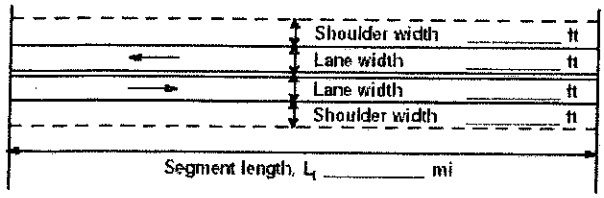
Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	FM 664	Highway	FM 664
Agency or Company	HDR	From/To	Tanner Farm Rd/FM 983
Date Performed	2/1/2012	Jurisdiction	TxDOT
Analysis Time Period	AM Peak Period	Analysis Year	2044

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	1108 veh/h
Directional split	59 / 41
Peak-hour factor, PHF	0.83
No-passing zone	87
% Trucks and Buses , P_T	1 %
% Recreational vehicles, P_R	0%
Access points/ mi	8

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.999
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF * f_G * f_{HV})$	1336
v_p * highest directional split proportion[2] (pc/h)	788

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	52.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	0.0 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	50.0 mi/h	Adj. for access points, f_A (Exhibit 20-6)	2.0 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	50.0 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	1.7
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	38.0

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF * f_G * f_{HV})$	1335
v_p * highest directional split proportion[2] (pc/h)	788
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	69.1
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	8.4
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	77.5

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	E
Volume to capacity ratio v/c $v/c=V_p/3{,}200$	0.42
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	587
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	1950
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	15.5

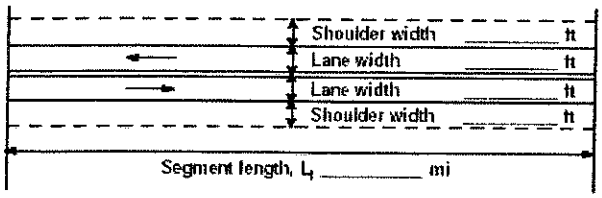
Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TAG	Highway	FM 983
Agency or Company	HDR	From/To	Bluff Springs Rd/BR 45
Date Performed	2/1/2012	Jurisdiction	TxDOT
Analysis Time Period	AM Peak Hour	Analysis Year	2044

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	1626 veh/h
Directional split	59 / 41
Peak-hour factor, PHF	0.83
No-passing zone	100
% Trucks and Buses , P_T	1 %
% Recreational vehicles, P_R	0%
Access points/ mi	26

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.999
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	1961
v_p * highest directional split proportion[2] (pc/h)	1157

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	45.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	1.7 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	36.8 mi/h	Adj. for access points, f_A (Exhibit 20-6)	6.5 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	36.8 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	1.1
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	20.4

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	1959
v_p * highest directional split proportion[2] (pc/h)	1156
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	82.1
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	4.6
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	86.7

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	E
Volume to capacity ratio v/c v/c=V_p/ 3,200	0.61
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	490
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	1626
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	24.0

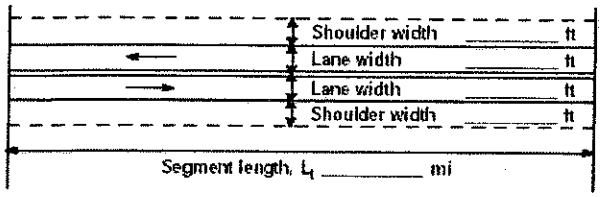
Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	TAG	Highway	Malloy Bridge Road
Agency or Company	HDR	From/To	BR 45/Roberts Rd
Date Performed	2/1/2012	Jurisdiction	Dallas County
Analysis Time Period	PM Peak Hour	Analysis Year	2044

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	266 veh/h
Directional split	57 / 43
Peak-hour factor, PHF	0.80
No-passing zone	21
% Trucks and Buses , P_T	6 %
% Recreational vehicles, P_R	0%
Access points/ mi	8

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	1.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.960
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	346
v_p * highest directional split proportion[2] (pc/h)	197

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	mi/h	Base free-flow speed, $BFFS_{FM}$	60.0 mi/h
Observed volume, V_f	veh/h	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	1.3 mi/h
Free-flow speed, FFS $FFS=S_{FM}+0.00776(V_f/f_{HV})$	56.7 mi/h	Adj. for access points, f_A (Exhibit 20-6)	2.0 mi/h
		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	56.7 mi/h

Adj. for no-passing zones, f_{np} (mi/h) (Exhibit 20-11)	1.5
Average travel speed, ATS (mi/h) $ATS=FFS-0.00776v_p-f_{np}$	52.6

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.994
Two-way flow rate[1], v_p (pc/h) $v_p=V/(PHF*f_G*f_{HV})$	334
v_p * highest directional split proportion[2] (pc/h)	190
Base percent time-spent-following, BPTSF(%) $BPTSF=100(1-e^{-0.000879v_p})$	25.4
Adj. for directional distribution and no-passing zone, $f_{d/np}$(%)(Exh. 20-12)	12.0
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{d/np}$	37.4

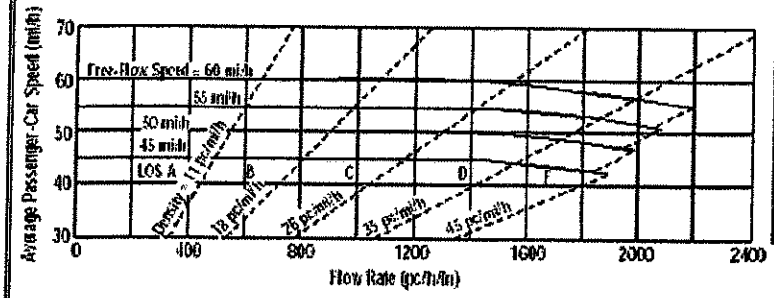
Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	A
Volume to capacity ratio v/c $v/c=V_p/3{,}200$	0.11
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	83
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $VMT_{60}=V*L_t$	266
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	1.6

Notes

1. If v_p >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split v_p>= 1,700 pc/h, terminated anlysis-the LOS is F.

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	TAG
Agency or Company	HDR
Date Performed	2/1/2012
Analysis Time Period	AM Peak Hour

Site Information

Highway/Direction to Travel	IH 45 NBFR
From/To	Malloy Bridge Rd/Mars Rd
Jurisdiction	TxDOT
Analysis Year	2044

Project Description Skyline Landfill Ferris

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	215	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	10
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.952

Speed Inputs

Lane Width, LW (ft)	11.0
Total Lateral Clearence, LC (ft)	2.0
Access Points, A (A/mi)	7
Median Type, M	Divided
FFS (measured)	
Base Free-Flow Speed, BFFS	60.0

Calc Speed Adj and FFS

f_{LW} (mi/h)	1.9
f_{LC} (mi/h)	3.6
f_A (mi/h)	1.8
f_M (mi/h)	0.0
FFS (mi/h)	52.8

Operations

Operational (LOS)

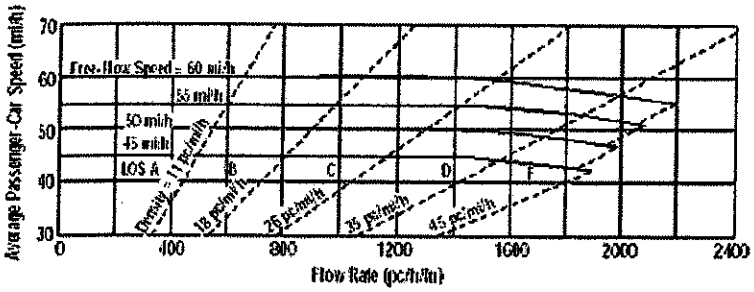
Flow Rate, v_p (pc/h/ln)	118
Speed, S (mi/h)	52.8
D (pc/mi/ln)	2.2
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	TAG
Agency or Company	HDR
Date Performed	2/1/2012
Analysis Time Period	AM Peak Hour

Site Information

Highway/Direction to Travel	IH 45 NBFR
From/To	BR 45/FM 660
Jurisdiction	TxDOT
Analysis Year	2044

Project Description Skyline Landfill Ferris

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	186	Peak-Hour Factor, PHF	0.78
AADT(veh/h)		%Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.995

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	0.0
Access Points, A (A/mi)	6
Median Type, M	Divided
FFS (measured)	
Base Free-Flow Speed, BFFS	52.0

Calc Speed Adj and FFS

f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	5.4
f_A (mi/h)	1.5
f_M (mi/h)	0.0
FFS (mi/h)	45.1

Operations

Operational (LOS)

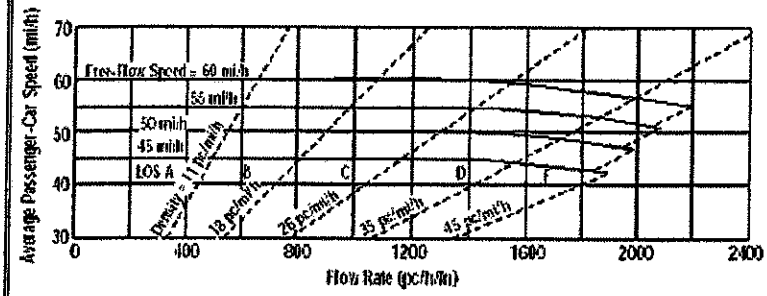
Flow Rate, v_p (pc/h/ln)	119
Speed, S (mi/h)	45.1
D (pc/mi/ln)	2.6
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	TAG
Agency or Company	HDR
Date Performed	2/1/2012
Analysis Time Period	PM Peak Hour

Site Information

Highway/Direction to Travel	IH 45 SBFR
From/To	Mars Rd/Malloy Bridge Rd
Jurisdiction	TxDOT
Analysis Year	2044

Project Description Skyline Landfill Ferris

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	233	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		%Trucks and Buses, P_T	11
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.948

Speed Inputs

Lane Width, LW (ft)	11.0
Total Lateral Clearence, LC (ft)	4.0
Access Points, A (A/mi)	7
Median Type, M	Divided
FFS (measured)	
Base Free-Flow Speed, BFFS	60.0

Calc Speed Adj and FFS

f_{LW} (mi/h)	1.9
f_{LC} (mi/h)	1.8
f_A (mi/h)	1.8
f_M (mi/h)	0.0
FFS (mi/h)	54.5

Operations

Operational (LOS)

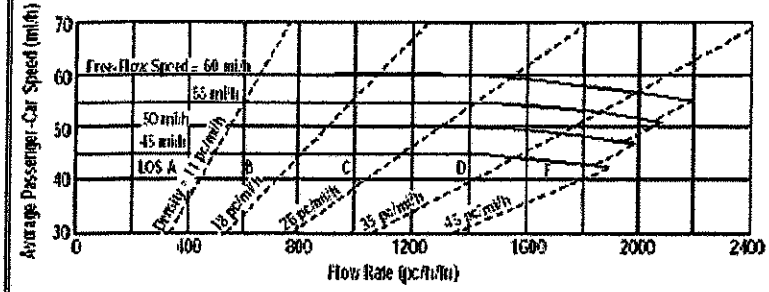
Flow Rate, v_p (pc/h/ln)	133
Speed, S (mi/h)	54.5
D (pc/mi/ln)	2.4
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, H, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	TAG
Agency or Company	HDR
Date Performed	2/1/2012
Analysis Time Period	PM Peak Hour

Site Information

Highway/Direction to Travel	IH 45 SBFR
From/To	FM 660/BR 45
Jurisdiction	TxDOT
Analysis Year	2044

Project Description Skyline Landfill Ferris

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	118	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.995

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	0.0
Access Points, A (A/mi)	13
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	62
Speed, S (mi/h)	45.0
D (pc/mi/ln)	1.4
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

HCM Unsignalized Intersection Capacity Analysis
1: MILLER'S FERRY RD & IH 45 SBFR

11/11/2011

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	7	15	36	5	0	26	0	161	35	94	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	8	17	40	6	0	29	0	179	39	104	1

Volume Total (vph)	24	46	208	39	106
Volume Left (vph)	0	40	29	39	0
Volume Right (vph)	17	0	179	0	1
Hadj (s)	-0.17	0.41	-0.25	0.74	0.23
Departure Headway (s)	4.6	5.1	4.1	5.6	5.1
Degree Utilization, x	0.03	0.07	0.24	0.06	0.15
Capacity (veh/h)	717	648	855	627	692
Control Delay (s)	7.7	8.5	8.4	7.7	7.7
Approach Delay (s)	7.7	8.5	8.4	7.7	
Approach LOS	A	A	A	A	

Delay		8.1		
HCM Level of Service		A		
Intersection Capacity Utilization	33.6%	ICU Level of Service		A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
3: MALLOY BRIDGE RD & IH 45 NBFR

11/11/2011

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	128	54	0	0	68	22	11	3	38	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.86	0.86	0.86
Hourly flow rate (vph)	135	57	0	0	72	23	12	3	40	0	0	0

Volume Total (vph)	192	95	55
Volume Left (vph)	135	0	12
Volume Right (vph)	0	23	40
Hadj (s)	0.31	0.02	-0.23
Departure Headway (s)	4.4	4.3	4.3
Degree Utilization, x	0.24	0.11	0.07
Capacity (veh/h)	797	827	776
Control Delay (s)	8.8	7.8	7.6
Approach Delay (s)	8.8	7.8	7.6
Approach LOS	A	A	A

Delay		8.3	
HCM Level of Service		A	
Intersection Capacity Utilization		26.6%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
4: SKYLINE LANDFILL DRIVEWAY & BR 45

11/11/2011

Lane Configurations						
Volume (veh/h)	29	4	3	165	110	34
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	30	4	3	172	115	35
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	310	132	150			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	310	132	150			
tC, single (s)	6.6	6.4	4.3			
tC, 2 stage (s)						
tF (s)	3.7	3.5	2.4			
p0 queue free %	95	100	100			
cM capacity (veh/h)	647	874	1334			

Volume Total	34	175	150
Volume Left	30	3	0
Volume Right	4	0	35
cSH	668	1334	1700
Volume to Capacity	0.05	0.00	0.09
Queue Length 95th (ft)	4	0	0
Control Delay (s)	10.7	0.2	0.0
Lane LOS	B	A	
Approach Delay (s)	10.7	0.2	0.0
Approach LOS	B		

Average Delay	1.1		
Intersection Capacity Utilization	21.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: 5TH ST & BR 45

11/11/2011

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	38	136	15	87	72	13	19	111	155	8	93	18
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	43	153	17	98	81	15	21	125	174	9	104	20

Volume Total (vph)	212	193	320	134
Volume Left (vph)	43	98	21	9
Volume Right (vph)	17	15	174	20
Hadj (s)	0.01	0.07	-0.30	-0.06
Departure Headway (s)	5.4	5.5	5.0	5.5
Degree Utilization, x	0.32	0.30	0.44	0.20
Capacity (veh/h)	604	593	671	585
Control Delay (s)	11.0	10.9	11.9	9.9
Approach Delay (s)	11.0	10.9	11.9	9.9
Approach LOS	B	B	B	A

Delay	11.1		
HCM Level of Service	B		
Intersection Capacity Utilization	48.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	199	23	151	2	39	5	212	64	1	1	54	112
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	226	26	172	2	44	6	241	73	1	1	61	127

Volume Total (vph)	424	52	315	190
Volume Left (vph)	226	2	241	1
Volume Right (vph)	172	6	1	127
Hadj (s)	-0.12	-0.04	0.17	-0.38
Departure Headway (s)	5.3	6.1	5.7	5.4
Degree Utilization, x	0.63	0.09	0.50	0.29
Capacity (veh/h)	645	490	585	595
Control Delay (s)	16.8	9.7	14.4	10.6
Approach Delay (s)	16.8	9.7	14.4	10.6
Approach LOS	C	A	B	B

Delay	14.4		
HCM Level of Service	B		
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: FM 983 (6TH ST) & FM 983

11/11/2011

Lane Configurations						
Volume (veh/h)	440	30	169	311	16	250
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	530	36	204	375	19	301
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			566		1330	548
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			566		1330	548
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			80		86	44
cM capacity (veh/h)			1011		137	538

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	566	204	375	320
Volume Left	0	204	0	19
Volume Right	36	0	0	301
cSH	1700	1011	1700	457
Volume to Capacity	0.33	0.20	0.22	0.70
Queue Length 95th (ft)	0	19	0	134
Control Delay (s)	0.0	9.5	0.0	29.3
Lane LOS		A		D
Approach Delay (s)	0.0	3.3		29.3
Approach LOS				D

Intersection Summary			
Average Delay	7.7		
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	38	22	42	26	84	15	94	39	102	111	6
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	3	42	24	46	29	92	16	103	43	112	122	7

Volume Total (vph)	69	167	163	241
Volume Left (vph)	3	46	16	112
Volume Right (vph)	24	92	43	7
Hadj (s)	-0.18	-0.26	-0.12	0.09
Departure Headway (s)	4.9	4.7	4.7	4.8
Degree Utilization, x	0.09	0.22	0.21	0.32
Capacity (veh/h)	653	698	722	711
Control Delay (s)	8.5	9.0	8.9	10.0
Approach Delay (s)	8.5	9.0	8.9	10.0
Approach LOS	A	A	A	B

Delay		9.3		
HCM Level of Service		A		
Intersection Capacity Utilization		45.5%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
9: 5TH ST & IH 45 SBFR

11/11/2011

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	290	43	4	140	0	0	0	0	50	108	52
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	319	47	4	154	0	0	0	0	55	119	57

Volume Total (vph)	366	158	114	116
Volume Left (vph)	0	4	55	0
Volume Right (vph)	47	0	0	57
Hadj (s)	-0.06	0.02	0.26	-0.33
Departure Headway (s)	4.7	5.0	6.0	5.4
Degree Utilization, x	0.48	0.22	0.19	0.18
Capacity (veh/h)	738	677	560	616
Control Delay (s)	11.9	9.4	9.2	8.4
Approach Delay (s)	11.9	9.4	8.8	
Approach LOS	B	A	A	

Delay	10.4		
HCM Level of Service	B		
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
10: 5TH ST & IH 45 NBFR

11/11/2011

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	289	51	0	0	52	37	92	194	3	0	0	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	328	58	0	0	59	42	105	220	3	0	0	0

Volume Total (vph)	386	101	215	114
Volume Left (vph)	328	0	105	0
Volume Right (vph)	0	42	0	3
Hadj (s)	0.19	-0.23	0.26	0.00
Departure Headway (s)	5.1	5.1	6.0	5.8
Degree Utilization, x	0.55	0.14	0.36	0.18
Capacity (veh/h)	676	650	568	590
Control Delay (s)	14.2	9.0	11.2	8.8
Approach Delay (s)	14.2	9.0	10.4	
Approach LOS	B	A	B	

Delay	12.0		
HCM Level of Service	B		
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	241	23	27	234	0	0	0	0	107	27	36
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	0	326	31	36	316	0	0	0	0	145	36	49

Volume Total (vph)	357	353	163	67
Volume Left (vph)	0	36	145	0
Volume Right (vph)	31	0	0	49
Hadj (s)	-0.04	0.04	-0.46	-0.49
Departure Headway (s)	5.1	5.2	6.7	5.8
Degree Utilization, x	0.51	0.51	0.31	0.11
Capacity (veh/h)	678	672	488	572
Control Delay (s)	13.2	13.3	11.5	8.3
Approach Delay (s)	13.2	13.3	10.6	
Approach LOS	B	B	B	

Delay		12.6		
HCM Level of Service		B		
Intersection Capacity Utilization	43.8%		ICU Level of Service	A
Analysis Period (min)		15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	39	309	0	0	211	197	50	37	47	0	0	0
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	50	396	0	0	271	253	64	47	60	0	0	0

Volume Total (vph)	446	523	64	108
Volume Left (vph)	50	0	64	0
Volume Right (vph)	0	253	0	60
Hadj (s)	0.04	-0.27	0.52	-0.37
Departure Headway (s)	5.2	4.8	7.3	6.4
Degree Utilization, x	0.64	0.70	0.13	0.19
Capacity (veh/h)	673	733	437	503
Control Delay (s)	17.0	18.2	10.2	9.7
Approach Delay (s)	17.0	18.2	9.9	
Approach LOS	C	C	A	

Delay		16.5		
HCM Level of Service		C		
Intersection Capacity Utilization		56.4%	ICU Level of Service	B
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
1: MILLER'S FERRY RD & IH 45 SBFR

11/11/2011

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	7	14	24	3	0	14	0	84	42	123	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	8	15	26	3	0	15	0	91	46	134	1

Volume Total (vph)	23	29	107	46	135
Volume Left (vph)	0	26	15	46	0
Volume Right (vph)	15	0	91	0	1
Hadj (s)	-0.21	0.36	-0.30	0.69	0.18
Departure Headway (s)	4.4	4.9	4.0	5.4	4.9
Degree Utilization, x	0.03	0.04	0.12	0.07	0.18
Capacity (veh/h)	760	679	869	650	721
Control Delay (s)	7.5	8.2	7.6	7.6	7.8
Approach Delay (s)	7.5	8.2	7.6	7.7	
Approach LOS	A	A	A	A	

Delay		7.7		
HCM Level of Service		A		
Intersection Capacity Utilization	30.6%	ICU Level of Service		A
Analysis Period (min)		15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	58	55	0	0	75	33	6	1	28	0	0	0
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	72	69	0	0	94	41	8	1	35	0	0	0

Volume Total (vph)	141	135	44
Volume Left (vph)	73	0	8
Volume Right (vph)	0	41	35
Hadj (s)	0.20	-0.08	-0.34
Departure Headway (s)	4.3	4.1	4.2
Degree Utilization, x	0.17	0.15	0.05
Capacity (veh/h)	815	869	806
Control Delay (s)	8.2	7.8	7.4
Approach Delay (s)	8.2	7.8	7.4
Approach LOS	A	A	A

Delay		7.9	
HCM Level of Service		A	
Intersection Capacity Utilization		22.8%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
4: SKYLINE LANDFILL DRIVEWAY & BR 45

11/11/2011

Movement	EBL	EBT	EBR	NBL	NBT	NBR
Lane Configurations						
Volume (veh/h)	24	7	6	70	184	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	27	8	7	80	209	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	311	218	226			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	311	218	226			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.3			
p0 queue free %	96	99	99			
cM capacity (veh/h)	658	798	1285			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	35	86	226
Volume Left	27	7	0
Volume Right	8	0	17
cSH	685	1285	1700
Volume to Capacity	0.05	0.01	0.13
Queue Length 95th (ft)	4	0	0
Control Delay (s)	10.5	0.7	0.0
Lane LOS	B	A	
Approach Delay (s)	10.5	0.7	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	20.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: 5TH ST & BR 45

11/18/2011

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	9	39	9	170	71	5	14	72	80	9	140	22
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	10	42	10	183	76	5	15	77	86	10	151	24

Volume Total (vph)	61	265	178	184
Volume Left (vph)	10	183	15	10
Volume Right (vph)	10	5	86	24
Hadj (s)	-0.05	0.14	-0.26	-0.05
Departure Headway (s)	5.2	5.0	4.8	4.9
Degree Utilization, x	0.09	0.37	0.24	0.25
Capacity (veh/h)	624	671	700	673
Control Delay (s)	8.6	11.0	9.2	9.6
Approach Delay (s)	8.6	11.0	9.2	9.6
Approach LOS	A	B	A	A

Delay	9.9		
HCM Level of Service	A		
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
6: FM 983 (6TH ST) & BR 45

11/18/2011

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	107	15	148	1	10	3	131	53	1	4	58	246
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	114	16	157	1	11	3	139	56	1	4	62	262

Volume Total (vph)	287	15	197	328
Volume Left (vph)	114	1	139	4
Volume Right (vph)	157	3	1	262
Hadj (s)	-0.23	-0.10	0.16	-0.46
Departure Headway (s)	5.0	5.6	5.3	4.5
Degree Utilization, x	0.40	0.02	0.29	0.41
Capacity (veh/h)	673	548	638	750
Control Delay (s)	11.2	8.7	10.4	10.7
Approach Delay (s)	11.2	8.7	10.4	10.7
Approach LOS	B	A	B	B

Delay	10.8		
HCM Level of Service	B		
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: FM 983 (6TH ST) & FM 983

11/18/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR
Lane Configurations						
Volume (veh/h)	239	4	113	343	6	69
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	246	4	116	354	6	71
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			251		835	248
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			251		835	248
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		98	91
cM capacity (veh/h)			1321		309	793

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	251	116	354	77
Volume Left	0	116	0	6
Volume Right	4	0	0	71
cSH	1700	1321	1700	705
Volume to Capacity	0.15	0.09	0.21	0.11
Queue Length 95th (ft)	0	7	0	9
Control Delay (s)	0.0	8.0	0.0	10.7
Lane LOS		A		B
Approach Delay (s)	0.0	2.0		10.7
Approach LOS				B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	33.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	104	64	64	21	130	11	146	50	97	131	7
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	13	137	84	84	28	171	14	192	66	128	172	9

Volume Total (vph)	234	283	272	309
Volume Left (vph)	13	84	14	128
Volume Right (vph)	84	171	66	9
Hadj (s)	-0.19	-0.29	-0.12	0.08
Departure Headway (s)	6.1	5.9	6.1	6.2
Degree Utilization, x	0.40	0.47	0.46	0.53
Capacity (veh/h)	514	548	538	532
Control Delay (s)	13.2	14.0	14.1	15.9
Approach Delay (s)	13.2	14.0	14.1	15.9
Approach LOS	B	B	B	C

Delay		14.4		
HCM Level of Service		B		
Intersection Capacity Utilization		59.9%	ICU Level of Service	B
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
9: 5TH ST & IH 45 SBFR

11/11/2011

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	78	45	15	53	0	0	0	0	40	263	180
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	0	88	51	17	60	0	0	0	0	45	296	202

Volume Total (vph)	138	76	193	350
Volume Left (vph)	0	17	45	0
Volume Right (vph)	51	0	0	202
Hadj (s)	-0.20	0.06	0.13	-0.39
Departure Headway (s)	5.0	5.3	5.2	4.7
Degree Utilization, x	0.19	0.11	0.28	0.45
Capacity (veh/h)	675	626	675	751
Control Delay (s)	9.1	9.0	9.0	10.3
Approach Delay (s)	9.1	9.0	9.9	
Approach LOS	A	A	A	

Delay	9.6		
HCM Level of Service	A		
Intersection Capacity Utilization	34.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
10: 5TH ST & IH 45 NBFR

11/11/2011

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	83	35	0	0	24	4	44	76	14	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	90	38	0	0	26	4	48	83	15	0	0	0

Volume Total (vph)	128	30	89	57
Volume Left (vph)	90	0	48	0
Volume Right (vph)	0	4	0	15
Hadr (s)	0.16	-0.07	0.29	-0.17
Departure Headway (s)	4.5	4.3	5.2	4.7
Degree Utilization, x	0.16	0.04	0.13	0.07
Capacity (veh/h)	784	796	674	737
Control Delay (s)	8.3	7.5	7.7	6.9
Approach Delay (s)	8.3	7.5	7.4	
Approach LOS	A	A	A	

Delay		7.8		
HCM Level of Service		A		
Intersection Capacity Utilization		23.6%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
11: FM 660 (8TH ST) & IH 45 SBFR

11/11/2011

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	194	14	30	123	0	0	0	0	217	41	50
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	204	15	32	129	0	0	0	0	228	43	53

Volume Total (vph)	219	161	250	74
Volume Left (vph)	0	32	228	0
Volume Right (vph)	15	0	0	53
Hadj (s)	-0.02	0.06	0.47	-0.48
Departure Headway (s)	5.0	5.2	6.0	5.0
Degree Utilization, x	0.30	0.23	0.41	0.10
Capacity (veh/h)	678	653	581	683
Control Delay (s)	10.2	9.7	11.9	7.4
Approach Delay (s)	10.2	9.7	10.9	
Approach LOS	B	A	B	

Delay		10.4		
HCM Level of Service		B		
Intersection Capacity Utilization		41.2%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	49	362	0	0	118	37	35	18	39	0	0	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	51	377	0	0	123	39	36	19	41	0	0	0

Volume Total (vph)	428	161	36	59
Volume Left (vph)	51	0	36	0
Volume Right (vph)	0	39	0	41
Hadj (s)	0.04	-0.13	0.52	-0.46
Departure Headway (s)	4.4	4.5	6.3	5.4
Degree Utilization, x	0.52	0.20	0.06	0.09
Capacity (veh/h)	804	761	520	607
Control Delay (s)	12.1	8.7	8.6	7.7
Approach Delay (s)	12.1	8.7	8.0	
Approach LOS	B	A	A	

Delay	10.7		
HCM Level of Service	B		
Intersection Capacity Utilization	43.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: MILLER'S FERRY RD & IH 45 SBFR

2/17/2012

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	10	21	51	7	0	36	0	227	49	135	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	11	23	57	8	0	40	0	252	54	150	1

Volume Total (vph)	34	64	292	54	151
Volume Left (vph)	0	57	40	54	0
Volume Right (vph)	23	0	252	0	1
Hadj (s)	-0.17	0.41	-0.25	0.74	0.23
Departure Headway (s)	5.0	5.5	4.3	5.7	5.2
Degree Utilization, x	0.05	0.10	0.35	0.09	0.22
Capacity (veh/h)	646	594	818	605	666
Control Delay (s)	8.2	9.1	9.5	8.1	8.5
Approach Delay (s)	8.2	9.1	9.5	8.4	
Approach LOS	A	A	A	A	

Delay	9.0		
HCM Level of Service	A		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	180	76	0	0	95	31	16	4	53	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	189	80	0	0	100	33	17	4	56	0	0	0

Volume Total (vph)	269	133	77
Volume Left (vph)	189	0	17
Volume Right (vph)	0	33	56
Hadj (s)	0.31	0.02	-0.22
Departure Headway (s)	4.5	4.4	4.6
Degree Utilization, x	0.34	0.16	0.10
Capacity (veh/h)	776	783	719
Control Delay (s)	9.9	8.3	8.1
Approach Delay (s)	9.9	8.3	8.1
Approach LOS	A	A	A

Delay	9.1		
HCM Level of Service	A		
Intersection Capacity Utilization	35.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	SBT	SBR
Lane Configurations					
Volume (veh/h)	45	6	5	229	153	53
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	47	6	5	239	159	55
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	436	187	215			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	436	187	215			
tC, single (s)	6.6	6.4	4.3			
tC, 2 stage (s)						
tF (s)	3.7	3.5	2.4			
p0 queue free %	91	99	100			
cM capacity (veh/h)	545	813	1261			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	53	244	215
Volume Left	47	5	0
Volume Right	6	0	55
cSH	567	1261	1700
Volume to Capacity	0.09	0.00	0.13
Queue Length 95th (ft)	8	0	0
Control Delay (s)	12.0	0.2	0.0
Lane LOS	B	A	
Approach Delay (s)	12.0	0.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	26.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	53	189	21	121	100	18	26	154	215	11	129	25
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	60	212	24	136	112	20	29	173	242	12	145	28

Volume Total (vph)	296	269	444	185
Volume Left (vph)	60	136	29	12
Volume Right (vph)	24	20	242	28
Hadj (s)	0.01	0.07	-0.30	-0.06
Departure Headway (s)	6.6	6.7	6.0	6.8
Degree Utilization, x	0.54	0.50	0.73	0.35
Capacity (veh/h)	489	479	576	449
Control Delay (s)	17.1	16.3	23.6	13.4
Approach Delay (s)	17.1	16.3	23.6	13.4
Approach LOS	C	C	C	B

Delay	18.7		
HCM Level of Service	C		
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	276	32	210	3	54	7	294	89	1	1	75	156
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	314	36	239	3	61	8	334	101	1	1	85	177

Volume Total (vph)	589	73	436	264
Volume Left (vph)	314	3	334	1
Volume Right (vph)	239	8	1	177
Hadj (s)	-0.12	-0.04	0.17	-0.39
Departure Headway (s)	6.4	7.8	6.8	6.8
Degree Utilization, x	1.04	0.16	0.83	0.49
Capacity (veh/h)	557	403	519	514
Control Delay (s)	73.2	12.3	34.8	16.2
Approach Delay (s)	73.2	12.3	34.8	16.2
Approach LOS	F	B	D	C

Delay		46.6		
HCM Level of Service		E		
Intersection Capacity Utilization		81.1%	ICU Level of Service	D
Analysis Period (min)		15		

Lane Configurations						
Volume (veh/h)	611	42	235	432	22	347
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	736	51	283	520	27	418
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			787		1848	761
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			787		1848	761
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			66		51	0
cM capacity (veh/h)			837		55	407

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	787	283	520	445
Volume Left	0	283	0	27
Volume Right	51	0	0	418
cSH	1700	837	1700	294
Volume to Capacity	0.46	0.34	0.31	1.51
Queue Length 95th (ft)	0	38	0	636
Control Delay (s)	0.0	11.5	0.0	280.3
Lane LOS		B		F
Approach Delay (s)	0.0	4.0		280.3
Approach LOS				F

Intersection Summary			
Average Delay	62.8		
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	53	31	58	36	117	21	131	54	142	154	8
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	4	58	34	64	40	129	23	144	59	156	169	9

Volume Total (vph)	97	232	226	334
Volume Left (vph)	4	64	23	156
Volume Right (vph)	34	129	59	9
Hadj (s)	-0.19	-0.26	-0.12	0.09
Departure Headway (s)	5.6	5.3	5.2	5.3
Degree Utilization, x	0.15	0.34	0.33	0.49
Capacity (veh/h)	552	617	630	647
Control Delay (s)	9.6	11.0	10.8	13.2
Approach Delay (s)	9.6	11.0	10.8	13.2
Approach LOS	A	B	B	B

Delay	11.6		
HCM Level of Service	B		
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	403	60	6	194	0	0	0	0	69	150	72
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	443	66	7	213	0	0	0	0	76	165	79

Volume Total (vph)	509	220	158	162
Volume Left (vph)	0	7	76	0
Volume Right (vph)	66	0	0	79
Hadj (s)	-0.06	0.02	0.26	-0.33
Departure Headway (s)	5.1	5.6	6.7	6.1
Degree Utilization, x	0.72	0.34	0.29	0.27
Capacity (veh/h)	686	609	498	554
Control Delay (s)	20.3	11.5	11.2	10.1
Approach Delay (s)	20.3	11.5	10.6	
Approach LOS	C	B	B	

Delay		15.5		
HCM Level of Service		C		
Intersection Capacity Utilization		40.0%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	401	71	0	0	72	51	128	269	4	0	0	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	456	81	0	0	82	58	145	306	5	0	0	0

Volume Total (vph)	536	140	298	157
Volume Left (vph)	456	0	145	0
Volume Right (vph)	0	58	0	5
Hadj (s)	0.19	-0.23	0.26	0.00
Departure Headway (s)	5.6	5.9	6.7	6.4
Degree Utilization, x	0.84	0.23	0.55	0.28
Capacity (veh/h)	629	564	513	537
Control Delay (s)	31.3	10.7	16.5	10.7
Approach Delay (s)	31.3	10.7	14.5	
Approach LOS	D	B	B	

Delay		22.0	
HCM Level of Service		C	
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	335	32	37	325	0	0	0	0	149	37	50
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	0	453	43	50	439	0	0	0	0	201	50	68

Volume Total (vph)	496	489	226	93
Volume Left (vph)	0	50	201	0
Volume Right (vph)	43	0	0	68
Hadj (s)	-0.04	0.04	0.46	-0.49
Departure Headway (s)	5.8	5.9	7.6	6.7
Degree Utilization, x	0.80	0.80	0.48	0.17
Capacity (veh/h)	605	595	439	501
Control Delay (s)	28.0	28.2	16.3	9.8
Approach Delay (s)	28.0	28.2	14.4	
Approach LOS	D	D	B	

Delay	24.8		
HCM Level of Service	C		
Intersection Capacity Utilization	57.0%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	54	429	0	0	293	274	69	51	65	0	0	0
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	69	550	0	0	376	351	88	65	83	0	0	0

Volume Total (vph)	619	727	88	149
Volume Left (vph)	69	0	88	0
Volume Right (vph)	0	351	0	83
Hadj (s)	0.04	-0.27	0.52	-0.38
Departure Headway (s)	5.7	5.5	8.1	7.2
Degree Utilization, x	0.98	1.11	0.20	0.30
Capacity (veh/h)	624	660	439	494
Control Delay (s)	55.8	89.6	11.9	12.0
Approach Delay (s)	55.8	89.6	12.0	
Approach LOS	F	F	B	

Delay	64.8		
HCM Level of Service	F		
Intersection Capacity Utilization	74.4%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	10	19	34	4	0	19	0	119	58	174	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	11	21	37	4	0	21	0	129	63	189	1

Volume Total (vph)	32	41	150	63	190
Volume Left (vph)	0	37	21	63	0
Volume Right (vph)	21	0	129	0	1
Hadj (s)	-0.21	0.37	-0.30	0.69	0.18
Departure Headway (s)	4.7	5.2	4.2	5.5	5.0
Degree Utilization, x	0.04	0.06	0.17	0.10	0.26
Capacity (veh/h)	702	634	836	637	706
Control Delay (s)	7.9	8.6	8.0	7.9	8.6
Approach Delay (s)	7.9	8.6	8.0	8.4	
Approach LOS	A	A	A	A	

Delay	8.3			
HCM Level of Service	A			
Intersection Capacity Utilization	36.4%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	82	77	0	0	104	46	9	1	39	0	0	0
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	102	96	0	0	130	58	11	1	49	0	0	0

Volume Total (vph)	199	188	61
Volume Left (vph)	103	0	11
Volume Right (vph)	0	58	49
Hadj (s)	0.21	-0.08	-0.34
Departure Headway (s)	4.4	4.2	4.4
Degree Utilization, x	0.25	0.22	0.08
Capacity (veh/h)	793	843	749
Control Delay (s)	8.9	8.3	7.8
Approach Delay (s)	8.9	8.3	7.8
Approach LOS	A	A	A

Delay		8.5	
HCM Level of Service		A	
Intersection Capacity Utilization		30.2%	ICU Level of Service A
Analysis Period (min)		15	

Movement	WBL	WBT	WBR	NBL	NBT	NBR
Lane Configurations						
Volume (veh/h)	37	11	9	97	256	23
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	42	12	10	110	291	26
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	435	304	317			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	435	304	317			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.3			
p0 queue free %	92	98	99			
cM capacity (veh/h)	555	713	1189			

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	55	120	317
Volume Left	42	10	0
Volume Right	12	0	26
cSH	585	1189	1700
Volume to Capacity	0.09	0.01	0.19
Queue Length 95th (ft)	8	1	0
Control Delay (s)	11.8	0.8	0.0
Lane LOS	B	A	
Approach Delay (s)	11.8	0.8	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	24.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	12	54	12	236	99	7	19	100	111	12	195	31
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	13	58	13	254	106	8	20	108	119	13	210	33

Volume Total (vph)	84	368	247	256
Volume Left (vph)	13	254	20	13
Volume Right (vph)	13	8	119	33
Hadj (s)	-0.04	0.14	-0.26	-0.05
Departure Headway (s)	6.0	5.6	5.4	5.6
Degree Utilization, x	0.14	0.57	0.37	0.40
Capacity (veh/h)	501	606	603	590
Control Delay (s)	10.0	15.9	11.6	12.3
Approach Delay (s)	10.0	15.9	11.6	12.3
Approach LOS	A	C	B	B

Delay	13.3		
HCM Level of Service	B		
Intersection Capacity Utilization	51.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	149	21	206	1	14	4	182	74	1	6	81	342
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	159	22	219	1	15	4	194	79	1	6	86	364

Volume Total (vph)	400	20	273	456
Volume Left (vph)	159	1	194	6
Volume Right (vph)	219	4	1	364
Hadj (s)	-0.23	-0.10	0.16	-0.46
Departure Headway (s)	5.7	6.8	6.1	5.2
Degree Utilization, x	0.63	0.04	0.46	0.66
Capacity (veh/h)	591	414	547	659
Control Delay (s)	18.0	10.1	14.3	18.0
Approach Delay (s)	18.0	10.1	14.3	18.0
Approach LOS	C	B	B	C

Delay		17.0		
HCM Level of Service		C		
Intersection Capacity Utilization		78.4%	ICU Level of Service	D
Analysis Period (min)		15		

Lane Configurations						
Volume (veh/h)	332	6	157	476	8	96
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	342	6	162	491	8	99
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			348		1160	345
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			348		1160	345
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			87		96	86
cM capacity (veh/h)			1216		188	700

Volume Total	348	162	491	107
Volume Left	0	162	0	8
Volume Right	6	0	0	99
cSH	1700	1216	1700	579
Volume to Capacity	0.20	0.13	0.29	0.19
Queue Length 95th (ft)	0	11	0	17
Control Delay (s)	0.0	8.4	0.0	12.6
Lane LOS		A		B
Approach Delay (s)	0.0	2.1		12.6
Approach LOS				B

Average Delay	2.5		
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	14	144	89	89	29	181	15	203	69	135	182	10
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	18	189	117	117	38	238	20	267	91	178	239	13

Volume Total (vph)	325	393	378	430
Volume Left (vph)	18	117	20	178
Volume Right (vph)	117	238	91	13
Hadj (s)	-0.19	-0.29	-0.12	0.08
Departure Headway (s)	9.0	8.6	8.8	9.0
Degree Utilization, x	0.82	0.94	0.93	1.08
Capacity (veh/h)	376	393	400	397
Control Delay (s)	41.6	60.6	58.5	99.0
Approach Delay (s)	41.6	60.6	58.5	99.0
Approach LOS	E	F	F	F

Delay	66.9		
HCM Level of Service	F		
Intersection Capacity Utilization	78.1%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	108	62	21	74	0	0	0	0	56	365	250
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	0	121	70	24	83	0	0	0	0	63	410	281

Volume Total (vph)	191	107	268	486
Volume Left (vph)	0	24	63	0
Volume Right (vph)	70	0	0	281
Hadj (s)	-0.20	0.06	0.13	-0.39
Departure Headway (s)	5.4	5.8	5.5	5.0
Degree Utilization, x	0.29	0.17	0.41	0.67
Capacity (veh/h)	625	574	644	704
Control Delay (s)	10.6	10.0	11.0	16.2
Approach Delay (s)	10.6	10.0	14.3	
Approach LOS	B	B	B	

Delay		13.2		
HCM Level of Service		B		
Intersection Capacity Utilization		44.2%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	115	49	0	0	33	6	61	106	19	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	125	53	0	0	36	7	66	115	21	0	0	0

Volume Total (vph)	178	42	124	78
Volume Left (vph)	125	0	66	0
Volume Right (vph)	0	7	0	21
Hadj (s)	0.16	-0.08	0.28	-0.17
Departure Headway (s)	4.6	4.6	5.3	4.9
Degree Utilization, x	0.23	0.05	0.18	0.11
Capacity (veh/h)	743	743	651	708
Control Delay (s)	9.0	7.8	8.3	7.2
Approach Delay (s)	9.0	7.8	7.9	
Approach LOS	A	A	A	

Delay		8.3		
HCM Level of Service		A		
Intersection Capacity Utilization		27.6%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	269	19	42	171	0	0	0	0	301	57	69
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	283	20	44	180	0	0	0	0	317	60	73

Volume Total (vph)	303	224	347	103
Volume Left (vph)	0	44	317	0
Volume Right (vph)	20	0	0	73
Hadr (s)	-0.02	0.06	0.47	-0.48
Departure Headway (s)	5.6	5.8	6.5	5.5
Degree Utilization, x	0.47	0.36	0.62	0.16
Capacity (veh/h)	613	585	535	627
Control Delay (s)	13.5	12.0	18.3	8.3
Approach Delay (s)	13.5	12.0	16.1	
Approach LOS	B	B	C	

Delay	14.3		
HCM Level of Service	B		
Intersection Capacity Utilization	53.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	68	503	0	0	164	51	49	25	54	0	0	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	71	524	0	0	171	53	51	26	56	0	0	0

Volume Total (vph)	595	224	51	82
Volume Left (vph)	71	0	51	0
Volume Right (vph)	0	53	0	56
Hadj (s)	0.04	-0.13	0.52	-0.46
Departure Headway (s)	4.6	4.9	6.9	6.0
Degree Utilization, x	0.77	0.31	0.10	0.14
Capacity (veh/h)	759	700	481	553
Control Delay (s)	21.2	10.1	9.5	8.7
Approach Delay (s)	21.2	10.1	9.0	
Approach LOS	C	B	A	

Delay	16.9		
HCM Level of Service	C		
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		