



Midtown Corridor Alternatives Analysis

Operating Plan Report

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Prepared by the
SRF Consulting Group Team
for





Table of Contents

Introduction	1
Existing Service Characteristics	2
<i>Rail Services</i>	<i>2</i>
<i>Bus Services</i>	<i>2</i>
2030 No-Build Service Characteristics	8
<i>Rail Services</i>	<i>8</i>
<i>Bus Services</i>	<i>8</i>
Enhanced Bus on Lake Street Alternative.....	14
<i>Rail Services</i>	<i>14</i>
<i>Bus Services</i>	<i>14</i>
Double/Single-Track Rail in the Greenway Alternative	20
<i>Rail Services</i>	<i>20</i>
<i>Bus Services</i>	<i>22</i>
Dual Alignment Alternative	24
<i>Rail Services</i>	<i>24</i>
<i>Bus Services</i>	<i>24</i>
Operating & Maintenance Costs.....	30

Appendix A Bus Travel Time Estimates

Appendix B Greenway Rail Travel Time and Train Meet Analysis Memorandum

Appendix C Operating Cost Methodology Memorandum

Tables

Table 1 – Route 21 Weekday Operating Plan Existing Service.....	4
Table 2 – Route 21 Saturday Operating Plan Existing Service	5
Table 3 – Route 21 Sunday Operating Plan Existing Service	6
Table 4 – Route 53 Weekday Operating Plan Existing Service.....	7
Table 5 – Route 21 Weekday Operating Plan 2030 No-Build	10
Table 6 – Route 21 Saturday Operating Plan 2030 No-Build	11
Table 7 – Route 21 Sunday Operating Plan 2030 No-Build	12
Table 8 – Route 53 Weekday Operating Plan 2030 No-Build	13
Table 9 – Enhanced Bus Route Travel Time Enhanced Bus on Lake Street Alternative.....	16
Table 10 – Route 21 Weekday Operating Plan Enhanced Bus on Lake Street Alternative	16
Table 11 – Route 21 Saturday Operating Plan Enhanced Bus on Lake Street Alternative.....	17
Table 12 – Route 21 Sunday Operating Plan Enhanced Bus on Lake Street Alternative	17
Table 13 – Enhanced Bus Route Weekday Operating Plan Enhanced Bus on Lake Street Alternative....	18
Table 14 – Enhanced Bus Route Saturday Operating Plan Enhanced Bus on Lake Street Alternative	18
Table 15 – Enhanced Bus Route Sunday Operating Plan Enhanced Bus on Lake Street Alternative	19
Table 16 – Greenway Rail Travel Time Double/Single-Track Rail in the Greenway Alternative.....	21
Table 17 – Greenway Rail Weekday Operating Plan Double/Single-Track Rail in the Greenway Alternative	22
Table 18 – Greenway Rail Saturday Operating Plan Double/Single-Track Rail in the Greenway Alternative	22
Table 19 – Greenway Rail Sunday Operating Plan Double/Single-Track Rail in the Greenway Alternative	22
Table 20 – Enhanced Bus Route Travel Time Dual Alignment Alternative	26
Table 21 – Route 21 Weekday Operating Plan Dual Alignment Alternative.....	26
Table 22 – Route 21 Saturday Operating Plan Dual Alignment Alternative	27
Table 23 – Route 21 Sunday Operating Plan Dual Alignment Alternative	27



Table 24 – Enhanced Bus Route Weekday Operating Plan Dual Alignment Alternative	28
Table 25 – Enhanced Bus Route Saturday Operating Plan Dual Alignment Alternative	28
Table 26 – Enhanced Bus Route Sunday Operating Plan Dual Alignment Alternative	29
Table 27 – Summary of O & M Cost Estimates For Midtown Corridor Alternatives	31
Table 28 – O & M Cost Estimates Assigned Within and Outside Midtown Corridor For Dual Alignment Alternative	32

Figures

Figure 1 – Existing Service Route Schematic.....	2
Figure 2 – 2030 No-Build Route Schematic.....	9
Figure 3 – Enhanced Bus on Lake Street Alternative Route Schematic	15
Figure 4 – Double/Single-Track Rail in the Greenway Alternative Route Schematic.....	23
Figure 4 – Dual Alignment Alternative Route Schematic.....	25



Introduction

This report documents existing and proposed bus and rail operating plans for the Midtown Corridor Transitway alternatives. The following alternatives are being evaluated for this corridor:

- **2030 No-Build Alternative.** This alternative provides a baseline by which to compare corridor alternatives, and is defined as no additional major investments beyond existing service plus committed transit enhancements included in the Metropolitan Council's 2030 Transportation Policy Plan. While no major transit projects are identified for the Midtown Corridor, 2030 No-Build contains significant new projects regionwide, including new LRT segments (Green Line Central Corridor LRT, Green Line Southwest LRT, and Blue Line Bottineau LRT extension), a highway BRT (I-35W), and several enhanced bus routes (West Broadway, Chicago-Emerson/Fremont, Snelling Avenue, Central Avenue and Nicollet Avenue).
- **Enhanced Bus on Lake Street.** This alternative establishes improved bus service over the current local and limited stop bus routes by providing faster, more frequent service between the planned Green Line (Southwest LRT) West Lake Street Station and the Blue Line (Hiawatha LRT) Midtown Station. The enhanced bus route would operate primarily on Lake Street in mixed traffic with some trips extending east to St. Paul, supplanting existing Route 53 Limited Stop service. Diesel electric hybrid buses will be branded with a unique identity to distinguish the service from local bus service.
- **Double/Single-Track Rail in the Greenway.** The 4.4-mile route begins at the planned Green Line West Lake Street Station and ends at the Blue Line Midtown Station, primarily along the Midtown Greenway on a dedicated transitway. While the majority of the route will have two sets of tracks (one set of tracks for each direction), portions of the route will have a single track. Stations average every ½ mile. A streetcar or LRT vehicle will be powered by electricity provided by an overhead wire.
- **Dual Alignment Alternative** (enhanced bus on Lake Street and rail on Greenway). This alternative provides both a rail line in the Greenway as well as enhanced bus on Lake Street.

Operating plans are detailed in this report, documenting the following elements:

- Routes and stations or stops
- Route frequencies
- Travel times
- Service span (hours per day and days per week)
- Operating statistics including fleet requirements, which are used for estimating operating and maintenance costs

Existing Service Characteristics

Transit services operating along the Midtown Corridor include local route 21 and limited stop route 53. The Blue Line LRT defines the eastern limit of the Midtown study area. Three major transit centers serve the study area: Uptown Transit Station, Chicago Lake Transit Center and Lake Street/Midtown Station.

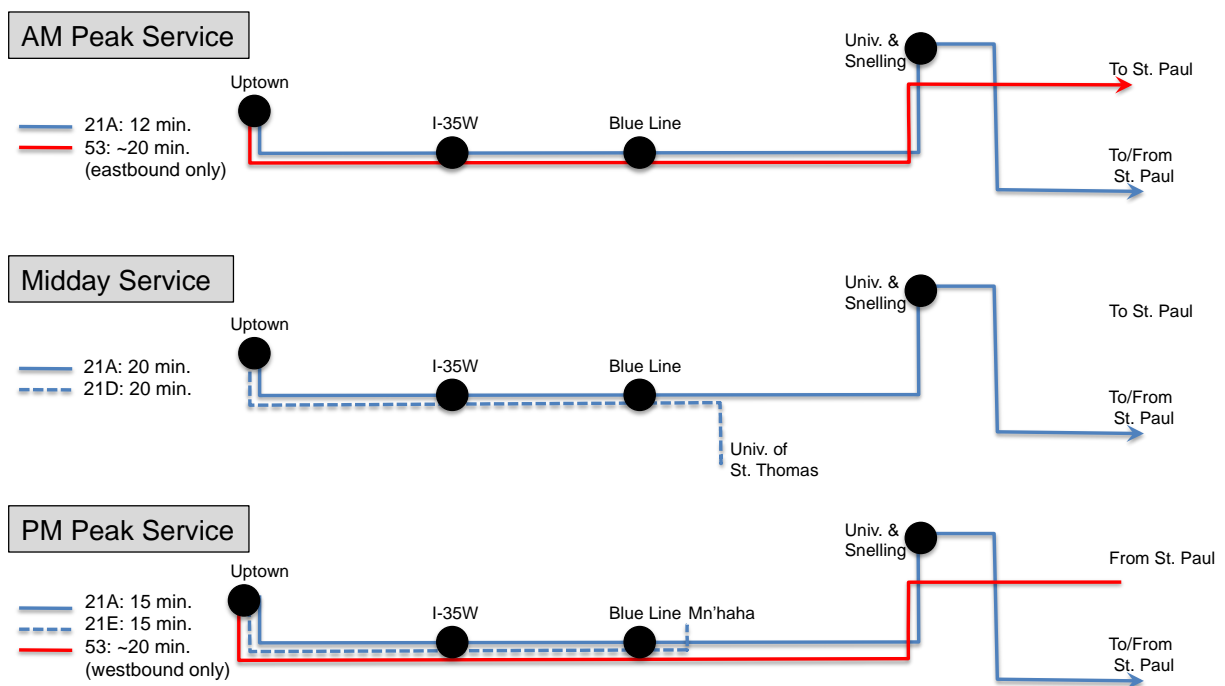
Rail Services

While no rail service currently exists along the Midtown Corridor, the METRO Blue Line provides LRT service along the Hiawatha corridor, stopping at the Lake Street Midtown station. The Blue Line operates from 4am to 1:30 a.m. Sunday through Friday, and operates all 24 hours on Saturday. Service frequencies generally are 10 minutes during the majority of the day, with less frequent service in the early mornings, evenings and at night.

Bus Services

Lake Street is served by local Route 21 and limited stop Route 53. **Figure 1** provides a schematic of the existing transit routes and weekday peak and midday period service frequencies along the Midtown Corridor, which are described in detail below.

Figure 1 – Existing Service Route Schematic





Route 21 Uptown – Lake Street – Selby Avenue

Route 21 has a primary pattern (21A) and two shorter patterns (21D and 21E). A fourth pattern, 21C, only affects a few late night trips. Collectively, the routes operate from 4 a.m. to 1:30 a.m. seven days a week.

- **Route 21A** (Uptown to Union Depot) begins at Uptown Transit Station, heading south on Hennepin and east on Lake. The route turns north at Snelling, east on University and south on Hamline, then east along Selby toward downtown St. Paul. The route penetrates downtown St. Paul using 5th Street (eastbound) or 6th Street (westbound), then Broadway and Kellot to terminate at Union Depot. This pattern operates from 4 a.m. to 12 a.m. weekdays, with 12 minute frequencies in the morning peak, 20 minutes during the midday/evenings, and 15 minutes in the afternoon peak, and 30 minutes in the evening.
- **Route 21D** (Uptown to Summit & Firth) begins at Uptown Transit Station, extending east along Lake Street and turning south at Cretin, terminating at the University of St. Thomas. This pattern operates at 20 minute frequencies in the midday and evenings.
- **Route 21E** (Uptown to Transit Way & 27th) essentially is a short pattern between Uptown Transit Station and the Blue Line Midtown station. Its eastern terminus is about a quarter mile east of the Blue Line Midtown station, at 27th Avenue S and Transit Way. This pattern operates at 15 minutes in the afternoon peak period.

Tables 1 through 3 provide Route 21's operating plan for weekdays, Saturdays and Sundays. Distance, travel times (run times) and service frequencies by service period allows calculation of operating statistics such as the peak buses needed to run service, number of bus trips, revenue bus-hours and revenue bus-miles. The operating statistics presented in Tables 1 through 3 are estimates of typical average weekday, Saturday and Sunday statistics. Route 21 is estimated to require 21 buses in peak period service on weekdays and Saturdays.



**Table 1 – Route 21 Weekday Operating Plan
Existing Service**

Route Pattern	Characteristics Hours of Operation	0400-0600 2.00	0600-0830 2.50	0830-1330 5.00	1330-1700 3.50	1700-2000 3.00	2000-2400 4.00	2400-0130 1.50	TOTAL 21.50
Route 21A 12.3 miles									
Uptown to Union Depot	Frequency	15.00	12.00	20.00	15.00	20.00	30.00	n/a	
	1-Way Run Time	65.00	75.00	75.00	85.00	77.00	70.00	n/a	
	Layover Time	20.00	6.00	30.00	10.00	26.00	10.00	n/a	
	Cycle Time	150.00	156.00	180.00	180.00	180.00	150.00	n/a	
	Peak Buses	10.00	13.00	9.00	12.00	9.00	5.00	0.00	13
	Bus Trips	16	25	30	28	18	16	0	133
	Rev. Bus-Hrs.	20.00	32.50	45.00	42.00	27.00	20.00	0.00	187
	Rev. Bus-Miles	196.80	307.50	369.00	344.40	221.40	196.80	0.00	1,636
Route 21D 6.1 miles									
Uptown to Summit & Finn	Frequency	n/a	n/a	20.00	n/a	20.00	30.00	n/a	
	1-Way Run Time	n/a	n/a	38.00	n/a	38.00	35.00	n/a	
	Layover Time	n/a	n/a	24.00	n/a	24.00	20.00	n/a	
	Cycle Time	n/a	n/a	100.00	n/a	100.00	90.00	n/a	
	Peak Buses	0.00	0.00	5.00	0.00	5.00	3.00	0.00	5
	Bus Trips	0	0	30	0	18	16	0	64
	Rev. Bus-Hrs.	0.00	0.00	25.00	0.00	15.00	12.00	0.00	52
	Rev. Bus-Miles	0.00	0.00	183.00	0.00	109.80	97.60	0.00	390
Route 21E 3.6 miles									
Uptown to Transit Way & 27th	Frequency	n/a	n/a	n/a	15.00	n/a	n/a	n/a	
	1-Way Run Time	n/a	n/a	n/a	34.00	n/a	n/a	n/a	
	Layover Time	n/a	n/a	n/a	22.00	n/a	n/a	n/a	
	Cycle Time	n/a	n/a	n/a	90.00	n/a	n/a	n/a	
	Peak Buses	0.00	0.00	0.00	6.00	0.00	0.00	0.00	6
	Bus Trips	0	0	0	28	0	0	0	28
	Rev. Bus-Hrs.	0.00	0.00	0.00	21.00	0.00	0.00	0.00	21
	Rev. Bus-Miles	0.00	0.00	0.00	100.80	0.00	0.00	0.00	101
Route 21C 7.2 miles									
Uptown to University & Snelling	Frequency	n/a	n/a	n/a	n/a	n/a	n/a	30.00	
	1-Way Run Time	n/a	n/a	n/a	n/a	n/a	n/a	40.00	
	Layover Time	n/a	n/a	n/a	n/a	n/a	n/a	10.00	
	Cycle Time	n/a	n/a	n/a	n/a	n/a	n/a	90.00	
	Peak Buses	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3
	Bus Trips	0	0	0	0	0	0	6	6
	Rev. Bus-Hrs.	0.00	0.00	0.00	0.00	0.00	0.00	4.50	5
	Rev. Bus-Miles	0.00	0.00	0.00	0.00	0.00	0.00	43.20	43
WEEKDAY TOTALS FOR ALL PATTERNS									
	Peak Buses	10.00	13.00	14.00	18.00	14.00	8.00	3.00	18
	Bus Trips	16.00	25.00	60.00	56.00	36.00	32.00	6.00	231
	Rev. Bus-Hrs.	20.00	32.50	70.00	63.00	42.00	32.00	4.50	264
	Rev. Bus-Miles	196.80	307.50	552.00	445.20	331.20	294.40	43.20	2,170



**Table 2 – Route 21 Saturday Operating Plan
Existing Service**

Route	Characteristics	0400-0630	0630-0830	0830-1130	1130-1700	1700-2000	2000-2230	2230-0130	TOTAL
Pattern	Hours of Operation	2.50	2.00	3.00	5.50	3.00	2.50	3.00	21.50
Route 21A	12.3 miles								
Uptown to Union Depot	Frequency	30.00	15.00	20.00	20.00	20.00	30.00	30.00	
	1-Way Run Time	55.00	63.00	72.00	78.00	70.00	65.00	65.00	
	Layover Time	10.00	24.00	16.00	24.00	20.00	20.00	20.00	
	Cycle Time	120.00	150.00	160.00	180.00	160.00	150.00	150.00	
	Peak Buses	4.00	10.00	8.00	9.00	8.00	5.00	5.00	10
	Bus Trips	10	16	18	33	18	10	12	117
	Rev. Bus-Hrs.	10.00	20.00	24.00	49.50	24.00	12.50	15.00	155
	Rev. Bus-Miles	123.00	196.80	221.40	405.90	221.40	123.00	147.60	1,439
Route 21D	6.1 miles								
Uptown to Summit & Finn	Frequency	n/a	n/a	20.00	20.00	20.00	n/a	n/a	
	1-Way Run Time	n/a	n/a	35.00	40.00	38.00	n/a	n/a	
	Layover Time	n/a	n/a	10.00	20.00	24.00	n/a	n/a	
	Cycle Time	n/a	n/a	80.00	100.00	100.00	n/a	n/a	
	Peak Buses	0.00	0.00	4.00	5.00	5.00	0.00	0.00	5
	Bus Trips	0	0	18	33	18	0	0	69
	Rev. Bus-Hrs.	0.00	0.00	12.00	27.50	15.00	0.00	0.00	55
	Rev. Bus-Miles	0.00	0.00	109.80	201.30	109.80	0.00	0.00	421
Route 21E	3.6 miles								
Uptown to Transit Way & 7th	Frequency	n/a	n/a	n/a	20.00	n/a	n/a	n/a	
	1-Way Run Time	n/a	n/a	n/a	31.00	n/a	n/a	n/a	
	Layover Time	n/a	n/a	n/a	18.00	n/a	n/a	n/a	
	Cycle Time	n/a	n/a	n/a	80.00	n/a	n/a	n/a	
	Peak Buses	0.00	0.00	0.00	4.00	0.00	0.00	0.00	4
	Bus Trips	0	0	0	33	0	0	0	33
	Rev. Bus-Hrs.	0.00	0.00	0.00	22.00	0.00	0.00	0.00	22
	Rev. Bus-Miles	0.00	0.00	0.00	118.80	0.00	0.00	0.00	119
Route 21C	7.2 miles								
Uptown to University & Snelling	Frequency	n/a	n/a	n/a	n/a	n/a	30.00	n/a	
	1-Way Run Time	n/a	n/a	n/a	n/a	n/a	40.00	n/a	
	Layover Time	n/a	n/a	n/a	n/a	n/a	10.00	n/a	
	Cycle Time	n/a	n/a	n/a	n/a	n/a	90.00	n/a	
	Peak Buses	0.00	0.00	0.00	0.00	0.00	3.00	0.00	3
	Bus Trips	0	0	0	0	0	10	0	10
	Rev. Bus-Hrs.	0.00	0.00	0.00	0.00	0.00	7.50	0.00	8
	Rev. Bus-Miles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
SATURDAY TOTALS FOR ALL PATTERNS									
	Peak Buses	4.00	10.00	12.00	18.00	13.00	8.00	5.00	18
	Bus Trips	10.00	16.00	36.00	99.00	36.00	20.00	12.00	229
	Rev. Bus-Hrs.	10.00	20.00	36.00	99.00	39.00	20.00	15.00	239
	Rev. Bus-Miles	123.00	196.80	331.20	726.00	331.20	123.00	147.60	1,979



**Table 3 – Route 21 Sunday Operating Plan
Existing Service**

Route	Characteristics	0400-0600	0600-0830	0830-1830	1830-2200	2200-0000	0000-0130	TOTAL
Pattern	Hours of Operation	2.00	2.50	10.00	3.50	2.00	1.50	21.50
Route 21A	12.3 miles							
Uptown to Union Depot	Frequency	60.00	20.00	20.00	30.00	30.00	60.00	n/a
	1-Way Run Time	55.00	72.00	72.00	65.00	55.00	55.00	n/a
	Layover Time	10.00	16.00	16.00	20.00	10.00	10.00	n/a
	Cycle Time	120.00	160.00	160.00	150.00	120.00	120.00	n/a
	Peak Buses	2.00	8.00	8.00	5.00	4.00	2.00	0.00
	Bus Trips	4	15	60	14	8	3	0
	Rev. Bus-Hrs.	4.00	20.00	80.00	17.50	8.00	3.00	0.00
	Rev. Bus-Miles	49.20	184.50	738.00	172.20	98.40	36.90	0.00
Route 21E	3.6 miles							
Uptown to Transit Way & 7th	Frequency	n/a	n/a	20.00	30.00	n/a	n/a	n/a
	1-Way Run Time	n/a	n/a	30.00	26.00	n/a	n/a	n/a
	Layover Time	n/a	n/a	20.00	8.00	n/a	n/a	n/a
	Cycle Time	n/a	n/a	80.00	60.00	n/a	n/a	n/a
	Peak Buses	0.00	0.00	4.00	2.00	0.00	0.00	0.00
	Bus Trips	0	0	60	14	0	0	0
	Rev. Bus-Hrs.	0.00	0.00	40.00	7.00	0.00	0.00	0.00
	Rev. Bus-Miles	0.00	0.00	216.00	50.40	0.00	0.00	0.00
SUNDAY TOTALS FOR ALL PATTERNS								
	Peak Buses	2.00	8.00	12.00	7.00	4.00	2.00	0.00
	Bus Trips	4.00	15.00	120.00	28.00	8.00	3.00	0.00
	Rev. Bus-Hrs.	4.00	20.00	120.00	24.50	8.00	3.00	0.00
	Rev. Bus-Miles	49.20	184.50	954.00	222.60	98.40	36.90	0.00

Route 53 Ltd Stop – Uptown – Lake Street – Marshall Avenue

Route 53 is a limited stop peak period only, peak direction only serving the Lake Street corridor. Route 53 shares the same routing as Route 21 until Snelling. Instead of proceeding up to University, the route continues east on I-94 to downtown St. Paul. The route penetrates downtown St. Paul using 5th Street (eastbound) or 6th Street (westbound), then Wall, 7th Street, Lafayette and University, terminating at University Avenue and Mississippi Street. This limited stop route is available weekdays only, offering eastbound service in the morning peak period and westbound service in the evening peak period. Table 4 provides Route 53's existing weekday operating plan and estimates of existing weekday service statistics.



**Table 4 – Route 53 Weekday Operating Plan
Existing Service**

Route Pattern	Characteristics Hours of Operation	0600-0830 2.50	1500-1800 3.00	TOTAL 5.50
12.0 miles		One-Way Trips		
Uptown to University & Mississippi	Frequency	18.75	n/a	
	1-Way Run Time	55.00	n/a	
	Layover Time	n/a	n/a	
	Cycle Time	n/a	n/a	
	Peak Buses	3.00	0.00	3
	Bus Trips	8	0	8
	Rev. Bus-Hrs.	7.33	0.00	7
	Rev. Bus-Miles	96.00	0.00	96
12.0 miles		One-Way Trips		
Groveland to Lafayette & Uptown	Frequency	n/a	18.00	
	1-Way Run Time	n/a	60.00	
	Layover Time	n/a	n/a	
	Cycle Time	n/a	n/a	
	Peak Buses	0.00	3.33	3
	Bus Trips	0	10	10
	Rev. Bus-Hrs.	0.00	10.00	10
	Rev. Bus-Miles	0.00	120.00	120
WEEKDAY TOTALS FOR ALL PATTERNS				
	Peak Buses	3.00	3.33	3
	Bus Trips	8.00	10.00	18
	Rev. Bus-Hrs.	7.33	10.00	17
	Rev. Bus-Miles	96.00	120.00	216



2030 No-Build Service Characteristics

While there are no major investments in the corridor reflected in 2030 No-Build, bus patterns are simplified and headways revised, offering some modest improvement in transit service frequencies.

Rail Services

Beyond the existing Blue Line LRT, the following LRT lines are assumed to be in place for 2030 No-Build:

- Central Corridor LRT (Green Line)
- Southwest LRT (Green Line extension)
- Bottineau LRT (Blue Line extension)

As the Blue Line Midtown Station defines the eastern end of the Midtown Corridor, the future Green Line extension's West Lake Station defines the western end of the Midtown Corridor.

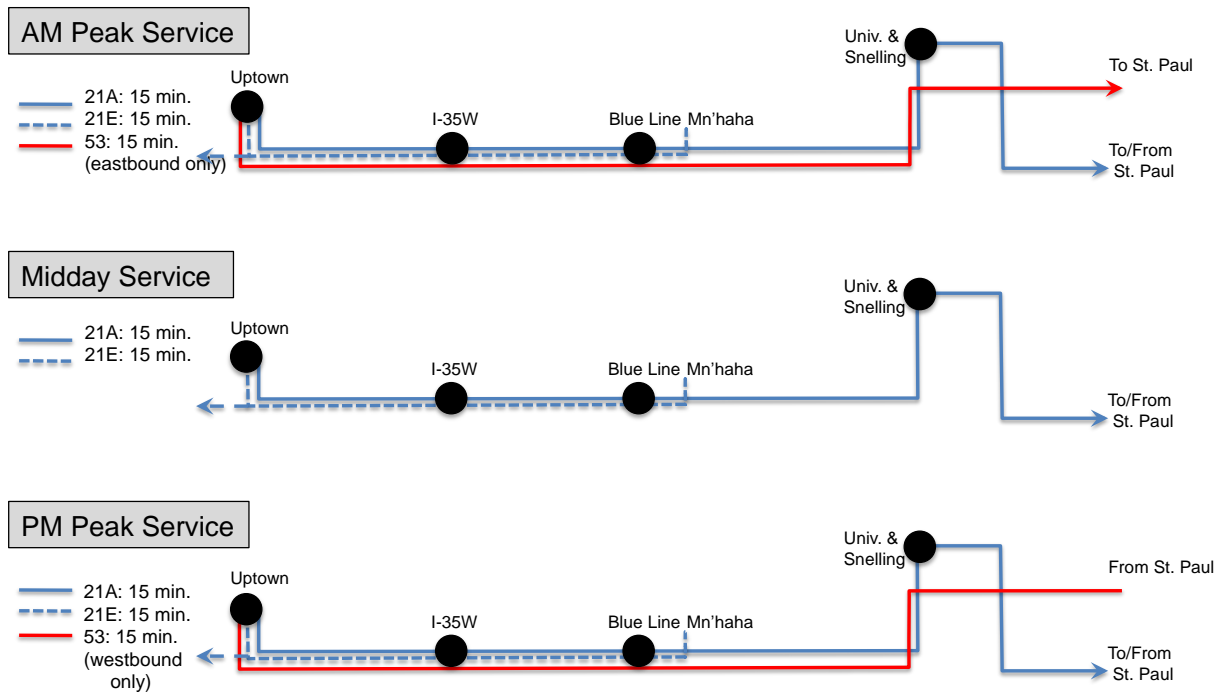
Bus Services

Lake Street continues to be served by local route 21 and limited stop route 53. Route 21 service is simplified to two patterns: 21A to St. Paul, and 21E to Minnehaha (near the Blue Line Midtown Station). The 21E pattern would also connect to the proposed new West Lake Station on the Green Line. Minor frequency improvements are also proposed to Route 53. Compared to existing service, the following differences are defined for 2030 No-Build:

- **Route 21A** (Uptown to Union Depot) adjusts headways to 15 minute frequencies in the morning peak (instead of existing 12 minute headways) and 15 minutes in the midday (instead of 20 minutes). The afternoon peak headway remains at 15 minutes.
- **Route 21D** (Uptown to Summit & Firth) is eliminated, in lieu of improved service on Route 21E.
- **Route 21E** (30 1/2th to Transit Way & 27th) is extended westward to the existing 30 1/2th bus turnaround bus loop (near France Avenue and Lake Street). New morning peak service at 15 minutes and new midday service at 15 minutes is added.
- **Route 53** (Uptown to University & Mississippi) is upgraded to 15-minute frequencies but still operates in the peak period, peak direction only.

Figure 2 provides a schematic of 2030 No-Build transit routes and weekday peak and midday period service frequencies along the Midtown Corridor, which are described in detail below.

**Figure 2 – 2030 No-Build
Route Schematic**



The net result is improved frequencies in the Lake Street corridor between the West Lake Station and Midtown Station:

- In the morning peak, Route 21 frequencies improve from 12 minutes to 7.5 minutes, and Route 53 frequencies from about 18 minutes to 15 minutes.
- In the midday, Route 21 frequencies improve from 10 minute frequencies to 7.5 minute frequencies.
- In the afternoon peak, Route 21 frequencies remain the same but Route 53 frequencies improve from about 18 minutes to 15 minutes.

Tables 5 through 7 provide Route 21's operating plan for weekdays, Saturdays and Sundays, and Table 8 provides Route 53's weekday operating plan. Route 21's peak bus requirement increases from 18 to 20 buses and Route 53's peak bus requirement increases from 3 to 5 peak buses.



**Table 5 – Route 21 Weekday Operating Plan
2030 No-Build**

Route	Characteristics	0400-0500	0500-0900	0900-1500	1500-1800	1800-2200	2200-0130	TOTAL
Pattern	Hours of Operation	1.00	4.00	6.00	3.00	4.00	3.50	21.50
Route 21A	12.3 miles							
Uptown to Union Depot	Frequency	15.00	15.00	15.00	15.00	15.00	20.00	
	1-Way Run Time	68.00	78.00	78.00	89.00	80.00	73.00	
	Layover Time	14.00	24.00	24.00	17.00	20.00	14.00	
	Cycle Time	150.00	180.00	180.00	195.00	180.00	160.00	
	Peak Buses	10.00	12.00	12.00	13.00	12.00	8.00	13
	Bus Trips	8	32	48	24	32	21	165
	Rev. Bus-Hrs.	10.00	48.00	72.00	39.00	48.00	28.00	245
	Rev. Bus-Miles	98.40	393.60	590.40	295.20	393.60	258.30	2,030
Route 21E	5.2 miles							
30th to Transit Way & 27th	Frequency	n/a	15.00	15.00	15.00	15.00	n/a	
	1-Way Run Time	n/a	43.00	45.00	47.00	45.00	n/a	
	Layover Time	n/a	19.00	15.00	11.00	15.00	n/a	
	Cycle Time	n/a	105.00	105.00	105.00	105.00	n/a	
	Peak Buses	0.00	7.00	7.00	7.00	7.00	0.00	7
	Bus Trips	0	32	48	24	32	0	136
	Rev. Bus-Hrs.	0.00	28.00	42.00	21.00	28.00	0.00	119
	Rev. Bus-Miles	0.00	166.40	249.60	124.80	166.40	0.00	707
WEEKDAY TOTALS FOR ALL PATTERNS								
	Peak Buses	10.00	19.00	19.00	20.00	19.00	8.00	20
	Bus Trips	8.00	64.00	96.00	48.00	64.00	21.00	301
	Rev. Bus-Hrs.	10.00	76.00	114.00	60.00	76.00	28.00	364
	Rev. Bus-Miles	98.40	560.00	840.00	420.00	560.00	258.30	2,737



**Table 6 – Route 21 Saturday Operating Plan
2030 No-Build**

Route Pattern	Characteristics	0400-0900	0900-1900	1900-2300	2300-0130	TOTAL
	Hours of Operation	5.00	10.00	4.00	2.50	21.50
Route 21A	12.3 miles					
Uptown to Union Depot	Frequency	20.00	15.00	15.00	20.00	
	1-Way Run Time	66.00	82.00	73.00	68.00	
	Layover Time	28.00	16.00	19.00	24.00	
	Cycle Time	160.00	180.00	165.00	160.00	
	Peak Buses	8.00	12.00	11.00	8.00	12
	Bus Trips	30	80	32	15	157
	Rev. Bus-Hrs.	40.00	120.00	44.00	20.00	224
	Rev. Bus-Miles	369.00	984.00	393.60	184.50	1,931
Route 21E	5.2 miles					
30th to Transit Way & 27th	Frequency	n/a	15.00	n/a	n/a	
	1-Way Run Time	n/a	40.00	n/a	n/a	
	Layover Time	n/a	10.00	n/a	n/a	
	Cycle Time	n/a	90.00	n/a	n/a	
	Peak Buses	0.00	6.00	0.00	0.00	6
	Bus Trips	0	80	0	0	80
	Rev. Bus-Hrs.	0.00	60.00	0.00	0.00	60
	Rev. Bus-Miles	0.00	416.00	0.00	0.00	416
SATURDAY TOTALS FOR ALL PATTERNS						
	Peak Buses	8.00	18.00	11.00	8.00	18
	Bus Trips	30.00	160.00	32.00	15.00	237
	Rev. Bus-Hrs.	40.00	180.00	44.00	20.00	284
	Rev. Bus-Miles	369.00	1400.00	393.60	184.50	2,347



**Table 7 – Route 21 Sunday Operating Plan
2030 No-Build**

Route Pattern	Characteristics	0400-0900	0900-1800	1800-2200	2200-0130	TOTAL
	Hours of Operation	5.00	9.00	4.00	3.50	21.50
Route 21A	12.3 miles					
Uptown to Union Depot	Frequency	30.00	15.00	15.00	30.00	
	1-Way Run Time	72.00	72.00	65.00	55.00	
	Layover Time	36.00	21.00	20.00	10.00	
	Cycle Time	180.00	165.00	150.00	120.00	
	Peak Buses	6.00	11.00	10.00	4.00	11
	Bus Trips	20	72	32	14	138
	Rev. Bus-Hrs.	30.00	99.00	40.00	14.00	183
	Rev. Bus-Miles	246.00	885.60	393.60	172.20	1,697
Route 21E	5.2 miles					
30th/2nd to Transit Way & 27th	Frequency	n/a	15.00	n/a	n/a	
	1-Way Run Time	n/a	41.00	n/a	n/a	
	Layover Time	n/a	23.00	n/a	n/a	
	Cycle Time	n/a	105.00	n/a	n/a	
	Peak Buses	0.00	7.00	0.00	0.00	7
	Bus Trips	0	72	0	0	72
	Rev. Bus-Hrs.	0.00	63.00	0.00	0.00	63
	Rev. Bus-Miles	0.00	374.40	0.00	0.00	374
SUNDAY TOTALS FOR ALL PATTERNS						
	Peak Buses	6.00	18.00	10.00	4.00	18.00
	Bus Trips	20.00	144.00	32.00	14.00	210.00
	Rev. Bus-Hrs.	30.00	162.00	40.00	14.00	246.00
	Rev. Bus-Miles	246.00	1260.00	393.60	172.20	2071.80

**Table 8 – Route 53 Weekday Operating Plan
2030 No-Build**

Route Pattern	Characteristics	0600-0830	1500-1800	TOTAL
	Hours of Operation	2.50	3.00	5.50
	12.0 miles	One-Way Trips		
Uptown to University & Mississippi	Frequency	15.00	n/a	
	1-Way Run Time	58.00	n/a	
	Layover Time	n/a	n/a	
	Cycle Time	n/a	n/a	
	Peak Buses	4.00	0.00	4
	Bus Trips	10	0	10
	Rev. Bus-Hrs.	9.67	0.00	10
	Rev. Bus-Miles	120.00	0.00	120
	12.0 miles	One-Way Trips		
Grove & Lafayette to Uptown	Frequency	n/a	15.00	
	1-Way Run Time	n/a	63.00	
	Layover Time	n/a	n/a	
	Cycle Time	n/a	n/a	
	Peak Buses	0.00	5.00	5
	Bus Trips	0	12	12
	Rev. Bus-Hrs.	0.00	12.60	13
	Rev. Bus-Miles	0.00	144.00	144
WEEKDAY TOTALS FOR ALL PATTERNS				
	Peak Buses	4.00	5.00	5
	Bus Trips	10.00	12.00	22
	Rev. Bus-Hrs.	9.67	12.60	22
	Rev. Bus-Miles	120.00	144.00	264

Enhanced Bus on Lake Street Alternative

This alternative establishes improved bus service over the current local and limited stop bus routes by providing faster, more frequent service between the planned Green Line (Southwest LRT) West Lake Street Station and the Blue Line (Hiawatha LRT) Midtown Station. The enhanced bus route would operate primarily on Lake Street in mixed traffic with some peak period trips extending east to St. Paul, supplanting existing Route 53 Limited Stop service.

Rail Services

The rail network is identical to 2030 No Build, which includes the Hiawatha LRT (Blue Line), Central Corridor LRT (Green Line), Southwest LRT (Green Line extension) and Bottineau LRT (Blue Line extension). The Green Line extension's West Lake Station and the Blue Line's Lake Street-Midtown Station define the western and eastern ends of the Midtown Corridor study area respectively.

Bus Services

Lake Street continues to be served by local route 21. A new enhanced bus route replaces Route 53. The enhanced bus incorporates unique branding and operational improvements, with fewer stops than Route 21. Compared to 2030 No-Build, the following differences are defined for enhanced bus on Lake Street:

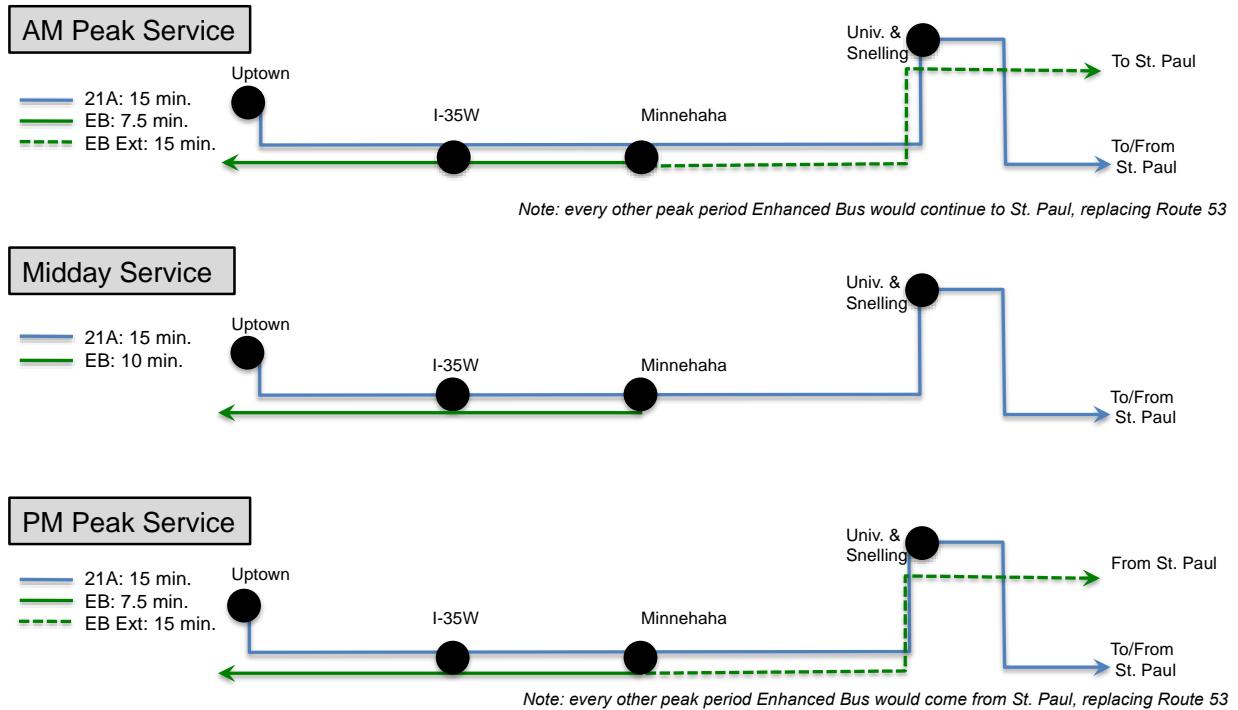
- **Route 21A** (Uptown to Union Depot) is the same as 2030 No-Build, operating at 15 minutes for the majority of the day.
- **Lake Street enhanced bus** is a new route with a 15-minute all-day base pattern from West Lake station to Minnehaha. A second longer pattern from West Lake station to St. Paul operates at 15 minutes in the morning and evening peak, leading to a combined service frequency of 7.5 minutes between West Lake and Minnehaha.
- **Route 21E** (30 1/2th bus turnaround to Transit Way & 27th), and **Route 53** (Uptown to University & Mississippi) are eliminated.

The net result of the enhanced bus alternative is significantly improved frequencies for faster service in the Lake Street corridor between the West Lake Station and Lake Street-Midtown Station:

- In the morning peak, local route frequencies are same as 2030 No-Build at 15 minutes, but enhanced bus service provides 7.5 minute service frequencies in both directions within the study corridor and bi-directional 15 minute service to St. Paul (rather than Route 53's 15 minute service in the peak direction only).
- In the midday, Route 21 frequencies remain at 15 minute frequencies while the enhanced bus route offers 10 minute service frequencies, which results in a combined frequency of 6-minute service (compared to 7.5 minute frequencies under No-Build).
- Afternoon peak frequencies reflect morning peak characteristics.

Figure 3 provides a schematic of this alternative's transit routes and service frequencies along the Midtown Corridor.

**Figure 3 – Enhanced Bus on Lake Street Alternative
Route Schematic**



Travel times for the enhanced bus route were calculated through use of a travel time spreadsheet model that accounts for distances between stops as well as acceleration and deceleration characteristics of the vehicle. Street characteristics such as highway level of service and length of green time at signals are used to calculate delay time, whereas transit improvements such as traffic signal priority are also accounted for in the model.

Route 53 was used to calibrate the runtime model based on actual travel times. The times and distances for the enhanced bus route were then calculated, incorporating traffic signal priority. As seen in Table 9 below, traveling the full length of the base route from Minnehaha to 30th ½ Street on an enhanced bus route under current estimated traffic conditions is estimated at 34:27 minutes.

In order to calculate travel times for the future year horizon of 2030, traffic speeds along Lake Street were compared between the travel demand model's existing year speed and 2030 year speed. The travel demand model reflects a 6.8 percent reduction in Lake Street travel speeds. This factor was applied to the existing year travel time calculation for the enhanced bus route to develop the future year travel time of 36:48.

Detailed travel time estimates for the enhanced bus route for this alternative are provided in Appendix A.



Table 9 – Enhanced Bus Route Travel Time
Enhanced Bus on Lake Street Alternative

From	To	Incremental Distance	Cumul. Distance	Using Existing Speeds		Future Speeds	
				Incremental Time	Cumul. Time	Incremental Time	Cumul. Time
Minneapolis Stop	Blue Line Light Rail Station	0.33	0.33	0:02:22	0:02:22	0:02:31	0:02:31
Blue Line Light Rail Station	Cedar Ave. South	0.42	0.75	0:02:57	0:05:19	0:03:09	0:05:40
Cedar Ave. South	Bloomington Ave. South	0.25	1.00	0:02:03	0:07:21	0:02:11	0:07:51
Bloomington Ave. South	Chicago Ave. South	0.55	1.55	0:03:43	0:11:04	0:03:58	0:11:49
Chicago Ave. South	Portland Ave. South	0.25	1.80	0:02:13	0:13:17	0:02:22	0:14:11
Portland Ave. South	I-35/S. 2nd Avenue	0.31	2.11	0:02:07	0:15:23	0:02:16	0:16:26
I-35/S. 2nd Avenue	Nicollet Avenue	0.19	2.30	0:01:47	0:17:10	0:01:54	0:18:20
Nicollet Avenue	S. Lyndale Avenue	0.50	2.80	0:03:06	0:20:16	0:03:19	0:21:39
S. Lyndale Avenue	S. Dupont Avenue	0.25	3.05	0:02:10	0:22:26	0:02:18	0:23:57
S. Dupont Avenue	Hennepin Ave.	0.26	3.31	0:03:21	0:25:46	0:03:34	0:27:31
Hennepin Ave.	Knox Ave.	0.33	3.64	0:01:38	0:27:24	0:01:44	0:29:16
Knox Ave.	W. Calhoun Pkwy/Dean Pkwy.	0.62	4.26	0:02:51	0:30:15	0:03:03	0:32:19
W. Calhoun Pkwy/Dean Pkwy.	West Lake Station	0.35	4.61	0:01:48	0:32:03	0:01:55	0:34:14
West Lake Station	W. 30th/25th Street Stop	0.35	4.96	0:02:24	0:34:27	0:02:34	0:36:48
		4.96		0:34:27		0:36:48	

Future (2030) travel speeds reflect a 5.8% degradation in travel times, based on travel demand model forecasts.

Tables 10 through 12 provide Route 21's operating plan for weekdays, Saturdays and Sundays, while Tables 13 through 15 provide the weekday, Saturday and Sunday operating plans for the Lake Street enhanced bus route. Overall, the enhanced bus requirement requires 13 buses on Route 21 and 17 buses on the enhanced bus route.

Table 10 – Route 21 Weekday Operating Plan
Enhanced Bus on Lake Street Alternative

Route Pattern	Characteristics Hours of Operation	0400-0500	0500-0900	0900-1500	1500-1800	1800-2200	2200-0130	TOTAL
		1.00	4.00	6.00	3.00	4.00	3.50	
Route 21A	12.3 miles							
Uptown to Union Depot	Frequency	30.00	15.00	15.00	15.00	15.00	20.00	
	1-Way Run Time	68.00	78.00	78.00	89.00	80.00	73.00	
	Layover Time	14.00	24.00	24.00	17.00	20.00	14.00	
	Cycle Time	150.00	180.00	180.00	195.00	180.00	160.00	
	Peak Buses	5.00	12.00	12.00	13.00	12.00	8.00	13
	Bus Trips	4	32	48	24	32	21	161
	Rev. Bus-Hrs.	5.00	48.00	72.00	39.00	48.00	28.00	240
	Rev. Bus-Miles	49.20	393.60	590.40	295.20	393.60	258.30	1,980
WEEKDAY TOTALS								
	Peak Buses	5.00	12.00	12.00	13.00	12.00	8.00	13
	Bus Trips	4.00	32.00	48.00	24.00	32.00	21.00	161
	Rev. Bus-Hrs.	5.00	48.00	72.00	39.00	48.00	28.00	240
	Rev. Bus-Miles	49.20	393.60	590.40	295.20	393.60	258.30	1,980



**Table 11 – Route 21 Saturday Operating Plan
Enhanced Bus on Lake Street Alternative**

Route Pattern	Characteristics Hours of Operation	0400-0900 5.00	0900-1900 10.00	1900-2300 4.00	2300-0130 2.50	TOTAL 21.50
Route 21A	12.3 miles					
Uptown to Union Depot	Frequency	20.00	15.00	15.00	20.00	
	1-Way Run Time	66.00	82.00	73.00	68.00	
	Layover Time	28.00	16.00	19.00	24.00	
	Cycle Time	160.00	180.00	165.00	160.00	
	Peak Buses	8.00	12.00	11.00	8.00	12
	Bus Trips	30	80	32	15	157
	Rev. Bus-Hrs.	40.00	120.00	44.00	20.00	224
	Rev. Bus-Miles	369.00	984.00	393.60	184.50	1,931
SATURDAY TOTALS						
	Peak Buses	8.00	12.00	11.00	8.00	12
	Bus Trips	30.00	80.00	32.00	15.00	157
	Rev. Bus-Hrs.	40.00	120.00	44.00	20.00	224
	Rev. Bus-Miles	369.00	984.00	393.60	184.50	1,931

**Table 12 – Route 21 Sunday Operating Plan
Enhanced Bus on Lake Street Alternative**

Route Pattern	Characteristics Hours of Operation	0400-0900 5.00	0900-1800 9.00	1800-2200 4.00	2200-0130 3.50	TOTAL 21.50
Route 21A	12.3 miles					
Uptown to Union Depot	Frequency	30.00	15.00	15.00	30.00	
	1-Way Run Time	72.00	72.00	65.00	55.00	
	Layover Time	36.00	21.00	20.00	10.00	
	Cycle Time	180.00	165.00	150.00	120.00	
	Peak Buses	6.00	11.00	10.00	4.00	11
	Bus Trips	20	72	32	14	138
	Rev. Bus-Hrs.	30.00	99.00	40.00	14.00	183
	Rev. Bus-Miles	246.00	885.60	393.60	172.20	1,697
SUNDAY TOTALS						
	Peak Buses	6.00	11.00	10.00	4.00	11
	Bus Trips	20.00	72.00	32.00	14.00	138
	Rev. Bus-Hrs.	30.00	99.00	40.00	14.00	183
	Rev. Bus-Miles	246.00	885.60	393.60	172.20	1,697



Table 13 – Enhanced Bus Route Weekday Operating Plan
Enhanced Bus on Lake Street Alternative

Route Pattern	Characteristics	0400-0500	0500-0900	0900-1500	1500-1800	1800-2200	2200-0100	TOTAL
	Hours of Operation	1.00	4.00	6.00	3.00	4.00	3.00	21.00
	4.96 miles							
301/2th to Minnehaha	Frequency	30.00	15.00	10.00	15.00	10.00	30.00	
	1-Way Run Time	29.44	33.12	33.12	36.80	33.12	29.44	
	Layover Time	31.12	23.76	13.76	16.40	13.76	31.12	
	Cycle Time	90.00	90.00	80.00	90.00	80.00	90.00	
	Peak Buses	3.00	6.00	8.00	6.00	8.00	3.00	8
	Bus Trips	4	32	72	24	48	12	192
	Rev. Bus-Hrs.	3.00	24.00	48.00	18.00	32.00	9.00	134
	Rev. Bus-Miles	19.84	158.72	357.12	119.04	238.08	59.52	952
	13.5 miles							
301/2th to St. Paul	Frequency	n/a	15.00	n/a	15.00	n/a	n/a	
	1-Way Run Time	n/a	69.31	n/a	72.99	n/a	n/a	
	Layover Time	n/a	11.38	n/a	19.02	n/a	n/a	
	Cycle Time	n/a	150.00	n/a	165.00	n/a	n/a	
	Peak Buses	0.00	10.00	0.00	11.00	0.00	0.00	11
	Bus Trips	0	32	0	24	0	0	56
	Rev. Bus-Hrs.	0.00	40.00	0.00	33.00	0.00	0.00	73
	Rev. Bus-Miles	0.00	432.00	0.00	324.00	0.00	0.00	756
WEEKDAY TOTALS FOR ALL PATTERNS								
	Peak Buses	3.00	16.00	8.00	17.00	8.00	3.00	17
	Bus Trips	4.00	64.00	72.00	48.00	48.00	12.00	248
	Rev. Bus-Hrs.	3.00	64.00	48.00	51.00	32.00	9.00	207
	Rev. Bus-Miles	19.84	590.72	357.12	443.04	238.08	59.52	1,708

Table 14 – Enhanced Bus Route Saturday Operating Plan
Enhanced Bus on Lake Street Alternative

Route Pattern	Characteristics	0500-0900	0900-1900	1900-2300	2300-0100	TOTAL
	Hours of Operation	4.00	10.00	4.00	2.00	20.00
	4.96 miles					
301/2th to Minnehaha	Frequency	15.00	10.00	15.00	30.00	n/a
	1-Way Run Time	29.81	33.12	29.81	26.50	n/a
	Layover Time	30.38	13.76	15.38	37.01	n/a
	Cycle Time	90.00	80.00	75.00	90.00	n/a
	Peak Buses	6.00	8.00	5.00	3.00	0.00
	Bus Trips	32	120	32	8	0
	Rev. Bus-Hrs.	24.00	80.00	20.00	6.00	0.00
	Rev. Bus-Miles	158.72	595.20	158.72	39.68	0.00
SATURDAY TOTALS FOR ALL PATTERNS						
	Peak Buses	6.00	8.00	5.00	3.00	0.00
	Bus Trips	32.00	120.00	32.00	8.00	0.00
	Rev. Bus-Hrs.	24.00	80.00	20.00	6.00	0.00
	Rev. Bus-Miles	158.72	595.20	158.72	39.68	0.00



**Table 15 – Enhanced Bus Route Sunday Operating Plan
Enhanced Bus on Lake Street Alternative**

Route	Characteristics	0500-0900	0900-1800	1800-2200	2200-0100			TOTAL
Pattern	Hours of Operation	4.00	9.00	4.00	3.00			20.00
4.96 miles								
301/2nd to Minnehaha	Frequency	15.00	10.00	15.00	30.00	n/a	n/a	
	1-Way Run Time	44.81	33.12	29.81	26.50	n/a	n/a	
	Layover Time	0.38	13.76	15.38	37.01	n/a	n/a	
	Cycle Time	90.00	80.00	75.00	90.00	n/a	n/a	
	Peak Buses	6.00	8.00	5.00	3.00	0.00	0.00	8
	Bus Trips	32	108	32	12	0	0	184
	Rev. Bus-Hrs.	24.00	72.00	20.00	9.00	0.00	0.00	125
	Rev. Bus-Miles	158.72	535.68	158.72	59.52	0.00	0.00	913
SUNDAY TOTALS FOR ALL PATTERNS								
	Peak Buses	6.00	8.00	5.00	3.00	0.00	0.00	8
	Bus Trips	32.00	108.00	32.00	12.00	0.00	0.00	184
	Rev. Bus-Hrs.	24.00	72.00	20.00	9.00	0.00	0.00	125
	Rev. Bus-Miles	158.72	535.68	158.72	59.52	0.00	0.00	913

Double/Single-Track Rail in the Greenway Alternative

For this alternative, the Midtown Greenway is considered for either streetcar or LRT service in a dedicated right-of-way adjacent to the existing bikeway, with 10-minute service all day. Existing bus routes 21 and 53 would continue to operate on Lake Street, with revised service frequencies.

Rail Services

As in the other alternatives, the regionwide rail network includes the Blue Line (Hiawatha LRT and Bottineau extension) and Green Line (Central and Southwest LRT). Additionally, this alternative establishes a new 4.4-mile rail service in the Midtown Corridor, anchored by the Green Line extension's West Lake station at the west end of the alignment and the Blue Line's Lake Street-Midtown station at the east end of the alignment. Stations are located at the following locations:

- West Lake (transfer to Green Line)
- Calhoun Beach
- Hennepin Avenue
- Lyndale Avenue S
- Nicollet Avenue
- I-35W/Stevens Avenue
- 5th Avenue S
- Chicago Avenue S
- Bloomington Avenue
- Lake Street-Midtown Station (transfer to Blue Line)

An all-day 10-minute service frequency is proposed for the rail line.

During conceptual engineering, a fully double-tracked concept was considered ideal but a number of bridges were identified that would need to be modified in order to accommodate a second track. In cases where modifying bridges would be particularly challenging, a single-track section was considered. An iterative exercise between engineering and operations disciplines led to a concept which minimizes single-track segments, focusing on each end of the route while leaving the majority of the alignment in between fully double-tracked. Per alignment drawings produced August 16, 2013, single-track sections were confirmed in the following segments:

- While the West Lake platform is double-tracked, once leaving the station the alignment is single-tracked until past the Dean Parkway bridge, making the majority of the route between West Lake Station and Calhoun Beach Station single-tracked.
- On the east end of the alignment, from east of Bloomington Avenue until north of the Lake Street-Midtown Station.

Determining the viability of operations with single-track segments required calculating a travel time using the runtime model, first under ideal conditions where the entire alignment is double-tracked, and then as single-tracked segments were confirmed, slowing operations where the tracks transition

between single- and double-track. This effort is documented in a separate memorandum (July 31, 2013 updated October 18, 2013) and included as Appendix B.

Once the conceptual alignment was determined, a travel time was calculated using a runtime spreadsheet that accounts for acceleration/deceleration of a rail vehicle, distance between stations, and assumed travel speeds given operational conditions and alignment curvature. The end-to-end travel time from the West Lake Station to the Midtown Station was calculated to be about 13 minutes, as shown in Table 15 and detailed in Appendix B. The proposed operating plan for the rail line in the Greenway is detailed in Tables 16 through 18. A total of 4 vehicles are required to provide 10-minute frequencies. A spare vehicle results in a total fleet requirement of 5 rail vehicles.

**Table 16 – Greenway Rail Travel Time
Double/Single-Track Rail in the Greenway Alternative**

Eastbound Run Time Estimate (assumes single track segments)

From	To	Distance [mi]	Total Distance	Run Time (hr:min:sec)	Dwell Time (hr:min:sec)	Time Between Stations	Total Time (hr:min:sec)
West Lake Station	Calhoun Beach Station (at-grade)	0.53	0.53	0:01:19	0:00:20	0:01:39	0:01:39
Calhoun Beach Station (at-grade)	Hennepin Ave Station	0.76	1.29	0:01:30	0:00:20	0:01:50	0:03:29
Hennepin Ave Station	Lyndale Ave S Station	0.51	1.80	0:01:00	0:00:20	0:01:20	0:04:49
Lyndale Ave S Station	Nicollet Ave Station	0.50	2.30	0:00:59	0:00:20	0:01:19	0:06:08
Nicollet Ave Station	I-35W/Stevens Ave Station	0.13	2.43	0:00:28	0:00:20	0:00:48	0:06:56
I-35W/Stevens Ave Station	5th Ave S Station (at-grade)	0.31	2.74	0:00:45	0:00:20	0:01:05	0:08:01
5th Ave S Station (at-grade)	Chicago Ave S Station	0.34	3.08	0:00:47	0:00:20	0:01:07	0:09:08
Chicago Ave S Station	Bloomington Ave Station	0.50	3.58	0:00:59	0:00:20	0:01:19	0:10:27
Bloomington Ave Station	Midtown Station (at-grade)	0.77	4.35	0:02:10	0:00:20	0:02:30	0:12:57
Totals			4.35	0:09:57	0:03:00	Avg. Speed (mph):	0:12:57 20.15

Westbound Run Time Estimate (assumes single track segments)

From	To	Incr. Dist.	Total Distance	Run Time (hr:min:sec)	Dwell Time (hr:min:sec)	Time Between Stations	Total Time (hr:min:sec)
Midtown Station (at-grade)	Bloomington Ave Station	0.77	0.77	0:02:10	0:00:20	0:02:30	0:02:30
Bloomington Ave Station	Chicago Ave S Station	0.50	1.27	0:00:59	0:00:20	0:01:19	0:03:49
Chicago Ave S Station	5th Ave S Station (at-grade)	0.34	1.61	0:00:47	0:00:20	0:01:07	0:04:56
5th Ave S Station (at-grade)	I-35W/Stevens Ave Station	0.31	1.92	0:00:45	0:00:20	0:01:05	0:06:01
I-35W/Stevens Ave Station	Nicollet Ave Station	0.13	2.05	0:00:28	0:00:20	0:00:48	0:06:49
Nicollet Ave Station	Lyndale Ave S Station	0.50	2.55	0:00:59	0:00:20	0:01:19	0:08:08
Lyndale Ave S Station	Hennepin Ave Station	0.51	3.06	0:01:00	0:00:20	0:01:20	0:09:28
Hennepin Ave Station	Calhoun Beach Station (at-grade)	0.76	3.82	0:01:30	0:00:20	0:01:50	0:11:18
Calhoun Beach Station (at-grade)	West Lake Station	0.53	4.35	0:01:17	0:00:20	0:01:37	0:12:55
Totals			4.35	0:09:55	0:03:00	Avg. Speed (mph):	0:12:55 20.21

Note:

Includes single track segments between West Lake and Calhoun Beach Stations, and east of Bloomington Avenue to Midtown Station approach.



Table 17 – Greenway Rail Weekday Operating Plan
Double/Single-Track Rail in the Greenway Alternative

Characteristics	0400-0500	0500-1800	1800-2200	2200-0100	TOTAL
Hours of Operation	1.00	13.00	4.00	3.00	21.00
Distance: 4.35 miles					
Frequency	15.00	10.00	15.00	20.00	
1-Way Run Time	12.9	12.9	12.9	12.9	
Layover Time	19.13	14.13	19.13	n/a	
Cycle Time	45.00	40.00	45.00	40.00	
Peak Vehicles	3	4	3	2	4
Train Trips	8	156	32	18	214
Rev. Train-Hrs.	3.00	52.00	12.00	6.00	73
Rev. Train-Miles	34.80	678.60	139.20	78.30	931

Table 18 – Greenway Rail Saturday Operating Plan
Double/Single-Track Rail in the Greenway Alternative

Characteristics	0500-0900	0900-1900	1900-2300	2300-0100	TOTAL
Hours of Operation	4.00	10.00	4.00	2.00	20.00
Distance: 4.35 miles					
Frequency	15.00	10.00	15.00	20.00	
1-Way Run Time	12.9	12.9	12.9	12.9	
Layover Time	19.13	14.13	19.13	14.13	
Cycle Time	45.00	40.00	45.00	40.00	
Peak Vehicles	3	4	3	2	4
Train Trips	32	120	32	12	196
Rev. Train-Hrs.	12.00	40.00	12.00	4.00	68
Rev. Train-Miles	139.20	522.00	139.20	52.20	853

Table 19 – Greenway Rail Sunday Operating Plan
Double/Single-Track Rail in the Greenway Alternative

Characteristics	0500-0900	0900-1800	1800-2200	2200-0100	TOTAL
Hours of Operation	4.00	9.00	4.00	3.00	20.00
Distance: 4.35 miles					
Frequency	15.00	10.00	15.00	20.00	
1-Way Run Time	12.9	12.9	12.9	12.9	
Layover Time	19.13	14.13	19.13	14.13	
Cycle Time	45.00	40.00	45.00	40.00	
Peak Vehicles	3	4	3	2	4
Train Trips	32	108	32	18	190
Rev. Train-Hrs.	12.00	36.00	12.00	6.00	66
Rev. Train-Miles	139.20	469.80	139.20	78.30	827

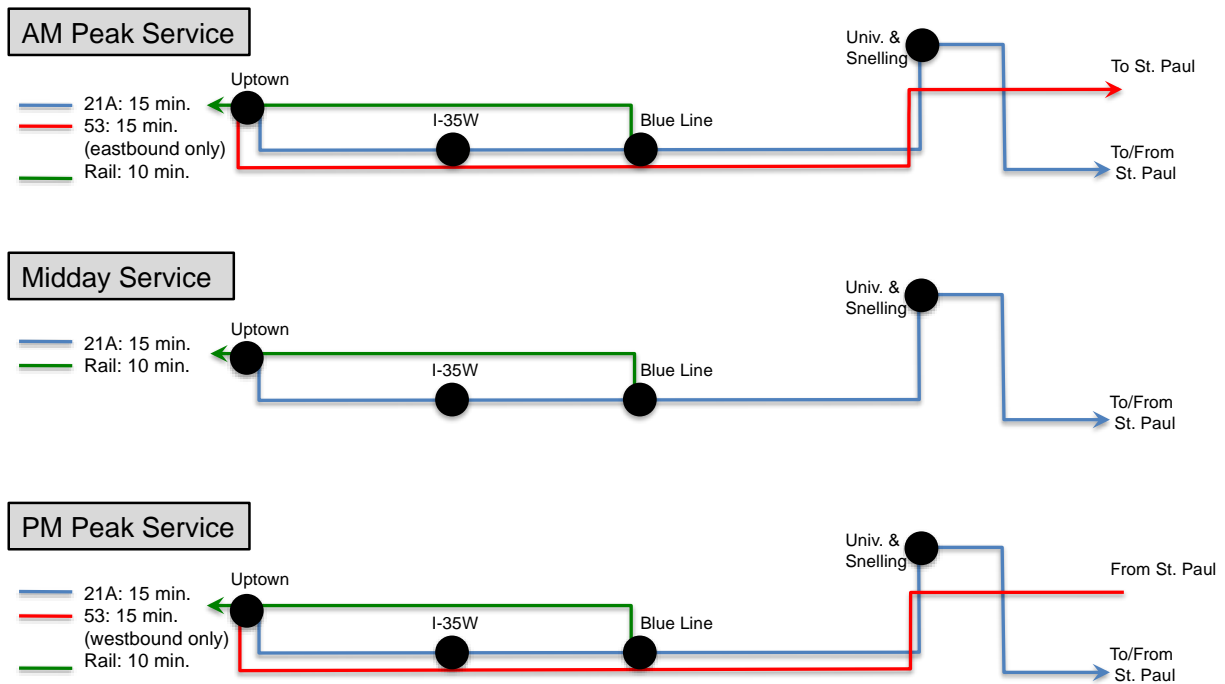
Bus Services

Lake Street continues to be served by local route 21 and limited route 53 in this alternative. In recognition that the Greenway rail line adds substantial parallel service, Route 21 is provided as a single pattern with a basic all-day frequency of 15 minutes with an identical operating plan as what is

proposed for Route 21 under the Enhanced Bus alternative, as previously shown in Tables 10 through 12 under the Enhanced Bus Alternative. Route 53 remains at the same level as No-Build, with 15-minute peak period only, peak direction service, as previously shown in Table 8 in the No-Build Alternative. Routes 21 and 53 require a total of 18 buses for peak period operations under this alternative.

Figure 4 provides a schematic of this alternative’s bus and rail transit routes and service frequencies along the Midtown Corridor.

**Figure 4 – Double/Single-Track Rail in the Greenway Alternative
Route Schematic**



Dual Alignment Alternative

The dual alignment alternative is a hybrid of the other build alternatives, providing both a rail line in the Greenway and enhanced bus service on Lake Street. This alternative provides a new 4.4-mile rail service in the Midtown Corridor, as defined for the double/single-track rail in the Greenway alternative. The enhanced bus route would operate primarily on Lake Street in mixed traffic with some peak period trips extending east to St. Paul, supplanting existing Route 53 Limited Stop service.

Rail Services

As in the other alternatives, the regionwide rail network includes the Blue Line (Hiawatha LRT and Bottineau extension) and Green Line (Central and Southwest LRT). The Midtown Corridor's Greenway rail line would provide stations at the following locations:

- West Lake (transfer to Green Line)
- Calhoun Beach
- Hennepin Avenue
- Lyndale Avenue S
- Nicollet Avenue
- I-35W/Stevens Avenue
- 5th Avenue S
- Chicago Avenue S
- Bloomington Avenue
- Midtown Station (transfer to Blue Line)

The dual alignment alternative's rail line is defined identically to the rail project described for the double/single-track rail in the Greenway alternative. The end-to-end travel time from the West Lake Station to the Lake Street-Midtown Station was calculated to be about 13 minutes, as shown in Table 15 in the previous section of the report; rail operating plans are identical to those previously presented in Tables 16 through 18. A total of 4 peak/5 fleet rail vehicles are required to operate at the proposed 10-minute service frequency.

Bus Services

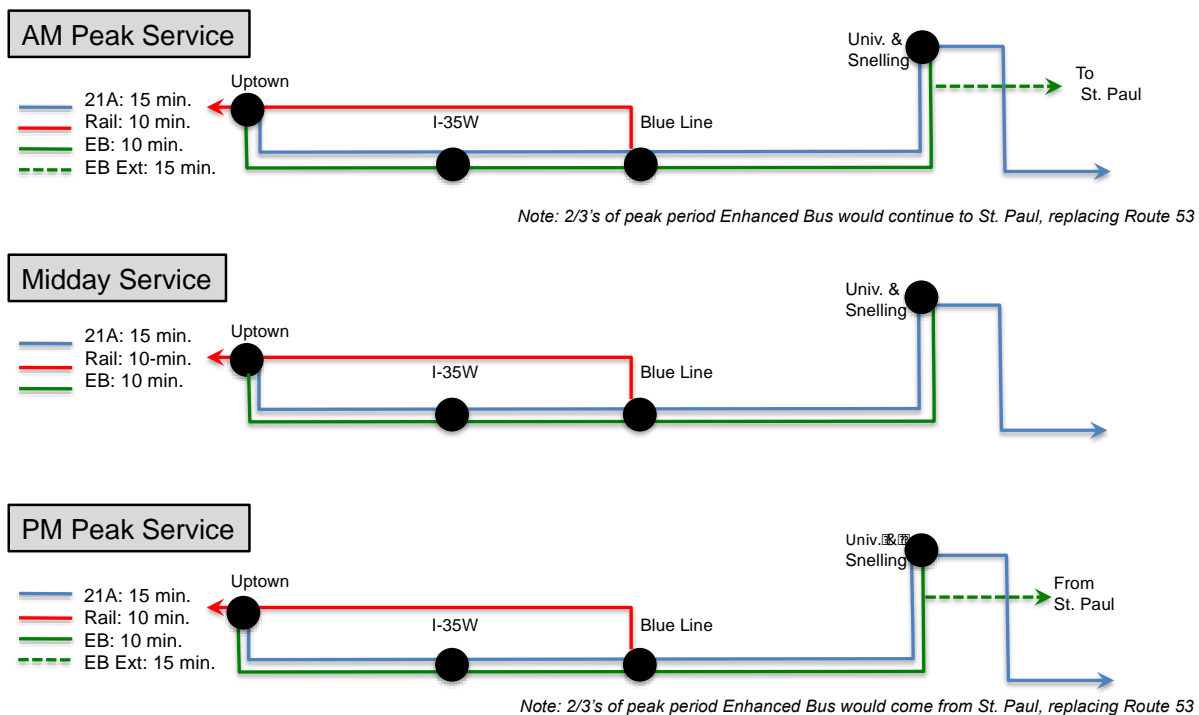
Lake Street continues to be served by local route 21. A new enhanced bus route replaces Route 53. Compared to the Enhanced Bus Alternative,

- **Route 21** (Uptown to Union Depot) is the same as the enhanced bus alternative, based on the Route 21A pattern and operating at 15 minutes for the majority of the day. However, in the late evenings service frequencies are scaled back to 30-minutes, since the rail line is assumed to operate 20-minute service frequencies during that period. As in the enhanced bus alternative, patterns to Summit & Firth (21D) and Transit Way & 27th (21E) are eliminated.
- **Lake Street Enhanced Bus** provides a 10-minute all-day base pattern from Uptown Transit Center to Minnehaha. In the peak period, two out of three buses continue on to St. Paul, leading to an average frequency of 15 minutes in the morning and evening peak, which allows

elimination of existing Route 53. The western terminus of the enhanced bus route remains at Uptown Transit Center rather than serving the West Lake station, as West Lake is served by the rail line. The 10-minute service frequency is similar to midday service levels for the enhanced bus alternative, but less frequent than the enhanced bus alternative's 7.5-minute service frequencies between West Lake and Minnehaha.

Figure 4 provides a schematic of this alternative's transit routes and service frequencies along the Midtown Corridor, which are described in detail below.

**Figure 4 – Dual Alignment Alternative
Route Schematic**



Travel times for the enhanced bus route were calculated as described for the enhanced bus alternative. As seen in Table 19 below, traveling the full length of the base route from Minnehaha to Uptown Station is estimated at 42:08 minutes based on existing speeds, and 44:23 based on future speeds (future speeds estimated with a 6.8% degradation in travel speeds west of Minnehaha and 3.4% east of Minnehaha, based on travel model speed forecasts). Detailed travel times for the enhanced bus route for the dual alignment alternative are included in Appendix A.



**Table 20 – Enhanced Bus Route Travel Time
Dual Alignment Alternative**

From	To	Incremental Distance	Cumul. Distance	Using Existing Speeds		Future Speeds	
				Incremental Time	Cumul. Time	Incremental Time	Cumul. Time
University Ave./Green Line LRT	Spruce Tree Ave.	0.06	0.06	0:00:41	0:00:41	0:00:42	0:00:42
Spruce Tree Ave.	Fry Ave.	0.95	1.01	0:03:35	0:04:16	0:03:42	0:04:25
Fry Ave.	Fairview Ave.	0.50	1.51	0:01:54	0:06:10	0:01:58	0:06:23
Fairview Ave.	Cleveland Ave.	0.50	2.01	0:02:03	0:08:13	0:02:07	0:08:30
Cleveland Ave.	Cretin Ave.	0.25	2.26	0:01:20	0:09:33	0:01:23	0:09:52
Cretin Ave.	Otis Ave.	0.27	2.53	0:01:15	0:10:48	0:01:18	0:11:10
Otis Ave.	S. 4th Ave.	0.59	3.12	0:02:09	0:12:57	0:02:13	0:13:24
S. 4th Ave.	S. 6th Ave.	0.50	3.62	0:02:04	0:15:02	0:02:09	0:15:32
S. 6th Ave.	S. 1st Ave.	0.33	3.95	0:01:24	0:16:25	0:01:27	0:16:59
S. 1st Ave.	Minneapolis Ave.	0.35	4.30	0:01:31	0:17:57	0:01:35	0:18:33
Minneapolis Ave.	Blue Line LRT Station	0.25	4.55	0:01:56	0:19:53	0:02:04	0:20:37
Blue Line LRT Station	Cedar Ave. South	0.42	4.97	0:02:57	0:22:50	0:03:09	0:23:47
Cedar Ave. South	Bloomington Ave. South	0.25	5.22	0:02:03	0:24:53	0:02:11	0:25:58
Bloomington Ave. South	Chicago Ave. South	0.55	5.77	0:03:43	0:28:35	0:03:58	0:29:55
Chicago Ave. South	Portland Ave. South	0.25	6.02	0:02:13	0:30:48	0:02:22	0:32:17
Portland Ave. South	I-35/S. 2nd Avenue	0.31	6.33	0:02:07	0:32:55	0:02:16	0:34:33
I-35/S. 2nd Avenue	Nicollet Avenue	0.19	6.52	0:01:47	0:34:42	0:01:54	0:36:27
Nicollet Avenue	S. Lyndale Avenue	0.50	7.02	0:03:06	0:37:48	0:03:19	0:39:45
S. Lyndale Avenue	S. Dupont Avenue	0.25	7.27	0:02:10	0:39:57	0:02:18	0:42:04
S. Dupont Avenue	Uptown Station	0.27	7.54	0:02:11	0:42:08	0:02:20	0:44:23
		7.54		0:42:08		0:44:23	

Future (2030) Travel Speeds reflect a 5.8% degradation in travel times east of Minneapolis and a 3.4% west of Minneapolis, based on travel demand model forecasts.

Tables 20 through 22 provide Route 21's operating plan for weekdays, Saturdays and Sundays, while Tables 23 through 25 provide the weekday, Saturday and Sunday operating plans for the Lake Street enhanced bus route. Overall, the Enhanced Bus Requirement requires 13 buses on Route 21 and 13 buses on the enhanced bus route.

**Table 21 – Route 21 Weekday Operating Plan
Dual Alignment Alternative**

Route	Characteristics	0400-0500	0500-0900	0900-1500	1500-1800	1800-2200	2200-0130	TOTAL
Pattern	Hours of Operation	1.00	4.00	6.00	3.00	4.00	3.50	21.50
Route 21A	12.3 miles							
Uptown to Union Depot	Frequency	30.00	15.00	15.00	15.00	15.00	30.00	
	1-Way Run Time	68.00	78.00	78.00	89.00	80.00	73.00	
	Layover Time	14.00	24.00	24.00	17.00	20.00	34.00	
	Cycle Time	150.00	180.00	180.00	195.00	180.00	180.00	
	Peak Buses	5.00	12.00	12.00	13.00	12.00	6.00	13
	Bus Trips	4	32	48	24	32	14	154
	Rev. Bus-Hrs.	5.00	48.00	72.00	39.00	48.00	21.00	233
	Rev. Bus-Miles	49.20	393.60	590.40	295.20	393.60	172.20	1,894
WEEKDAY TOTALS								
	Peak Buses	5.00	12.00	12.00	13.00	12.00	6.00	13
	Bus Trips	4.00	32.00	48.00	24.00	32.00	14.00	154
	Rev. Bus-Hrs.	5.00	48.00	72.00	39.00	48.00	21.00	233
	Rev. Bus-Miles	49.20	393.60	590.40	295.20	393.60	172.20	1,894



**Table 22 – Route 21 Saturday Operating Plan
Dual Alignment Alternative**

Route Pattern	Characteristics Hours of Operation	0400-0900 5.00	0900-1900 10.00	1900-2300 4.00	2300-0130 2.50	TOTAL 21.50
Route 21A	12.3 miles					
Uptown to Union Depot	Frequency	30.00	15.00	20.00	30.00	
	1-Way Run Time	66.00	82.00	73.00	68.00	
	Layover Time	28.00	16.00	14.00	14.00	
	Cycle Time	160.00	180.00	160.00	150.00	
	Peak Buses	5.33	12.00	8.00	5.00	12
	Bus Trips	20	80	24	10	134
	Rev. Bus-Hrs.	26.67	120.00	32.00	12.50	191
	Rev. Bus-Miles	246.00	984.00	295.20	123.00	1,648
SATURDAY TOTALS FOR ALL PATTERNS						
	Peak Buses	5.33	12.00	8.00	5.00	12
	Bus Trips	20.00	80.00	24.00	10.00	134
	Rev. Bus-Hrs.	26.67	120.00	32.00	12.50	191
	Rev. Bus-Miles	246.00	984.00	295.20	123.00	1,648

**Table 23 – Route 21 Sunday Operating Plan
Dual Alignment Alternative**

Route Pattern	Characteristics Hours of Operation	0400-0900 5.00	0900-1800 9.00	1800-2200 4.00	2200-0130 3.50	TOTAL 21.50
Route 21A	12.3 miles					
Uptown to Union Depot	Frequency	30.00	15.00	30.00	30.00	
	1-Way Run Time	72.00	72.00	65.00	55.00	
	Layover Time	36.00	21.00	20.00	10.00	
	Cycle Time	180.00	165.00	150.00	120.00	
	Peak Buses	6.00	11.00	5.00	4.00	11
	Bus Trips	20	72	16	14	122
	Rev. Bus-Hrs.	30.00	99.00	20.00	14.00	163
	Rev. Bus-Miles	246.00	885.60	196.80	172.20	1,501
SUNDAY TOTALS						
	Peak Buses	6.00	11.00	5.00	4.00	11
	Bus Trips	20.00	72.00	16.00	14.00	122
	Rev. Bus-Hrs.	30.00	99.00	20.00	14.00	163
	Rev. Bus-Miles	246.00	885.60	196.80	172.20	1,501



**Table 24 – Enhanced Bus Route Weekday Operating Plan
Dual Alignment Alternative**

Route Pattern	Characteristics Hours of Operation	0400-0500 1.00	0500-0900 4.00	0900-1500 6.00	1500-1800 3.00	1800-2200 4.00	2200-0100 3.00	TOTAL 21.00
7.54 miles								
Uptown Station to University & Snelling	Frequency	n/a	30.00	10.00	30.00	15.00	30.00	
	1-Way Run Time	n/a	39.95	39.95	44.38	39.95	35.51	
	Layover Time	n/a	40.11	20.11	31.23	10.11	18.99	
	Cycle Time	n/a	120.00	100.00	120.00	90.00	90.00	
	Peak Buses	0.00	4.00	10.00	4.00	6.00	3.00	10
	Bus Trips	0	16	72	12	32	12	144
	Rev. Bus-Hrs.	0.00	16.00	60.00	12.00	24.00	9.00	121
	Rev. Bus-Miles	0.00	79.36	357.12	59.52	158.72	59.52	714
12.0 miles								
Uptown Station to St. Paul	Frequency	n/a	15.00	n/a	15.00	n/a	n/a	
	1-Way Run Time	n/a	56.56	n/a	61.00	n/a	n/a	
	Layover Time	n/a	21.89	n/a	13.01	n/a	n/a	
	Cycle Time	n/a	135.00	n/a	135.00	n/a	n/a	
	Peak Buses	0.00	9.00	0.00	9.00	0.00	0.00	9
	Bus Trips	0	32	0	24	0	0	56
	Rev. Bus-Hrs.	0.00	36.00	0.00	27.00	0.00	0.00	63
	Rev. Bus-Miles	0.00	384.00	0.00	288.00	0.00	0.00	672
WEEKDAY TOTALS FOR ALL PATTERNS								
	Peak Buses	0.00	13.00	10.00	13.00	6.00	3.00	13
	Bus Trips	0.00	48.00	72.00	36.00	32.00	12.00	200
	Rev. Bus-Hrs.	0.00	52.00	60.00	39.00	24.00	9.00	184
	Rev. Bus-Miles	0.00	463.36	357.12	347.52	158.72	59.52	1,386

**Table 25 – Enhanced Bus Route Saturday Operating Plan
Dual Alignment Alternative**

Route	Characteristics	0500-0900	0900-1900	1900-2300	2300-0100			TOTAL
Pattern	Hours of Operation	4.00	10.00	4.00	2.00			20.00
7.54 miles								
Uptown Station to University & Snelling	Frequency	15.00	15.00	15.00	30.00	n/a	n/a	
	1-Way Run Time	35.95	39.95	35.95	31.96	n/a	n/a	
	Layover Time	18.10	10.11	18.10	26.09	n/a	n/a	
	Cycle Time	90.00	90.00	90.00	90.00	n/a	n/a	
	Peak Buses	6.00	6.00	6.00	3.00	0.00	0.00	6
	Bus Trips	32	80	32	8	0	0	152
	Rev. Bus-Hrs.	24.00	60.00	24.00	6.00	0.00	0.00	114
	Rev. Bus-Miles	241.28	603.20	241.28	60.32	0.00	0.00	1,146
SATURDAY TOTALS FOR ALL PATTERNS								
	Peak Buses	6.00	6.00	6.00	3.00	0.00	0.00	6
	Bus Trips	32.00	80.00	32.00	8.00	0.00	0.00	152
	Rev. Bus-Hrs.	24.00	60.00	24.00	6.00	0.00	0.00	114
	Rev. Bus-Miles	241.28	603.20	241.28	60.32	0.00	0.00	1,146



**Table 26 – Enhanced Bus Route Sunday Operating Plan
Dual Alignment Alternative**

Route	Characteristics	0500-0900	0900-1800	1800-2200	2200-0100			TOTAL
Pattern	Hours of Operation	4.00	9.00	4.00	3.00			20.00
7.54 miles								
Uptown Station to University & Snelling	Frequency	15.00	15.00	15.00	30.00	n/a	n/a	
	1-Way Run Time	50.95	39.95	35.95	31.96	n/a	n/a	
	Layover Time	-11.90	0.11	3.10	26.09	n/a	n/a	
	Cycle Time	90.00	80.00	75.00	90.00	n/a	n/a	
	Peak Buses	6.00	5.33	5.00	3.00	0.00	0.00	6
	Bus Trips	32	72	32	12	0	0	148
	Rev. Bus-Hrs.	24.00	48.00	20.00	9.00	0.00	0.00	101
	Rev. Bus-Miles	241.28	542.88	241.28	90.48	0.00	0.00	1,116
SUNDAY TOTALS FOR ALL PATTERNS								
	Peak Buses	6.00	5.33	5.00	3.00	0.00	0.00	6
	Bus Trips	32.00	72.00	32.00	12.00	0.00	0.00	148
	Rev. Bus-Hrs.	24.00	48.00	20.00	9.00	0.00	0.00	101
	Rev. Bus-Miles	241.28	542.88	241.28	90.48	0.00	0.00	1,116



Operating & Maintenance Costs

Annual operating and maintenance (O & M) costs were calculated for each of the alternatives, through use of an O & M cost model. The methodology is described in a separate memorandum dated May 20, 2013 and included in Appendix C. O & M cost estimates are based on levels of service provided and facilities that are to be maintained. Annual service statistics (revenue bus-hours and bus-miles) assume 255 weekdays, 52 Saturdays and 58 Sundays/Holidays of service, and utilize the daily estimates presented in the operating plan tables shown earlier in this report. Tables 26 presents a summary of O & M costs for all Midtown alternatives. Greenway rail costs are based on LRT cost methodology, with some adjustments where appropriate (e.g., smaller stations than typical LRT stations). Key results are summarized below:

- No-Build's additional annual cost of \$2.8 million over existing service is associated with providing improvements in service frequencies mostly in the morning peak period and midday.
- The enhanced bus alternative is estimated to cost \$6.8 million annually over the No-Build alternative to establish a new enhanced bus line offering all-day service seven days a week, replacing Route 53's weekday peak period, peak direction only service.
- The double/single-track rail in the Greenway alternative costs \$8.1 million annually over the No-Build alternative to provide all-day service seven days a week.
- The dual alignment alternative, at an annual cost of \$14.6 over the No-Build, is the highest-cost alternative as it provides both the enhanced bus route as well as rail service in the Greenway.

For the dual alignment alternative, O & M costs were split to designate costs related to the Midtown Corridor versus costs outside of the Midtown Corridor. These assigned costs are summarized in Table 27. About \$3.2 million is attributed to enhanced bus service improvements outside the Midtown Corridor.



**Table 27 – Summary of O & M Cost Estimates
For Midtown Corridor Alternatives
Rail Costs based on LRT O & M Cost Methodology (2012 \$s)**

Transit Service	Transit Service	Cost Drivers	Unit Cost (\$2012)	No-Build Alternative	Enhanced Bus Alternative	Greenway Streetcar Alt.	Dual Alignment Alt.
New Corridor Services	Arterial BRT	Peak Buses	\$36,330	0	17	0	13
		Annual Rev. Bus-Hours	\$75.25	0	66,795	0	58,706
		Annual Rev. Bus-Miles (60' Bus)	\$3.55	0	538,075	0	477,811
		Total Directional Stops	\$18,250	0	28	0	40
		Intersections with TSP	<u>\$2,800</u>	<u>0</u>	<u>27</u>	<u>0</u>	<u>36</u>
		Change in O&M Cost (from Existing)		\$0	\$8,140,600	\$0	\$7,416,800
	Streetcar	Peak Streetcar Vehicles	\$57,387.00	0	0	4	4
		Annual Rev. Car-Hours	\$171.02	0	0	25,979	24,937
		Annual Rev. Car-Miles	\$1.98	0	0	329,652	311,521
		Total Directional Route Miles	\$209,305	0	0	7.66	7.66
		Total Stations	\$55,402	0	0	10	10
		Stations with Elevators	\$20,000	0	0	7	7
		Streetcar Yard & Shop	<u>\$1,071,986</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>
		Change in O&M Cost (from Existing)		\$0	\$0	\$8,694,500	\$8,480,400
Changes in Background Services	Route 21	Peak Buses	\$38,730	2	-5	-5	-5
		Annual Rev. Bus-Hours	\$63.02	31,697	-6,697	-6,697	-6,697
		Annual Rev. Bus-Miles (40' Bus)	<u>\$3.05</u>	<u>194,103</u>	<u>-42,126</u>	<u>-42,126</u>	<u>-42,126</u>
		Change in O&M Cost (from Existing)		\$2,667,000	-\$744,200	-\$744,200	-\$744,200
	Route 53	Peak Buses	\$38,730	2	-3	2	-3
		Annual Rev. Bus-Hours	\$63.02	1,258	-4,420	1,258	-4,420
		Annual Rev. Bus-Miles (40' Bus)	<u>\$3.05</u>	<u>12,240</u>	<u>-55,080</u>	<u>12,240</u>	<u>-55,080</u>
		Change in O&M Cost (from Existing)		\$194,100	-\$562,700	\$194,100	-\$562,700
NET ADDITIONAL OPERATING COSTS FOR CORRIDOR SERVICE				\$2,861,100	\$6,833,700	\$8,144,400	\$14,590,300

Notes:

1. Rail methodology uses LRT unit costs for peak vehicles, car-hours, car-miles, directional route-miles and stations (with station costs reduced to account for smaller facilities).
2. Unit costs from project O&M cost methodology paper prepared 5/20/13. Costs driven by directional route miles factored by 1.10 to account for turf track that is unique to this project.



**Table 28 – O & M Cost Estimates Assigned Within and Outside Midtown Corridor
For Dual Alignment Alternative
Rail Costs based on LRT O & M Cost Methodology (2012 \$s)**

Transit Service	Transit Service	Cost Drivers	Unit Cost (\$2012)	Dual Alignment Alt.	Dual Alignment	
					Midtown	E. of Midtown
New Corridor Services	Arterial BRT	Peak Buses	\$36,330	13	7	6
		Annual Rev. Bus-Hours	\$75.25	58,706	33,121	25,585
		Annual Rev. Bus-Miles (60' Bus)	\$3.55	477,811	293,941	183,870
		Total Directional Stops	\$18,250	40	20	20
		Intersections with TSP	<u>\$2,800</u>	<u>36</u>	23	13
		Change in O&M Cost (from Existing)		\$7,416,800	\$4,219,500	\$3,197,300
	Streetcar	Peak Streetcar Vehicles	\$57,387.00	4	4	0
		Annual Rev. Car-Hours	\$171.02	24,937	24,937	0
		Annual Rev. Car-Miles	\$1.98	311,521	311,521	0
		Total Directional Route Miles	\$209,305	7.66	7.66	0
		Total Stations	\$55,402	10	10	0
		Stations with Elevators	\$20,000	7	7	0
		Streetcar Yard & Shop	<u>\$1,071,986</u>	<u>1</u>	<u>1</u>	<u>0</u>
		Change in O&M Cost (from Existing)		\$8,480,400	\$8,480,400	\$0
Changes in Background Services	Route 21	Peak Buses	\$38,730	-5	-5	0
		Annual Rev. Bus-Hours	\$63.02	-6,697	-6,697	0
		Annual Rev. Bus-Miles (40' Bus)	<u>\$3.05</u>	<u>-42,126</u>	<u>-42,126</u>	<u>0</u>
		Change in O&M Cost (from Existing)		-\$744,200	-\$744,200	\$0
	Route 53	Peak Buses	\$38,730	-3	-3	0
		Annual Rev. Bus-Hours	\$63.02	-4,420	-4,420	0
		Annual Rev. Bus-Miles (40' Bus)	<u>\$3.05</u>	<u>-55,080</u>	<u>-55,080</u>	<u>0</u>
		Change in O&M Cost (from Existing)		-\$562,700	-\$562,700	\$0
NET ADDITIONAL OPERATING COSTS FOR CORRIDOR SERVICE				\$14,590,300	\$11,393,000	\$3,197,300

Notes:

1. Rail methodology uses LRT unit costs for peak vehicles, car-hours, car-miles, directional route-miles and stations (with station costs reduced to account for smaller facilities).
2. Unit costs from project O&M cost methodology paper prepared 5/20/13. Costs driven by directional route miles factored by 1.10 to account for turf track that is unique to this project.
3. Dual alignment costs Arterial BRT costs split on the basis of route-miles for the Uptown to Snelling/University route pattern only.