

Appendix A: List of Maps, Figures, and Tables

Chapter 1 INTRODUCTION

Maps – Chapter 1

Map 1.1: The Lincoln Park neighborhood in Duluth, MN.....1

Map 1.2: Study area boundaries2

Figures – Chapter 1

Figure 1.1: US Highway 53 overpass at 22nd Avenue W4

Chapter 2 STAKEHOLDER INPUT

Maps – Chapter 2

Map 2.1: A summary of input received related to motor vehicles10

Map 2.2: A summary of input received related to Heavy Trucks.....11

Map 2.3: A summary of input received related to transit.....12

Map 2.4: A summary of input received related to bikes & pedestrians.....13

Figures – Chapter2

Figure 2.1: Coordinated stakeholder engagement model.....5

Figure 2.2: Project webpage8

Figure 2.3: Heavy commercial truck crossing the Cross City Trail in Lincoln Park9

Tables – Chapter 2

Table 2.1: Stakeholders representing the City of Duluth’s Lincoln Park Small Area Plan (SAP) committee6

Table 2.2: Professional transportation stakeholders representing the MIC Technical Advisory Committee (TAC).....6

Table 2.3: Key stakeholders identified for one-on-one engagement7

Chapter 3 EXISTING CONDITIONS & ANALYSIS

Maps – Chapter 3

Map 3.1: Alternative through routes & regional trails	24
Map 3.2: Highway 23 context zones & West Duluth neighborhoods	25
Map 3.3: Transit frequency	29
Map 3.4: Daily transit boarding & alighting	29
Map 3.5: Posted speeds on Highway 23	31

Figures – Chapter 3

Figure 3.1: View of Lincoln Park from Skyline Parkway	14
Figure 3.2: Higher density, mixed-use urban form in sub-area 9	15
Figure 3.3: Estimates of future households by study sub-area by year 2040	26
Figure 3.4: Estimates of added jobs by study sub-area by year 2040	27
Figure 3.5: Household projections for the Lincoln Park study	27
Figure 3.6: Employment projections for the Lincoln Park study	27
Figure 3.7: Estimated changes in job types by growth scenario (year 2040)	28
Figure 3.8: Daily trip estimates of future growth scenarios (year 2040)	28

Tables – Chapter 3

Table 3.1: Land-use types in Lincoln Park	14
Table 3.2: Higher density, mixed-use urban form in sub-area 9	15
Table 3.3: Zoning Districts within the Lincoln Park study area	18
Table 3.4: Job and trip-generation estimates of employment zones	19
Table 3.5: Unit estimates of key land use types in each sub-area in the Lincoln Park neighborhood	21

Table 3.6: Trip generation rates and daily for Lincoln Park neighborhood sub-areas.....	21
Table 3.7: Average running slope for roads within the Lincoln Park sub-areas.....	22
Table 3.8: Household (HH) characteristics by study sub-area	23
Table 3.9: Growth scenarios and assumptions used for analysis.....	25

Chapter 4 THE ROAD NETWORK

Maps – Chapter 4

Map 4.1: Functional classification of roadways within the Lincoln Park neighborhood	31
Map 4.2: Annual Average Daily Traffic (AADT) in the Lincoln Park Neighborhood (2012)	32
Map 4.3: Annual Average Daily Traffic (AADT) for intersections in the Lincoln Park Neighborhood (2012).....	33
Map 4.4: Key thoroughfares and stop controls on the local street network in Lincoln Park	35
Map 4.5: Potential improved connection between W 3rd Street and Piedmont Avenue	36
Map 4.6: Roadway access to regional arterials and key activity centers with access concerns	37
Map 4.7: Potential connection between Anson Ave and W 10th St.....	38
Map 4.8: Potential improved connection between Lower Michigan St and Courtland St	38
Map 4.9: Location of off-street surface parking space in the business areas of the Lincoln Park neighborhood.....	39
Map 4.10: Change in annual average daily traffic (AADT): years 1992 to 2012	42
Map 4.11: Locations of poor level of service (LOS) - PM peak hour of traffic (year 2015)	42
Map 4.12: Priority pavements identified as being in “poor” condition.....	50

Figures – Chapter 4

Figure 4.1: View of US Highway 53 from W 5th Street & 22nd Avenue W	30
Figure 4.2: Roadway classification and intended function.....	31
Figure 4.3: On-street parking on Superior Street between Garfield Ave and 18th Ave - Weekday, midmorning	39

Figure 4.4: Underutilized off-street parking space underneath US Highway 53.....	40
Figure 4.5: Location of the renovated Esmond building.....	40
Figure 4.6: On-street parking demand along 27th Avenue W.....	40
Figure 4.7: US Highway 53 - before and after.....	41
Figure 4.8: Congestion on Piedmont Ave during PM peak hour of traffic.....	43
Figure 4.9: 24th Ave W at W 3rd St during PM peak hour of traffic.....	43
Figure 4.10: Superior St at Lower Michigan St during Weekday PM peak traffic.....	44
Figure 4.11: 27th Ave W between Superior St and Michigan St - PM peak hour of traffic.....	44
Figure 4.12: Location of high-volume adjacent intersections on 27th Ave W.....	44
Figure 4.13: Comparison of peak periods of traffic - adjacent intersections on 27th Ave W.....	44
Figure 4.14: Directional counts at Superior St & 27th Ave W - Oct 30, 2014 (4:15 pm to 5:15 pm).....	45
Figure 4.15: Directional counts at Michigan St & 27th Ave W - Nov 6, 2014 (4:15 pm to 5:15 pm).....	45
Figure 4.16: PM peak traffic by direction - Intersection of 27th Ave W & Michigan St.....	46
Figure 4.17: PM peak queue length for southbound traffic vs. actual storage space - 27th Ave W & Michigan St.....	46
Figure 4.18: 25-year growth scenarios for daily vehicle-miles traveled (DVMT) for the local street network in Lincoln Park.....	47
Figure 4.19: Example of pavement in “poor” condition - 20th Avenue W.....	47
<i>Tables – Chapter 4</i>	
Table 4.1: Commute-to-work trips: Duluth and US (5-Yr est., 2009 -2013).....	30
Table 4.2: Key thoroughfares of the local street network in the Lincoln Park neighborhood.....	34
Table 4.3: Roadway miles in and daily vehicle miles traveled (DVMT) - Lincoln Park neighborhood - years 2000 and 2012.....	41
Table 4.4: Level of Service (LOS) ratings of traffic congestion for road segments.....	43

Table 4.5: Vehicle-capacity (V/C) ratios for critical lane groups at the intersections of Superior St & 27th Ave W and Michigan St & 27th Ave W	46
Table 4.6: Estimates of operations at 27th Ave W & Michigan St traffic signal	46
Table 4.7: 25-year growth scenarios for trip-demand in Lincoln Park (local street network)	47
Table 4.8: 25-year growth scenarios for daily vehicle-miles traveled (DVMT) per functional class in Lincoln Park	47
Table 4.9: Ranges of annual average daily traffic (AADT) on 27th Avenue W and Piedmont Avenue under two 2040 growth scenarios	46

Chapter 5: THE FREIGHT NETWORK

Maps – Chapter 5

Map 5.1: Rail lines, designated truck routes, and intermodal facilities in the Lincoln Park study area	54
Map 5.2: Regional truck routes and weight-restricted segments	56
Map 5.3: Percent of traffic that is heavy trucks & 10-yr change in that percentage (year 2012)	60

Figures – Chapter 5

Figure 5.1: Heavy truck traveling on US 53 in Lincoln Park	53
Figure 5.2: The CN ore docks	53
Figure 5.3: Relation of Truck Center Drive to truck routes	54
Figure 5.4: Restricted commercial truck traffic on W 1st St	55
Figure 5.5: Bypass connections for oversize/overweight loads on US 53	57
Figure 5.6: OS/OW staging area on “Upper” Piedmont Avenue	57
Figure 5.7: Height restriction on Jenswold Street	57
Figure 5.8: MnDOT Vehicle Classifications	58
Figure 5.9: Percentage of heavy vehicle crash incidents in the Lincoln Park Study Area (2009-2013)	58
Figure 5.10: Heavy truck traveling on Superior Street in the Lincoln Park CBD	59

Figure 5.11: Key intersections and One-way segment in the Lincoln Park CBD	59
Figure 5.12: The intersection of Superior Street & Garfield Avenue	61
Figure 5.13: Comparison of typical semi-truck lengths with the available storage space - Southbound, 27th Ave W & Michigan St. .	61
Figure 5.14: Peak traffic counts at Michigan Street & 27th Avenue W	62
<i>Tables – Chapter 5</i>	
Table 5.1: AADT and HCAADT Comparisons for years 2002, 2007, and 2012	60

Chapter 6: THE TRANSIT SYSTEM

Maps – Chapter 6

Map 6.1: Transit routes and key transfer points within the Lincoln Park study area	66
Map 6.2: Transit-supportive areas and relative service levels of transit routes within Lincoln Park	67
Map 6.3: Transit routes connecting Lincoln Park to key destinations and activity centers in the Duluth-Superior metropolitan area	71
Map 6.4: Geographic comparison of transit service scores with transit demand scores for Lincoln Park sub-areas	73
Map 6.5: Average daily boardings and alightings at bus stops within the Lincoln Park study area.....	73

Figures – Chapter 6

Figure 6.1: A DTA west mainline bus making a stop on Superior Street near the Garfield Avenue transfer point to Superior, Wisconsin.....	65
Figure 6.2: The bus stop at W 2nd Street & 21st Avenue W.....	66
Figure 6.3: The bus stop at Superior Street & Garfield Avenue W	67
Figure 6.4: Hours of operation for transit routes traveling through the Lincoln Park study area	68
Figure 6.5: Weekday and Saturday frequency of buses in the Lincoln Park neighborhood	70
Figure 6.6: Location of bus lines relative to the Super One grocery store in West Duluth.....	72
Figure 6.7: Pedestrian ways across US 53 to access transit	74

Figure 6.8: Suggested path across Lincoln Park to access transit	74
Figure 6.9: Location of the middle school relative to transit	75
Figure 6.10: Concept alternatives for a middle school shuttle / DTA bus transfer point	75
Figure 6.11: Concept for transit connection to the Heritage Center	76
Figure 6.12: Possible zoning changes that could support transit.....	77
Figure 6.13: Current redevelopment along the west mainline transit routes.....	77
Figure 6.14: Wade Stadium & Wheeler Fields: Opportunity for future transit-support development and an enhanced transit stop	78
Figure 6.15: W 2nd Street & 21st Avenue W: Potential impact from future redesign of I-35/I-35/US 53 interchanges.....	78
Figure 6.16: Comparison of DTA annual operating costs, revenues, and grants (excluding STRIDE shares): 2009-2013	79
Figure 6.17: Comparison of DTA regular route passenger trips and revenue miles operated: 2009–2013	79

Tables – Chapter 6

Table 6.1: Hours of operation for transit routes traveling through the Lincoln Park study area.....	68
Table 6.2: Level of Service (LOS) ratings for hours of transit service available	68

Chapter 7: ACTIVE TRANSPORTATION

Maps – Chapter 7

Map 7.1: Comparison of average daily boardings/alightings at bus stops with “transit demand” rankings of neighborhood sub-areas.	83
Map 7.2: Sidewalk conditions and gaps near the Lincoln Park Middle School.....	85
Map 7.3: Sidewalk conditions in and around the Lincoln Park Central Business District.....	86
Map 7.4: Sidewalk conditions and gaps in the SW portion of the Lincoln Park neighborhood.....	87
Map 7.5: Comparison of designated bike routes and count locations with pedestrian demand model	88
Map 7.6: City of Duluth’s planned bikeway system.....	90

Map 7.7: City of Duluth’s planned bikeway connections within Lincoln Park.....	90
Map 7.8: Conceptual pedestrian spaces at 26th Avenue W and 28th Avenue W	96
<i>Figures – Chapter 7</i>	
Figure 7.1: Cyclist using the Cross City Trail along Superior Street.....	81
Figure 7.2: Sidewalk priority areas identified in the 2011 Pedestrian Demand model and sidewalk conditions	83
Figure 7.3: Condition of sidewalks in the Lincoln Park neighborhood.....	84
Figure 7.4: Sidewalk in poor condition along 21st Avenue W.....	84
Figure 7.5: Devonshire Trail	85
Figure 7.6: Non-ADA compliant sidewalk at Piedmont Avenue & W 2nd Street.....	86
Figure 7.7: Pedestrian activity in the 27th Avenue W commercial node	86
Figure 7.8: Cyclists on 24th Avenue W in the Lincoln Park neighborhood.....	87
Figure 7.9: Comparison of east– and westbound bike and pedestrian traffic on W 3rd Street at Carlton Street (Sept. 9, 2012).....	88
Figure 7.10: Comparison of east– and westbound bike and pedestrian traffic on Superior Street at 27th Avenue W (Sept. 17, 2014).....	88
Figure 7.11: Comparison of east– and westbound bike and pedestrian traffic on Michigan Street at Superior Street (July. 9, 2013).....	88
Figure 7.12: Cyclist at the intersection of Superior Street & Lower Michigan Street.....	89
Figure 7.13: Street views of Skyline Parkway above the Lincoln Park neighborhood	91
Figure 7.14: Example of a sharrow marking	91
Figure 7.15: The Cross City Trail in Lincoln Park.....	93
Figure 7.16: 26th Avenue W connection between the Cross City Trail and Lincoln Park Drive	94
Figure 7.17: Street enhancement examples.....	94
Figure 7.18: Conceptual corridor for a possible extension of the Cross City Trail along Merritt Creek.....	95
Figure 7.19: Conceptual corridor for a possible future connection to the waterfront in the Lincoln Park neighborhood.....	95

Figure 7.20: Conceptual pedestrian spaces at 26th Avenue W and 28th Avenue W	96
--	----

Tables – Chapter 7

Table 7.1: Bike parking at key activity centers	91
---	----

Chapter 8: INTEGRATION & SAFETY

Maps – Chapter 8

Map 8.1: Key multimodal corridors and key intersections in the Lincoln Park study area	100
Map 8.2: Intersections with crash rates or severity rates that exceed statewide averages (2009 - 2013)	104
Map 8.3: Locations of heavy truck crashes (2009 - 2013).....	104
Map 8.4: Pedestrian related crashes (2009 - 2013).....	106
Map 8.5: Bike related crashes (2009 - 2013).....	107

Figures – Chapter 8

Figure 8.1: 1st Avenue, New York City	99
Figure 8.2: Screen image of MnCMAT coverage of the Lincoln Park study area	103
Figure 8.3: Current characteristics of the 27th Avenue W corridor	108
Figure 8.4: Cross City Trail at 27th Avenue W	109
Figure 8.5: Bike-specific signal head	109
Figure 8.6: NACTO recommendations for bikeway crossings at signalized intersections	109
Figure 8.7: Bus stop at 27th Avenue W.....	110
Figure 8.8: Curbed terminus of spur trail.....	110
Figure 8.9: Lack of curb cuts along Lower Michigan Street.....	110
Figure 8.10: Bike racks on DTA buses.....	111
Figure 8.11: Bike parking at a bus stop.....	111

Figure 8.12: Pairing bus and bike facilities	111
--	-----

Tables – Chapter 8

Table 8.1: Multimodal level of service (mmLOS) scores for locations shown in Map 8.1	101
Table 8.2: Intersections with high crash or severity rates (2009-2013).....	105
Table 8.3: Locations with multiple indicators of poor integration.....	105

Chapter 9: RECOMMENDATIONS

Maps – Chapter 9

Map 9.1: Recommended short-range (2016-2019) improvements for motor vehicles	116
Map 9.2: Recommended mid-range (2020 –2029) improvements for motor vehicles	116
Map 9.3: Recommended transit improvements.....	118
Map 9.4: Recommended sidewalk improvements	118
Map 9.5: Recommended short-range (2016-2019) improvements for cyclists.....	121
Map 9.6: Recommended improvements to help mitigate safety risks at 27th Avenue W & Superior Street.....	121
Map 9.7: Recommended connections to the Cross City Trail	123
Map 9.8: Recommended future trails and greenways	123

Figures – Chapter 9

Figure 9.1: Improving multimodal integration.....	114
Figure 9.2: Range of cost estimates for recommended improvements.....	103

Tables – Chapter 9

Table 9.1: Recommendations focused on improvements for motor vehicles and heavy trucks.....	117
Table 9.2: Recommendations focused on improvements for regular-route transit service	119
Table 9.3: Recommendations focused on improving priority sidewalk segments	120

Table 9.4: Recommended short-range improvements for cyclists 122

Table 9.5: Recommendations focused on reducing risks along 27th Avenue W between Superior Street and Michigan Street..... 122

Table 9.6: Recommendations focused on creating improved connections between neighborhood activity centers..... 124

Appendix B: Methodologies

The following pages contain descriptions of various assessments in this study that were not explained in detail in the main body of the document. Explanations are provided for how or where the various data were collected and what processes were used for deriving results from those data.

TRANSIT SCORES (Chapter 6)

To help assess the characteristics and quality of public transit service within the Lincoln Park neighborhood, an indexing method was to derive two scores: a “transit service” score for each route, and a “transit demand” score for each of the neighborhood sub-areas defined in the study. The first was used to compare levels of service among the routes within the neighborhood, the later to compare the relative levels of demand for transit service. In both cases, values were indexed to each other (using the lowest and highest values to create a bounded range) and combined to create composite scores. How those scores were generated is described below.

Service Scores:

There are two priority factors that determine the service quality of public transit from the rider’s perspective: 1) the hours of service and 2) the frequency of buses. Using these parameters, the seven routes were indexed and compared against each other. The results of this approach are shown in Table A.1.

Routes 1,2, and 3 were also assessed as one route because they share the same street segments in the Lincoln Park study area and essentially act as a combined service in those corridors.

Table A.1 | Indexing tables used for deriving “transit service” scores

The different transit routes in the study area were compared according to the indexed value (from 0 to 10) of their average frequency and hours of service.

Weekday Service					
Route	Avg frequency	I	Hours of service	I	CI
1,2,3	0:16	10	18:00	9	19
1	0:41	4	16:20	7	11
2	0:53	2	18:21	10	12
3	0:52	2	15:30	6	7
4	0:46	3	13:00	2	5
5	1:00	0	12:00	0	0
9	0:46	3	14:00	3	6
16	0:41	4	13:00	2	6

Saturday Service					
Route	Avg frequency*	I	Hours of service	I	CI
1,2,3	0:33	10	17:00	10	20
1	2:00	0	0:00	0	0
2	0:59	7	17:15	10	17
3	1:00	7	12:42	7	14
4	2:00	0	8:00	5	5
5	1:00	7	8:00	5	12
9	1:00	7	10:00	6	13
16	1:00	7	11:00	6	13

Sunday Service					
Route	Avg frequency*	I	Hours of service	I	CI
1,2,3	0:36	10	15:00	10	20
1	2:00	0	0:00	0	0
2	0:58	7	15:00	10	17
3	1:00	7	8:45	6	13
4	2:00	0	0	0	0
5	2:00	0	0	0	0
9	1:00	7	9:00	6	13
16	0:59	7	8:00	5	13

When done this way, the combination of Routes 1, 2, and 3 stand out as having a high level of service compared to the others in the neighborhood. This process of comparing the routes was done for the weekday, Saturday, and Sunday route schedules. In situations where a route was not running on a Sunday, for example, an arbitrary max 2-hour frequency was applied for simple indexing purposes (which turned into a zero value in the final summation). The resulting “service” score was entered into a geographic information system (GIS) in order to do conduct the overlay analysis shown in Map 6.2 in Chapter 6 of the study document.

Demand Scores:

A similar indexing method was applied to the demand-side of the transit equation in the study area. As shown in Table A.2, the

Table A.2 | Indexing table used for deriving “transit demand” scores

Six metrics were indexed across the 13 geographical sub-areas analyzed for this study. The indexed values were combined in a single score to determine the relative degree of potential demand for transit service within those sub-areas.

Sub-area	NoCar Density	Index Score	Seniors Density	Index Score	Pop_Dense	Index Score	MED_INC	Index Score	AMB_DENSE	Index Score	SLOPE_AVG	Index Score	area	Composite Score	RANK
1	0.05	36	29	0	232	0	24,138	65	10	0	2.0	3	460,490.83	103	12
2	0.13	100	40	3	749	8	22,474	69	13	2	1.6	0	450,834.05	182	11
3	0.13	100	40	3	749	8	22,474	69	13	2	1.6	0	430,714.63	183	10
4	0.13	100	403	98	6,416	100	29,514	52	13	2	1.7	1	268,720.76	353	1
5	0.13	100	38	2	371	2	9,375	100	13	2	6.1	30	260,291.67	237	7
6	0.05	36	413	100	3,841	58	51,563	0	10	0	4.1	17	464,623.99	211	8
7	0.03	22	394	95	5,690	88	31,964	47	71	44	5.7	27	508,416.36	324	3
8	0.03	22	403	98	6,416	100	29,514	52	13	2	6.5	33	248,774.88	307	4
9	0.13	100	38	2	371	2	9,375	100	13	2	16.5	100	242,327.59	307	4
10	0.03	22	159	34	1,732	24	35,245	39	31	15	9.9	56	1,145,460.53	190	9
11	0.03	22	394	95	5,690	88	31,964	47	71	44	8.2	44	263,426.07	341	2
12	0.00	0	283	66	3,538	53	51,667	0	148	100	7.3	38	320,377.59	258	6
13	0.00	0	283	66	3,538	53	51,667	0	148	100	9.2	51	474,003.43	271	5

thirteen neighborhood sub-areas were assessed using six metrics that were indexed to a scale of 0 to 100. Those metrics are identified in Table A.3 below. The sub-areas were then ranked according to the combined index scores, and the ranking was used to help evaluate how well matched the “service” scores of the previous assessment matched the “demand” scores of the sub-areas (as illustrated in Map 6.4 in Chapter 6).

Table A.3 | Metrics used for deriving “transit demand” scores

The metrics used in deriving the “demand” scores included a mix of demographic characteristics, as well as a measure of difficulty to pedestrian travel in the area (i.e. slope).

Field ID	Metric	Data Source
NoCarDensity	Percent households with no vehicle ownership	2013 American Community Survey
SeniorDensity	Percentage of population age 65 or older	2010 Census 100SF
Pop_Dense	Population per square mile	2010 Census 100SF
MED_NC	Median household income	2013 American Community Survey
AMB_DENSE	Percent population with amputatory difficulties	2013 American Community Survey
SLOPE_AVG	Average slope of the streets	MIC generated: 2011 MN Lidar data; 2013 St. Louis Co. centerline road file.

Table A.4 | Factors influencing LOS scores

Measures of the following factors were used in calculating the four individual modal LOS scores, which were then used collectively as an assessment of a multimodal Level of service (mmLOS).

<p>Auto LOS</p> <ul style="list-style-type: none"> • Demand (volumes) and available capacity • Number of lanes • Posted speed • Number of stops per mile • Interference from other users (modes)
<p>Transit LOS</p> <ul style="list-style-type: none"> • Frequency of service • Average wait time • Pedestrian LOS scores • Passenger load • Number of bus stops per mile
<p>Pedestrian LOS</p> <ul style="list-style-type: none"> • Traffic volume and speed • Buffer separation • Presence and width of sidewalk • Crossing difficulty • <i>Pedestrian density</i>
<p>Bicycle LOS</p> <ul style="list-style-type: none"> • Traffic volume and speed • Lateral separation • Percent of traffic that is heavy trucks • Pavement quality • Number of driveways per mile

TRANSIT SCORES (Chapter 6)

In transportation planning, level of service (LOS) has traditionally been a measure of the vehicle capacity of a roadway. However, with the increasing understanding that roadway environments serve the movements of a variety of different users, the 2010 Highway Capacity Manual (HCM) was expanded to include a collection of LOS measures for cyclists, pedestrians, and transit riders. These new measures go beyond the notion of capacity to also reflect the safety, ease, and comfort of using a roadway from the perspectives of these other user groups. They are meant to be combined as a measure of multimodal level of service (mmLOS) to help evaluate “complete streets” or context sensitive design alternatives for a particular roadway.

For this study specifically, the mmLOS methodology developed from the NCHRP 03-07 research effort and outlined in NCHRP Report No. 616: *Multimodal Level of Service Analysis for Urban Streets* was used to derive individual LOS scores representative of conditions found in each of the six context zones being studied. These measures are identified in Table A.4.

Six locations were selected within the key multimodal corridors identified in this study for which mmLOS “samples” were calculated for those corridors. To help calculate these scores, a spreadsheet template developed by Richard Dowling Associates was used to calculate LOS scores per one half of the roadway. Therefore, each of the six locations were first evaluated qualitatively in order to determine which side of the corridor would be most representative in terms of a single mmLOS evaluation. Generally, if sidewalk was present on just one side of

the corridor, that side was chosen for evaluation. Figure A.1 shows an example template for Location 1 (24th Avenue W - between W 7th Street and W 6th Street).

CRASH RATES and SEVERITY RATES (Chapter 8)

Crash rates and severity rates were used to help evaluate areas of poor multimodal integration within the Lincoln Park study area. To do this, MnDOT’s Crash Mapping Analysis Tool (MnCMAT) was used to help identify areas of high-crash locations and segments in the study area. Once identified, crash- and severity rates were calculated for those locations and segments using the Equation A.1 and Equation A.2 on the following page.

Figure A.1 | Template for mmLOS calculations

The methodology outlined in NCHRP Report No. 616: *Multimodal Level of Service Analysis for Urban Streets* was used to generate mmLOS scores, and the spreadsheet template developed by Richard Dowling Associates based off of the NCHRP report was used to calculate LOS scores for the six locations assessed for mmLOS.

NCHRP 3-70 Multimodal LOS																													
Range Check		Ped LOS	LOS #																										
ADT	2,700 (>=0 vpd) OK Yes	Prop	C 3.86																										
% HW	7% (<=100%) OK No	Plan	B 2.82																										
Busess/hr	7 (>=0 bph) OK No	Model 1	D 9.70																										
Peds/hr	8 (>=0 pph) OK If Vary High	Model 2	D 4.17																										
		RCDF 1	A 1.20																										
		RCDF 2	A 1.20																										
		Mode	LOS																										
		Auto	C 2.87 0.9747																										
		Transit	B 2.45																										
		Bicycle	D 3.39																										
		Pedestrian	D 3.79																										
<table border="1"> <thead> <tr> <th>SideWalk</th> <th>Buffer</th> <th>Parking</th> <th>Bike Ln</th> <th>Trav. Lane</th> <th>Trav. Lane</th> <th>Median</th> <th>Trav. Lane</th> <th>Trav. Lane</th> <th>Bike Ln</th> <th>Parking</th> <th>Buffer</th> <th>SideWalk</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>8</td> <td>9</td> <td>0</td> <td>12</td> <td>0</td> <td>0</td> <td>0</td> <td>12</td> <td>0</td> <td>9</td> <td>8</td> <td>4</td> </tr> </tbody> </table>				SideWalk	Buffer	Parking	Bike Ln	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Bike Ln	Parking	Buffer	SideWalk	4	8	9	0	12	0	0	0	12	0	9	8	4
SideWalk	Buffer	Parking	Bike Ln	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Bike Ln	Parking	Buffer	SideWalk																	
4	8	9	0	12	0	0	0	12	0	9	8	4																	
(all entries in feet, enter zero for non-existent lanes)																													
Street: Main Street (Eastside)		Key Parameters																											
Limits: Civic Drive - Bonanza Street		Signal Timing: 4,000 (200-10,560 Ft.) OK																											
Key: Data Entry		Progression Quality: 3 (2=good, 4=excellent) OK																											
Spreadsheet by: R. Dowling, Dowling Associates, Inc., July 6, 2007, Updated 02/12/08		Speed Limit: 30 (15-70 mph) OK																											
		Bus Stops w/ Shelter: 10% (0-100%) OK																											
		Pavement Quality: 3 (2=good, 4=excellent) OK																											
Additional Parameters																													
Auto LOS Inputs		Pedestrian LOS Inputs																											
Parking Factor (p) 0.1		% Parking Occ 0%																											
Directional Factor (d) 0.80		Barrier (Yes/No) 0																											
Peak Hr. Fac. (PHF) 0.88		RTOR/Farm LT (vph) 100																											
Adj. Sat Flow (vph-ft) 1500		X-Street Vel. (vph) 50																											
Through g/c 0.30		X-Street Speed (mph) 30																											
Cycle Length (sec) 100		X-Street Lane (ft) 5																											
		Right Turn Islands (ft) 1																											
		X-Street Width (ft) 0.07																											
		Threat LOS Inputs																											
		% On Time 90%																											
		% Stops w/ Bansha 10%																											
		Load Factor (p/seat) 1.00																											
		CD (Yes/No) Yes																											
		Bus Stop/segment 2																											
		Delay/Bus Stop (sec) 20																											
		Bicycle LOS Inputs																											
		Usely Conditionals 20																											

The rates were calculated by using all crashes that occurred within a segment in the years 2009 through 2013, or any crash within a 50-foot radius of an intersection in those years. Those three years represented to most recent years of data available at the time of the study, and were also likely to be the most indicative of transportation patterns that reflected existing conditions, infrastructure, and development patterns. Three years of data were used in order to compare the crash calculated with averages for MnDOT District 1 reported on the 2011 “green sheets” found at:

http://www.dot.state.mn.us/stateaid/sa_traffic_safety.html.

Equation A.1 | Intersection crash rate

The following equation measures the number of crashes per 1 million vehicles entering the intersection. It is used as an expectation for future crashes at a location if all other factors remained the same.

$$\text{Crash rate} = \frac{1,000,000 \times \text{number of crashes}}{\text{years} \times 365 \times \text{AADT} [x \text{ miles}]}$$

AADT = average annual daily traffic

[x miles] = modifier used to calculate rates for a highway segment

Equation A.2 | Intersection crash severity rate

Weighted values can be attributed to crashes based on the severity of resulting injuries, which can then be summed up and used in the crash

$$\text{Severity rate} = \frac{1,000,000 \times [(10)K + (8)A + (6)B + (3)C + PD]}{\text{years} \times 365 \times \text{AADT} [x \text{ miles}]}$$

K = total number of fatality crashes

A = total number of incapacitating injury crashes

B = total number of non-incapacitating injury crashes

C = total number of possible injury crashes

PD = total number of property damage only crashes

AADT = average annual daily traffic

Appendix C: Summary notes from open house meetings

COMMUNITY INPUT

LICOLN PARK SMALL AREA PLAN OPEN HOUSE

September 17, 2014: 5:00PM-8:00PM

Harrison Community Center

Comments received at the "Multi-Modal Transportation" table

General:

Trash accumulation is a big issue in Lincoln Park. It is especially bad in the areas around and underneath the freeway ramps. Interest in seeing a more coordinated clean-up effort between the City of Duluth and the neighborhood associations, such as the Seaway Tenants Assoc.

DTA service is great in the Lincoln Park neighborhood, but there should be garbage cans and benches at major bus stops.

Take a look at the quantity and quality of street lighting in the neighborhood - along main roads, especially 3rd Street.

Take a look at the City's current sidewalk-use permit policies and procedures. Are they designed in a way that impedes or disincentivizes the installation of benches and bike racks?

The City should inventory and prioritize the cul-de-sacs in Lincoln Park. They should look for opportunities to remove some for the purpose of better circulation and access, especially for emergency response vehicles.

There needs to be stronger political efforts to get the Sault Ste Marie Locks widened in order to allow for larger ships and help revitalize the shipping industry in Duluth-Superior, especially some of the lands along the water front in Lincoln Park.

The City should look explore opportunities to re-use the vacant ore dock for recreation and historical-education in the area.

Cross City Trail:

The new trail is great. I've changed my walking route just so I can use it.

The City should seek ways to connect the trail to the waterfront in Lincoln Park.

Superior St:

There is poor sidewalk on Superior St. between 27th Ave W and 30th Ave W. This is a bus route (Rt No. 9) and is a path that people walk along between the commercial area at Michigan St. and 27th Ave W. and the neighborhoods above Superior St.

Vegetation or streetscaping treatments should be considered along the south side of Superior Street – especially along the few blocks approaching 27th Ave W. This would help buffer pedestrians from the “industrial” character of the uses in that area. This is a bus route. Benches for waiting transit riders should be placed along this corridor.

Michigan St:

Adequate snow removal is a BIG problem on Michigan St. between 21st Ave W and 23rd Ave W (underneath the freeway). There is a lot of pedestrian movement in that area. And now with the Cross City Trail...

There is poor sidewalk on Michigan St between 18th Ave W and 22nd Ave W.

W 3rd St:

Should improve lighting along 3rd Street.

W 4th St:

Snow removal is difficult on W 4th St. Parking used to be on the north side only, but it was changed to alternate-side parking. This has created more problems than it solved.

W 10th St:

The City should consider extending W 10th St to Anson Ave to create a more direct link to the new middle school from Piedmont Ave.

Skyline Pkwy:

Vegetation has become so overgrown that it is impacting many of the views from the road. Some of that stuff should be cut back in places.

Hwy 53 / Piedmont Ave:

There are a lot of intersections with poor visibility along Hwy 53. These are very dangerous, especially after the speed limit was raised from 30mph to 40mph on Hwy 53. The intersection of W 7th St. is particularly hazardous.

The center medians on Hwy 53 are not wide enough to allow for sufficient refuge for vehicles trying to make left turns. These vehicles have to enter the spaces in the medians at an angle, which creates sight-distance challenges for those drivers.

The intersection of Piedmont Ave & 24th Ave W needs a traffic signal. Take a look at the crash data for this intersection - I bet you will see a lot of weather-related crashes... slush, ice.

Atlantic Ave:

Sidewalks are in poor condition. The school was in discussions about sharing snow removal responsibilities with the City, if the City would address the sidewalk conditions. The City should really pursue this.

20th Ave W:

There is a blind pedestrian area on 20th Ave W at the off ramp. This spot could use some safety improvements to make it more visible. It could use better lighting.

20th Ave W is probably one of the major pedestrian corridors in Lincoln Park because of its direct connection between the Little Store at 19th Ave W and the residential areas further up the hill. The sidewalk is in poor condition along this avenue.

21st Ave W:

The street and sidewalk along 21st Ave W are in rough shape up the hill, which gets pretty steep. 21st Ave E gets a lot of pedestrian traffic because of its connection to the bus stops/shelters between W 3rd St and Superior St.

The pavement condition on 21st Ave W between W 3rd St and Superior St is so bad that you can't even snow plow it. It should be redone and, when it is, the sidewalks should be brought to the curb.

24th Ave W:

They removed an LED crossing for pedestrians on 24th Ave W (at the corner of 5th St) when the middle school moved. However, there is still the park, the Boys and Girls Club, and services for seniors in the area. They shouldn't have taken that safety device away from there.

24th Ave W:

26th Ave W has some significant gaps in sidewalk. It is a street that could provide easy, direct access to Lincoln Park from Superior Street.

There might be some opportunities to consolidate lots along 26th Ave W for the purpose of creating an enhanced pedestrian corridor between Lincoln Park and Superior St (or even to the waterfront).

The short segment of 26th Ave W between Superior St and Michigan St is not paved. It gets a lot of pedestrians cutting through there, many of whom are using it to avoid having to cross the busy intersections at 27th Ave W. This small segment is owned by the city. The City should enhance it as a pedestrian corridor, possibly even daylight the creek here and create access to the waterfront.

27th Ave W:

Parking on 27th Ave W can be a problem during winter months (when snow piles up) because it is narrow, and the residents don't have off-street parking. Creative solutions to parking should be sought for this corridor because it is a major artery up and down the hill.

There are narrow sidewalks at the intersection of 27th Ave W and Superior St. The sidewalks are also in poor condition. This is a busy intersection both in terms of cars and pedestrians. Things should be done to make pedestrian crossings safer and more comfortable here.

37th Ave W:

Parking on 27th Ave W can be a problem during winter months (when snow piles up) because it is narrow, and the residents don't have off-street parking. Creative solutions to parking should be sought for this corridor because it is a major artery up and down the hill in Lincoln Park.

COMMUNITY INPUT

LICOLN PARK SMALL AREA PLAN OPEN HOUSE

March 26th, 2015: 6:00PM-8:00PM

Harrison Community Center

Comments received at the "Multi-Modal Transportation" table

Requests for increased DTA service:

Could the DTA provide even just one trip per day up to the Lincoln Park Middle School? The school is discovering that a number of parents are

having difficulty getting to the school for meetings and other things. If the DTA could provide just one trip a day, the school could work to schedule things around that trip.

Is there any way the DTA could increase the frequency of service in the neighborhood?

Response to the Devonshire Trail Recommendation:

Is the recommendation to pave the Devonshire Trail feasible? There is an exposed rock bed there, and it goes really close to a house.

Grievance regarding the intersection near the M&H gas station:

The intersection of Superior Street, Michigan St, and Lower Michigan is a mess. It's dangerous and the design of it isn't achieving its intended purpose: to move the traffic to Lower Michigan. All the vehicles are going up onto Superior St regardless. When MnDOT was re-routing traffic during the reconstruction of I-35, they installed temporary traffic signals at the intersection and it worked better than it does now under typical conditions. They should put those traffic signals back.

Response to the Recommendation for repaving/repairing 27th Ave W:

27th Ave W has, and will continue to, experience increases in traffic. The last time it was redone, its width was shortened, making everything tighter. Drivers are flying up and down it, and it's not a good situation. They really should re-widen to better fit the traffic volumes there.

There is parking on only one side of the street, and don't I think you could widen it by removing the parking because there are some residences on the street that don't have off-street parking. I think that the residences along 27th Ave W should be surveyed about what types of improvements are needed there.

Could more stop signs be put along 27th Ave W, wouldn't that slow traffic down and make it safer?

Regarding the recommendation to repave/repair Wellington Ave:

That street does need to be redone, and it makes sense that it should be a secondary access to the Middle School. But its narrow, and is there even enough room to get two buses passing through there?

Regarding the recommendation to convert W 1st St back to 2-Way:

This street was narrowed (from 27th Ave W to 30th Ave W) when last reconstructed. This was done at the neighborhood's request in order to dissuade heavy trucks from using it. The recommendation to turn it back to a two-way street won't work because there is not enough room for two lanes of travel on it.

Regarding the recommendation for a paved trail connection between Anson Ave and 27th Ave W:

Part of this proposed alignment is where the Superior Hiking Trail goes through. You don't want to pave over that, do you?

Reported concern about the intersection of 27th Ave W & W 3rd St:

This is a bad intersection, very dangerous for pedestrians. It is now a 4-way stop, but drivers are tending not to fully respect them. The intersection could really use a traffic signal instead. I would argue that it has as much traffic as the intersection of Superior St & 27th Ave W does.