

1.0 Purpose of and Need for Action

The North Lake Shore Drive (NLSD) study corridor extends approximately seven miles from Grand Avenue to Hollywood Avenue. See Exhibits 1 and 2 in Appendix A. The corridor is comprised of the eight-lane “Outer Drive” boulevard and the parallel two to four-lane “Inner Drive” local access roadway that is variously named North Lake Shore Drive, Sheridan Road and Marine Drive. The Outer Drive is designated as US 41 from the south study limit to Foster Avenue, where the US route designation continues west on Foster. The Outer Drive between Foster Avenue and the northern terminus at Hollywood Avenue is an unmarked State route. The Outer Drive is on the National Highway System which consists of roadways that are important to the nation’s economy, defense and mobility.

North Lake Shore Drive is located primarily within Lincoln Park which is a 1,200-acre regional park dating back to 1860 that is listed on the *National Register of Historic Places*. Since its inception, NLSD has been a heavily used transportation artery in the lakefront corridor and it has evolved into an important multi-modal facility. It is a major north-south corridor through the city as it provides regional connectivity for trips which desire to bypass the city center as well as a link between north and south suburbs and the central business district. Today, the corridor serves almost 3,300 trips for Chicago Transit Authority (CTA) buses with 69,000 passengers per day along the Inner and/or the Outer Drives as well as 161,000 cars per day as shown on Exhibits 3 and 4 in Appendix A. The Lakefront Trail, which parallels NLSD in the study area, is also an important element of the transportation facilities in this corridor, serving recreational users, commuters and tourists. The trail comprises the most heavily used section in Chicago’s extensive trail system with as many as 31,000 daily users on peak summer days on portions of the trail, as shown on Exhibit 5 in Appendix A.

1.1 Project Purpose

The purpose of the project is to improve the NLSD multi-modal transportation facility. The specific needs to be addressed throughout the study include: improve safety, improve mobility of people including those on non-motorized modes of travel, buses and automobiles, improve facility deficiencies and improve accessibility to and from Lincoln Park, the Lakefront Trail and the adjacent communities.

1.2 Study Area

The NLSD study area is depicted on Exhibit 2. The study area encompasses the seven-mile multi-modal transportation corridor and includes the parallel Inner Drive roadways as well as crossing arterial streets and the Lakefront Trail.

The logical termini for the NLSD project are identified as Grand Avenue on the south and the northern terminus of NLSD at the Hollywood Avenue/Sheridan Road intersection on the north. The southern terminus was selected as a rational endpoint for several reasons. The Illinois Street/Grand Avenue interchange complex is a major ingress and egress point for trips along NLSD destined to and from the Loop and Navy Pier. Also, whereas the majority of the infrastructure for NLSD north of Grand Avenue was constructed in the 1930s, the transportation infrastructure south of Grand Avenue is by comparison relatively new. The nearly one mile section of NLSD between Monroe Street and Grand Avenue was reconstructed between 1982 and 1984 and includes the elevated structures for the north and south approaches to the two-level Chicago River bascule bridge as well as the NLSD “S-curve”. The character of Lake Shore Drive from Monroe Street south is also different from NLSD as it transitions from an access-controlled boulevard with grade separated junctions north of the river to a facility with at-grade signalized intersections that traverses Grant Park and the Museum Campus. The section of Lake Shore Drive through the Museum Campus was reconstructed in 1996.

The logical northern terminus of the project is the point where NLSD ends at the Hollywood Avenue/Sheridan Road intersection. At this location, traffic to and from the northern terminus of the eight-lane access-controlled boulevard is routed to and from surface streets in the Edgewater neighborhood via a signal controlled intersection of two four-lane roadways.

1.3 Project Background

The entire history of NLSD, or “the Drive” as it is often referred to, is intertwined with that of Lincoln Park. North Lake Shore Drive was initially constructed and then reconfigured by the Chicago Park District in concert with northerly and easterly expansions of Lincoln Park over the last century as a “boulevard” through a park. According to the 1909 *Plan of Chicago*, boulevards were intended to be “a combination of park and driveway” where all truck traffic was to be excluded and “where grass and shrubs and trees assert themselves”.

With the arrival of the motor bus in the early 20th Century, Lake Shore Drive immediately became a major thoroughfare for this new mode of transit service. Local and limited-stop services began operations as early as 1917, and with the expansion of the Drive in the 1930s, many services were immediately converted to Outer Drive express operation. This extensive network of bus service using the Drive has remained to this day.

North Lake Shore Drive, as recognized today, was constructed by the Chicago Park District in the 1930s with the northernmost extension completed in the early 1950s. In 1959, jurisdiction of NLSD was transferred from the Park District to the City of Chicago and only included transfer of land devoted to roadway purposes. Roadway jurisdiction was transferred again in the 1970s from the City to the Illinois Department of Transportation, though the City still has maintenance responsibility for the roadway facilities.

Over the years, numerous resurfacing and spot improvements have been conducted on NLS D to maintain the roadway surface and address safety concerns as described in Section 1.4.1. However, the major infrastructure elements of the Drive, such as bridges and lower pavement layers, are nearly 80 years old and have exceeded their expected service lives by 30 or more years. Continued maintenance is not a cost effective strategy for maintaining such a vital facility.

As the NLS D roadway is surrounded by an historic park, any proposed physical changes may affect park property. The “right-of-way” for NLS D is defined by the backs of curb on each side of the roadway. Therefore, any property beyond the curb is Chicago Park District property that is protected under Section 4(f) of the Department of Transportation Act of 1966 and Section 106 of the National Historic Preservation Act of 1966. Thus, impacts to Park District property as well as access to the park and circulation within it will be important considerations in project decision-making.

The 1972 *Lakefront Plan of Chicago* and the companion 1973 *Lake Michigan and Chicago Lakefront Protection Ordinance*, as they pertain to NLS D, established a policy to “strengthen the parkway characteristics of Lake Shore Drive and prohibit any roadway of expressway standards”. The *Lakefront Plan* states a goal to “maintain the current speed and traffic capacity of Lake Shore Drive”. It should be noted that improvement alternatives on NLS D should occur within the context of current regulations that are related to the roadway. However, feasible improvement alternatives that would be prohibited by the Ordinance which increase the number of general purpose traffic lanes on NLS D would only be considered in concert with consideration of an accompanying change to the Ordinance.

The Inner Drive roadways within the study area began as local streets that provided access to adjacent residential properties. Through the years in concert with development of the Outer Drive, their function in the street network transitioned to that of a collector street for the adjacent neighborhoods in the corridor, providing access to adjacent properties, a route for local bus service and on-street parking for older residential buildings which have no on-site parking facilities. The Inner Drive carries between 2,000 and 11,000 vehicles per day, much of which is neighborhood collector traffic destined to and from Outer Drive junctions.

1.4 Project Need

Improvement needs vary throughout the seven-mile study area and fall into one of four categories:

- Improve safety for all users.
- Improve mobility for all users.
- Address infrastructure deficiencies.
- Improve access and circulation.

Needs within these categories were identified based on the analysis of existing conditions as well as extensive stakeholder input. The following information was utilized as part of the existing conditions analysis:

- 2007-2011 crash data and collision diagrams.
- 2013 ADT and peak hour intersection traffic counts and intersection operational analyses.

- 2013 lakefront access and lakefront trail counts.
- 2012 transit ridership and bus route performance data.
- Field observations of lakefront trail and peak hour transit and traffic operations.
- Structure Conditions Reports.
- Historic and record plan data.
- 2013 measurements of prevailing vehicle speeds.

1.4.1 Improve Safety for All Users

There is the need to improve safety in the study area not only for vehicular traffic but also for non-motorized modes of travel.

1.4.1.1 Improve Safety for Non-Motorized Modes of Travel

Lincoln Park draws as many as 20 million visitors each year. The Lakefront Trail is heavily used for recreation, tourism and commuting, with peak Saturday trail utilization between 7,700 users per day north of Hollywood Avenue to more than 31,000 users per day at Oak Street as shown on Exhibit 5.

Park users who desire to access either the lakefront or the Lakefront Trail must cross the trail at at-grade trail crossings located at one of nine roadway junctions, twelve pedestrian underpasses or one pedestrian overpass. Heavy usage results in conflicts and safety concerns at those trail intersections. Peak Saturday park user access volumes range between about 2,000 users per day at northerly access locations to nearly 22,000 users per day at the Oak Street pedestrian tunnel.

The heavy user demand combined with inadequate sight distances in some areas, the variety of user speeds and lack of awareness of other users, among many other factors, often results in collisions on the trail. Input from stakeholders revealed that safety on the Lakefront Trail is a major concern. Task Force members regularly recounted stories of their own or friend's injuries while using or crossing the trail. Many stated they avoid the Lakefront Trail during the busiest times because it is unsafe. The public corroborated the perception of substantial safety issues on the trail as well as along the access routes to Lincoln Park at the first round of public meetings



that were held for this project. Of the 605 comments from stakeholders at the three meetings, fully 20% of the comments pertained to pedestrian and bicycle issues.

These safety concerns arise more from the overwhelming user demand than from substandard design features. Much of the trail consists of 14 feet of pavement with 3-foot aggregate shoulders for joggers compared to a standard width for a heavily-used trail of 12 feet. The sheer magnitude of user demand, however, overwhelms the capacity of the facility during peak times. Thus, though the width of the Lakefront Trail is not substandard, it is insufficient to accommodate the peak demand.

Despite the suggested abundance of mishaps, no public reporting system or database exists that quantifies the number or cause of pedestrian/bicycle or bicycle/bicycle crashes that occur along the Lakefront Trail. Most minor mishaps go unreported; however, local emergency rooms still see frequent occurrences of serious injuries during peak usage times. Though medical records do not record where injuries occurred, contacts with emergency responders and nearby emergency rooms corroborated the perception that trail safety is a major concern in Lincoln Park during peak times of the year.

A good reporting system does exist for vehicle crashes with pedestrians or bicyclists. Vehicle crash records for 2007-2011 yielded a total of 146 pedestrian or bicyclist crashes with vehicles at roadway junctions or intersections and on the Oak Street curve, resulting in one fatality and 137 injuries.

Based on the analysis of existing conditions and the stakeholder input, safety for non-motorized modes of travel needs to be improved. Inadequate trail capacity to accommodate peak user demands combined with conflicts between user types creates safety hazards along nearly the entire length of the Lakefront Trail. Trail conflicts at junction intersections and where park users cross, enter or leave the trail are other sources of safety hazards at major park access locations. Finally, pedestrian and bicycle accommodations along park access routes where they cross the Inner and Outer Drives fail to meet Complete Streets requirements and are also inadequate for the magnitude of peak user demands.

1.4.1.2 Improve Vehicular Safety

Based on 2007-2011 crash data, in excess of 5,800 vehicular crashes have occurred along the entire length of the Outer Drive and at its junction intersections over the five-year study period which included 1,005 injury and 17 fatal crashes. An average of three crashes per day occurs along NLSD.

Each year, the State of Illinois produces a report that identifies highway locations that exhibit the most pressing safety needs. This report, called the *Five Percent Report*, helps to provide guidance on where safety investments are most needed. More than 80% of the length of NLSD was identified in the *Five Percent Report*. Within its state-wide peer group of urban multi-lane divided highways, NLSD accounted for six out of the top 10 high crash sections within the entire state. See Exhibit 6 in Appendix A for a graphical overview of vehicular crash data. Table 1 summarizes crashes that have occurred over the 5-year study period along mainline NLSD and at junction intersections and adjacent Inner Drive intersections.

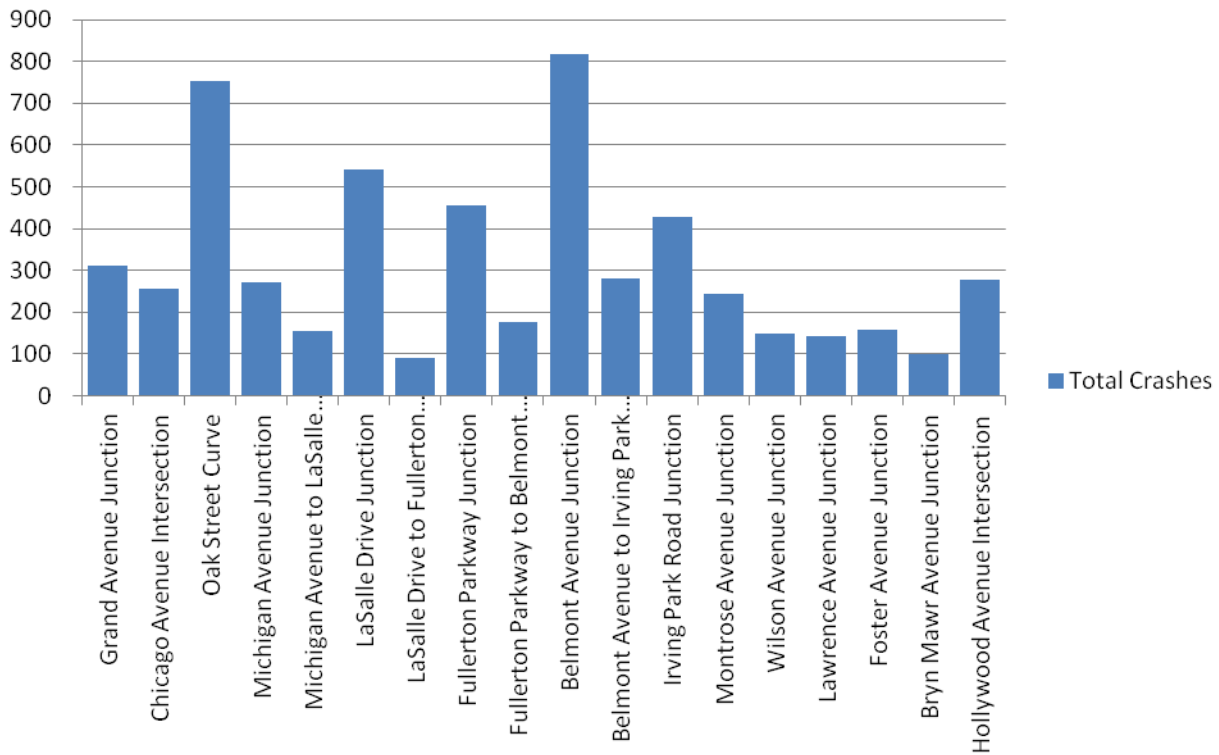
Table 1
North Lake Shore Drive
Crash Summary Table

Year	Crash Type Breakdown							Crash Severity Breakdown*					Total
	Rear End	Side-swipe	Right-Angle	Left Turning	Ped./Bike	Fixed Object	Other	K	A	B	C	PDO	
2007	531	298	54	118	38	249	78	2	36	106	75	1147	1366
2008	539	308	47	127	34	313	183	8	25	96	91	1331	1551
2009	358	213	38	77	33	220	89	4	32	100	88	804	1028
2010	388	190	36	89	36	207	43	2	17	95	85	790	989
2011	322	189	27	74	26	177	75	1	24	65	70	730	890
Total	2138	1198	202	485	167	1166	468	17	134	462	409	4802	5824

*Crash severities are classified as follows:
 K – Fatal crash.
 A - Incapacitating injury.
 B – Non-incapacitating injury.
 C – Reported injury, but not evident.
 PDO – Property damage only.

Chart 1 depicts crash data by location.

Chart 1
North Lake Shore Drive
Schematic Crash Summary



Although vehicle crashes are dispersed throughout the corridor, the following five locations have substantial crash histories that account for 51% of the total crashes during the study period as well as two-thirds of the crashes that occurred at junctions and intersections:

- Oak Street Curve (753 crashes)
- LaSalle Drive Junction (540 crashes)
- Fullerton Parkway Junction (455 crashes)
- Belmont Avenue Junction (819 crashes)
- Irving Park Road Junction (429 crashes)

Oak Street Curve - Fifty-six percent of the crashes on the Oak Street curve were off-road fixed object collisions with the barrier walls that line the curve. Of all of the crashes on the curve, 76% occurred during wet or icy conditions. The maximum safe operating speed on the Oak Street curve under ideal conditions is 30 mph (25 mph posted advisory speed), which is substantially lower than the prevailing speeds of traffic. Despite the geometric limitations of the Oak Street curve and the 40 mph posted speed limit, hourly 85th percentile speeds immediately north and south of the curve have been measured to be as high as 68 mph. Compounding the challenge of negotiating the curve is the fact that lane widths on the Outer Drive are only 10 feet wide on the curve.



LaSalle Drive Junction - Half of all rear end crashes and sideswipe crashes at this junction occurred at the mainline NLSJ terminals for the junction ramps to and from the south. The crashes indicate that exiting vehicles may have difficulty decelerating before encountering vehicles queued at the ramp signal and entering vehicles may be unable to safely merge into the southbound mainline traffic flow.

The next most predominant crash type at this junction was the off-road fixed object collision, of which 80 of 114 crashes occurred on southbound NLSJ immediately south of the LaSalle Drive overpass. The concentration of fixed object crashes at this location would indicate a potential problem with the combination of horizontal and vertical roadway alignment south of the bridge and high vehicle speeds. Even though the posted speed limit is 40 mph, the free-flow hourly 85th percentile southbound vehicle speeds measured along this section of NLSJ averaged 58 mph.



Fullerton Parkway Junction - The predominant crash type at this junction is the rear end collision with 90% of these crashes occurring on mainline NLSJ or at the mainline entrance and exit ramp terminals. The rear end crashes are related to the congested conditions that exist along this section of NLSJ during peak travel periods. Forty-four percent of all rear end crashes at the junction occurred on northbound

mainline NLSD north of the Fullerton Parkway overpass. This section of NLSD coincides with the southern limit of P.M. peak hour traffic flow disturbance that occurs as a result of congestion at the Belmont Avenue junction which is located about one mile to the north.

Belmont Avenue Junction - The Belmont Avenue junction provides the only access to and from NLSD for a distance of two miles, which concentrates heavy entering and exiting traffic volumes at this location. The junction forms the nexus of NLSD, Belmont Avenue, Inner Lake Shore Drive, Sheridan Road and the south harbor driveway in a complex of four signalized intersections that are spaced only about 200 feet apart. Nearly half of the 819 crashes at Belmont Avenue occurred at the four signalized junction intersections, which is indicative of the high levels of traffic congestion which exist at this location for many hours of each day.

A total of 210 rear end and sideswipe crashes occurred at the mainline ramp terminals for the ramps to and from the south. The crashes indicate that exiting vehicles may have difficulty decelerating before encountering vehicles queued at the ramp signal and entering vehicles may be unable to safely merge into the southbound mainline traffic flow.



Irving Park Road (IL 19) Junction - Of the 104 fixed object crashes that occurred at the Irving Park Road junction, 81 of them occurred on mainline NLSD south of the Irving Park Road overpass. North Lake Shore Drive in this area has reverse horizontal curves that have smaller radii than adjoining roadway sections in concert with vertical curves for the Irving Park Road overpass. The concentration of fixed object crashes at this location, many of which were of high severity, would indicate a potential problem with the combination of horizontal and vertical roadway alignment south of the bridge and vehicle speeds.

Of the 17 fatal crashes that occurred in the entire NLSD study area, five occurred within this roadway section. Four of the five fatal crashes occurred between the hours of 11 P.M. and 5 A.M. and three occurred in the southbound direction. Although the posted speed limit is 40 mph, the free-flow hourly 85th percentile vehicle speeds measured along this section of NLSD throughout the day averaged between 60 and 65 mph and increased to as high as 70 mph in the early morning hours.

Overarching Safety Issues – Analysis of crash data at the five crash hot spots as well as along the remainder of the corridor reveals recurring safety issues that point to a combination of roadway geometry, prevailing vehicle speeds and weather conditions as contributing factors. The horizontal and vertical roadway alignment, when considered in light of the 40 mph posted speed limit, is sufficient to provide adequate safety for vehicle

operating speeds of that magnitude, even under adverse weather conditions. However, when actual vehicle operating speeds are combined with the existing roadway geometry, crash data show that safety issues arise, particularly when weather conditions are less than ideal.

Vehicle speed studies conducted at twelve locations along the length of NLSD for a 48-hour weekday period showed non-compliance rates with the posted speed limit (40 mph at the time of the study) of 78% in the southbound direction and 95% in the northbound direction, with most compliance occurring only during periods of heavy congestion. Within the highest speed section of NLSD, nearly 9% of the 48-hour traffic volume exceeded the posted speed limit by 30 mph or more. The speed study substantiates that prevailing vehicle speeds along much of the Outer Drive are substantially higher than the posted speed limit.

High vehicle operating speeds combined with the boulevard design of NLSD and (within some sections of the Drive) narrow 10-foot lane widths result in reduced safety margins. North Lake Shore Drive was originally designed as a boulevard with barrier curb & gutter at both edges of pavement. Through the years, barrier walls and guardrails were added along much of the roadway in response to safety issues. Today, barrier wall or guardrail has been installed along approximately 60% of the total roadside length on each side of the roadway. These roadside barriers have been installed at the faces of curb so there is little or no clear zone available for errant vehicles to avoid contacting the barriers.

In addition to roadside barriers, intermittent emergency pull-off bays were added to NLSD through the years as well. These bays, which are spaced roughly two-tenths to one-half mile apart, are very short with only 50 feet of bay combined with 50-foot tapers into and out of the pull-off. Thus, provided a disabled vehicle can reach a pull-off bay, it is hazardous for them to pull into and out of the bay.

It should be noted that the 1972 *Lakefront Plan of Chicago* and the companion 1973 *Lake Michigan and Chicago Lakefront Protection Ordinance*, as they pertain to NLSD, established a policy to “strengthen the parkway characteristics of Lake Shore Drive and prohibit any roadway of expressway standards”. The *Lakefront Plan* specifies:

“[t]he Drive is a parkway that should conform to the following general roadway standards: lanes should be no more than eleven feet wide with additional width only at curves and other special locations; regularly spaced emergency pull-off bays should be provided rather than continuous paved shoulders and where continuous shoulders are needed, they should be specially treated; minimum width access ramps should be provided; and design speed should be 45 mph or 50 mph with speed limits set at 40 mph or 45 mph. The median should be developed with appropriate plantings. Protective barriers, where necessary to protect pedestrians, should be blended with landscaping”.

From individual crash reports along NLSD, it is not possible to determine the contribution that the lack of shoulders or the location of the roadside barriers had in crash cause and severity. However, overall crash data suggests that roadway sections where barriers are offset from the edges of pavement are noticeably safer, given similar roadway geometry. The only sections of the Drive that are not listed in the *Five Percent Report* (the northernmost sections) do not have continuous guardrail or barrier wall at the faces of curbs. Where bridge parapet walls and guardrails exist in these areas, they are typically offset from the edges of pavement by about 10 feet. Thus, the ability for errant or disabled vehicles to leave the travel lanes may contribute to the lower incidence of crashes. The poor condition of the grass parkways along the backs of curb in these areas indicates that vehicles leaving the roadway are a

common occurrence. It should be noted that the northernmost sections of NLSD have fewer crashes despite the fact that they have 85th percentile speeds (averaged over 48 hours) that are about 5 mph faster than the remainder of the Drive.

Emergency responders have also indicated that the inability to remove disabled vehicles from the travel lanes increases risks to emergency crews and can often result in secondary collisions due to the lane blockages. The lack of shoulders also makes conventional speed enforcement measures nearly impossible. In light of the above, there is a need to separate roadside barriers from the edges of the travel lanes.

1.4.2 Improve Mobility for All Users

Improving mobility for all users in the NLSD study area is an important overarching need for this multi-modal corridor. Existing roadway travel demands overburden NLSD during peak periods and result in substantial traffic congestion in the southern half of the study area as well as bottlenecks at several junctions. Buses in the NLSD corridor are trapped in the same roadway congestion as autos, resulting in unreliable service. The Lakefront Trail is also overwhelmed with users on peak summer weekends with as many as 31,000 daily users competing for space on the 20-foot wide path.

1.4.2.1 Improve Lakefront Trail Mobility

The Lakefront Trail is heavily used except during inclement weather or during some winter months when portions of the trail are closed due to ice buildup. On summer weekdays, the 20-foot wide trail accommodates nearly 15,000 daily users along its most heavily utilized section. See Exhibit 5. On summer weekends, that number swells to more than 31,000 users. Trail users include walkers, bikers, joggers, parents with children and strollers, tourists, dog walkers and skaters, among others.

There are several methods for calculating the Level of Service (LOS) on a shared-use path, including the 2010 edition of the *Highway Capacity Manual* and the 2006 FHWA *Shared-Use Path Level of Service Calculator*¹. Path Levels of Service are similar to the vehicle LOS rankings of A through F. Analyses indicate that even the most lightly used sections of the Lakefront Trail are ranked as LOS F according to both methodologies. Level of Service F in the FHWA methodology is described as:

F: Failing- *Trail is popular to the point of significantly diminishing the experience for at least one and probably all user groups. It does not effectively serve most bicyclists; significant user conflicts should be expected.*

Portions of the Lakefront Trail carry more than twice the user volume per hour that would be characterized as LOS F according to the FHWA methodology.

While it is clear that the Lakefront Trail is an important recreational path, it is also a heavily used commuter trail, even though it is difficult to accurately quantify the commuter usage. Weekday trail utilization shifts dramatically from weekend utilization. Weekend utilization is split with one out of

¹ The FHWA method was based on research conducted on 15 trails in ten cities nationwide, including a section of the Lakefront Trail at North Avenue beach. Ultimately, the Lakefront Trail was considered an outlier in the study as its average user volume per hour was more than seven times the average of all other trails. Its utilization was termed “off the charts”.

every four trail users on a bicycle, whereas weekday utilization has nearly the opposite split with three out of four users on bicycles. The much higher weekday bicycle utilization would indicate the likelihood of a large number of weekday bicycle commuters. Moreover, a large percentage of stakeholders who attended the first round of public meetings also indicated that they use the Lakefront Trail for commuting. Attendees were asked to fill out a survey to determine how they used NLS, the Lakefront Trail and Lincoln Park. The survey captured self-described trail utilization data from 295 attendees who filled out the survey card. The results are shown in Table 2.

Table 2
Lakefront Trail Utilization

Type of Trail Use	Percentage of Respondents who use the Trail in that fashion
Walker	68%
Jogger	33%
Bicyclist (Recreational)	66%
Bicyclist (Commuter)	41%
Rollerblader/Skateboarder	4%
Access the Lakefront	76%

As can be seen from the above data, about 40% of the respondents use the trail for commuting between destinations on bicycles rather than just for recreation.

Compounding the effects of high trail volumes are large numbers of park users who enter or leave the trail at access points along its length or cross it to travel to and from the lakefront. These movements cause conflicts between users at each access point which further degrades mobility. Trail access counts identified peak daily user volumes which ranged between about 2,000 users at north end junctions to nearly 22,000 users at the Oak Street underpass.

CMAA has also forecast 2040 socioeconomic (household and employment) growth factors throughout the study area for use in projecting changes in weekday pedestrian/bicycle utilization along the Lakefront Trail. Based on their forecasts, weekday trail utilization is projected to increase between 12% at the north end of the study area to 19% near Oak Street.

1.4.2.2 Improve Transit Mobility

Each weekday the CTA launches a complex operation of more than 3,300 bus trips within the study corridor to accommodate the heavy transit demand. These transit operations occur despite the lack of transit infrastructure needed to efficiently support them. Over the years, most of the planning and supporting infrastructure surrounding the daily transit operations has been done on an ad-hoc and informal basis, with transit facilities retrofitted to the existing street system. For instance, there are a handful of locations within and around Lincoln Park that have become staging areas for bus operations, most notably the North Avenue Beach area, the area around Montrose and Wilson Avenues east of NLS, and Foster Avenue between Sheridan Road and Marine Drive. These informal facilities lack clear definition, and quite often generate opposition from local residents and/or park users. The weekday performance of these facilities is hampered by roadway congestion, weather conditions, accidents

and/or occasional park closures. The facilities are largely inaccessible to CTA on weekends, especially during summer months.

The lack of transit priority measures (e.g. a dedicated transitway, traffic signal priority or queue-jumping facilities) on the supporting roadway network means that the quality of CTA bus service is dependent on the broader vehicular use on these roadways. Moreover, the complex operation required to cost-effectively support peak-period service necessitates that *both* directions of the roadway be available for bus use. Therefore, increases in auto-demand, accidents or weather-related events will doubly-impact transit and its ability to attract and maintain customers.



Transit ridership comprises a substantial portion of the total travel demand in the NLSD corridor on a daily basis. More than 42,000 passengers per day ride on seven express bus routes which utilize the Outer Drive and an additional 27,000 riders per day use two local bus routes which travel on the Inner Drive roadways. Of the 3,300 bus trips in the corridor each day, approximately 2,000 daily bus trips are on the Inner Drive, ancillary streets and arterials within the study boundaries to support local and express bus services. Trips on the Outer Drive include 700 revenue bus trips in which the buses are available to the public for transport and 600 non-revenue trips when a public transit vehicle operates without carrying or accepting passengers to support the delivery of peak hour service. Buses travel while “Not in Service” to staging areas in the corridor where they queue before commencing their revenue runs. Mobility for “Not in Service” travel is equally as important as mobility for revenue bus runs as congestion affects bus recirculation times, thereby increasing manpower, operating and equipment costs.

Combined ridership on bus routes in the corridor is relatively high. In addition, the strong bus ridership accounts for more than one in five user trips within the NLSD corridor. The high transit ridership that is experienced along this corridor is a result of the lifestyles of residents living in proximity to NLSD. In the 16 census tracts adjacent to study area, 35 percent of households own zero automobiles. Transit trips are the most popular commute choice for workers living in these areas.

NLSD User Trips by Mode: AVG Weekday		
	NLSD Bus Transit Boardings	NLSD Auto Trips
Trips	69,000	161,000
Users per trip	1	1.59
Users	69,000	256,000
Percent of all User Trips	21%	79%

In order to address the current transit demand, CTA runs buses every 3 to 10 minutes on the seven express and two local routes in peak periods. However, transit service is hampered by high overall travel demand on the area roadway network. Express bus routes that enter and exit NLSD must contend with severe vehicle congestion on some junction ramps during peak periods as well as on the Outer Drive itself. Congestion during peak periods negatively affects reliability and passenger crowding, ultimately diminishing the desirability of the CTA service.

Existing demands on transit service in the corridor will be intensified by expected future development in the north lakefront neighborhoods. The GO TO 2040 regional plan projects robust population and employment growth in the study area. CMAP has forecast bus boardings within the NLSD corridor to grow approximately 23% corridor-wide by 2040. Within the most heavily traveled section of NLSD north of Michigan Avenue, the bus routes on the Inner and Outer Drives are projected to carry as many as 85,000 riders per day.

Transit Service Quality - Because transit is a “service” as opposed to a “facility”, performance measures must be somewhat different than conventional facility-based performance measures. The *TCRP: Transit Capacity and Quality of Service Manual* provides guidance on calculating transit capacity and a framework for measuring transit availability, comfort, and convenience from the passenger and transit provider points of view. Compared to owner-occupied modes (automobile, bike, pedestrian), transit is patronized; thus, NLSD buses are viewed through the customer lens where service quality is the primary focus. For the purposes of this study, service quality is measured by travel time, reliability, comfort, and passenger environment metrics.

CTA Service Standards establish maximum desirable passenger loading for buses based on bus size. The load standards are not the maximum capacity of the given vehicle types; rather they are set at levels that provide a reasonable amount of comfort for customers on their daily commutes. Any routes and time periods that exceed these standards on a regular basis are targeted for improved service. Based on 2013 data, an average of 19% of all peak period bus trips in the NLSD corridor exceeded bus loading standards in the peak direction. Individual routes ranged between 15% and 25% of all peak period/peak direction trips exceeding the loading standards.

Travel Time and Reliability - Currently NLSD buses on the Outer Drive travel at relatively high speeds, but are negatively affected by congestion during peak periods. Following are characteristics of existing bus service in the NLSD corridor:

- NLSD express buses experience relatively high average travel speeds (30 mph or higher) on the Outer Drive.
- Outer Drive traffic delays during peak periods are especially prevalent in the southern portion of the study area between Grand Avenue and Fullerton Parkway. Afternoon peak period delays are the most dramatic in this section and have the greatest impact on bus travel time and reliability.
- Traffic delays on the heavily-utilized Inner Drive also impact bus travel times and reliability on a routine basis during peak periods. The 1/8-mile spacing of bus stops on the Inner Drive magnifies the impacts of traffic congestion on bus service as a result of frequent bus diverging and merging maneuvers.

Comfort and Passenger Environment – The service quality measures pertaining to comfort and passenger environment extend beyond the bus ride and include the accessibility of and amenities at bus stops:

- While the majority of bus stops meet the basic needs of transit customers, select locations do not meet ADA standards or lack sufficient capacity to accommodate peak demand operations.

- Comfort is also affected by service reliability, as large gaps in bus arrivals often lead to customer crowding, both at stations and on the buses themselves.



While the majority of bus stops meet the basic needs of transit riders, some locations do not meet ADA standards or they lack sufficient capacity to accommodate the large crowding that results from the high demand services which exist in this corridor. The CTA bus stop at Belmont Avenue is the most heavily used stop in the corridor where as many as 1,700 passengers board or alight buses during each peak period.

Northbound bus stops on the Inner Drive north of Belmont Avenue are squeezed onto the narrow 10-foot wide medians between the Inner and Outer Drives. Bus riders stand only a few feet away from high speed traffic on the Outer Drive, protected only by a guardrail and a Plexiglas splash-shield. There are no northbound bus stops provided on the Inner Drive between Grand Avenue and Oak Street because the median or barrier wall that separates the Inner Drive from the Outer Drive is too narrow.



There are approximately 85 bus stops within the NLSL study area. While the majority are equipped with handicap ramps at crosswalks, some have the accessible paths obstructed by sign posts, trash cans or other fixed objects. Despite heavy transit ridership in the corridor, more than 40% of the bus stops have no bus shelters or benches to accommodate riders. As noted earlier, few bus stops have any accommodations for bicycle parking. The lack of space for bus stops also inhibits the ability of CTA to implement creative service enhancements such as off-board payment systems that would speed boarding operations.

There is a need to provide transit accommodations at bus stops all along the NLSL corridor that are commensurate with the ridership demands and which enhance the comfort and convenience of the ridership experience.

Transit Ridership - Transit demand is diminished when transit service quality is negatively affected. A prime example is found in the drop in customer demand in the PM peak hour for NLSL buses when travel speeds in the southern portion of the study area are slowest. As noted earlier, NLSL buses experience relatively high travel speeds of 30 mph or higher on the Outer Drive at most times of day. However, the travel speeds are slowest in the southern-most section of the study area (between the Chicago River and North Avenue), especially in the PM peak period. In particular, the slowest average travel speeds (10mph) occur for northbound trips during the PM peak hours.

An impact of this change in average travel speed is the fact that NLS D buses also experience a reduction in passenger demand during these time periods (see Table 3). The demand for peak hour travel for southbound buses in the AM peak is about 5,200 customers traveling at the maximum flow point near Division Street. However, the demand for peak hour travel for northbound buses at the same location in the PM peak is only about 3,500 customers. Thus, afternoon NLS D buses experience a ridership reduction of about 1/3rd compared to the peak morning transit demand where travel times are slower in the southern sections of the NLS D bus routes. The parallel CTA Red Line experiences a similar increase in ridership during the PM peak period.

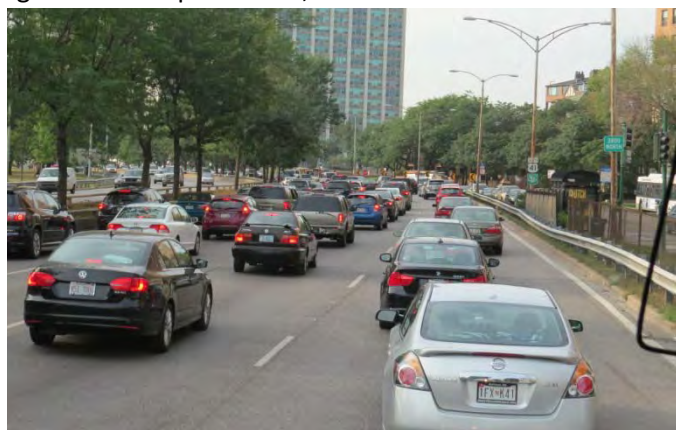
Table 3

Impacts of Travel Speed and Transit Demand on NLS D Buses		
	NLS D Peak Period Travel Speeds	Flow of customers in Peak Hour
AM Peak Southbound	20 mph	5,226
PM Peak Northbound	10 mph	3,479
Percent Change	-50%	-33%

Based upon the above metrics, there is a need to not only improve both the mobility and service quality of transit in the NLS D corridor, but to fully integrate transit accommodations into the design of improvement alternatives in order to improve transit travel time, reliability, comfort and passenger environments.

1.4.2.3 Improve Vehicular Mobility

The Outer Drive is an eight-lane boulevard with a 40 mph posted speed limit that is access-controlled with all but one junction grade separated. Though trucks are prohibited, the Outer Drive carries as many as 155,000 vpd. News organizations report peak period travel times on NLS D along with those of the region’s expressways and tollways. Traffic flow along the Drive is often expressway-like, except at the lone signalized intersection at Chicago Avenue or when congestion at junction ramp intersections backs up onto mainline. Because of these unique characteristics, traffic engineering tools for measuring capacity and level of service must be carefully selected and applied to appropriate sections of NLS D.



Mainline Level of Service – North Lake Shore Drive is heavily congested in the southbound direction during the morning peak period and in the northbound direction during the afternoon peak. Morning backups begin at or near Irving Park Road and extend beyond the southern limit of the study area.

Afternoon congestion begins south of the southern limit of the study area and extends routinely through Belmont Avenue and oftentimes through Irving Park Road.

Level of Service (LOS) is a congestion measure represented by six levels of service, ranging from A to F. LOS A represents the best (free flow) operating conditions and LOS F, the worst (breakdown) conditions. Exhibit 8 in Appendix A depicts Levels of Service at junction intersections as well as along the Outer Drive of NLSD.

Because NLSD is not a freeway, nor is it a typical arterial highway, there is no single measurement tool to accurately measure mainline Level of Service. Thus, a combination of tools was applied to determine mainline Levels of Service which included the FHWA Highway Performance Monitoring System methodologies for estimating freeway and multilane highway capacity, Synchro and SimTraffic for arterial sections, and the HCM method for adjusting over-capacity segments within freeway facilities. This hybrid analysis yields a southbound mainline Level of Service (LOS) in the A.M. peak hour of Level “F” beginning at the Irving Park Road southbound on-ramp and extending approximately 4½ miles through the southern project limit (see Exhibit 8). In the northbound direction in the P.M. peak hour, mainline NLSD is at LOS “F” between Grand Avenue and Michigan Avenue, between LaSalle Drive and Belmont Avenue and between Recreation Drive and Irving Park Road.

The Chicago Metropolitan Agency for Planning (CMAP) has developed 2040 traffic projections for NLSD. The 2040 traffic projections forecast minimal growth in traffic volumes along the length of the corridor, averaging approximately a 4% increase over 2013 volumes. The most heavily traveled section of the Outer Drive is predicted to increase from about 155,000 vpd to approximately 161,000 vpd in 2040.

It should also be noted that the Inner and Outer Drives along the length of the study area are an integral part of the urban street network. That street network is saturated with travel demand during peak periods to the point where no roadway has any excess capacity to absorb diverted traffic. Any improvement measures in the NLSD corridor that affect traffic volumes or patterns must not shift traffic burdens elsewhere. They must avoid or minimize impacts to the safety and operation of adjacent arterial roadways.

Mobility at at-grade intersections is typically measured by calculating the average control delay per vehicle and relating it to Level of Service benchmarks. Existing junction ramp intersection Levels of Service are shown in Table 4.

**Table 4
Existing Junction Intersection Levels of Service**

Junction Intersection	Level of Service and Delay (sec./veh.)	
	A.M. Peak Hour	P.M. Peak Hour
Grand Avenue Junction		
• SB Exit Ramp Intersection	F (228)	B (10)
• NB Entrance Ramp Intersection	C (22)	F (*)
Chicago Avenue Intersection		
• Inner/Outer Drive at Chicago Avenue	A (7)	F (129)
Michigan Avenue/Oak Street Intersection		
• Michigan/Oak/Inner Drive Intersection	B (13)	B (18)

LaSalle Drive Junction		
• SB Ramp/Inner Drive Intersection	C (27)	C (34)
• NB Ramp Intersection	C (33)	F (80)
Fullerton Parkway Junction		
• SB Ramp Intersection	B (17)	D (**)
• NB Ramp Intersection	B (10)	D (**)
Belmont Avenue Junction		
• SB Ramp/Inner Dr. Intersection	F (*)	C (29)
• NB Ramp Intersection	C (20)	F (440)
Irving Park Road (IL 19) Junction		
• SB Ramp/Inner Dr./Marine Dr. Intersection	E (78)	F (80)
• NB Ramp/Recreation Dr. Intersection	D (38)	C (28)
Montrose Avenue Junction		
• SB Ramp/Marine Dr. Intersection	F (98)	D (37)
• NB Ramp Intersection	***	NB LT D (32)***
Wilson Avenue Junction		
	***	***
Lawrence Avenue Junction		
	***	***
Foster Avenue (US 41) Junction		
	NB LT E (39)***	NB LT F (56)***
Bryn Mawr Avenue Junction		
	Free Flow	Free Flow
NLSD/Hollywood Ave./Sheridan Rd. Intersection		
	D (47)	F (88)

* Observed delays are substantial, however, they cannot be accurately quantified in Synchro/Sim Traffic.

** Level of Service determined from field observations.

*** Ramp intersections are stop sign controlled. All movements are at LOS A or B unless otherwise noted.

Three locations stand out in regard to their effects on vehicular mobility as they cause substantial traffic bottlenecks on mainline NLSD during one or both peak periods. Those locations are highlighted in blue in Table 4. The needs for improvement at the three bottleneck locations are described below.

Chicago Avenue Intersection -

Chicago Avenue, which is the only signalized intersection on NLSD, causes substantial mainline congestion, especially northbound during the P.M. peak period. Northbound queues can extend nearly to Monroe Street, which is about one mile to the south. Southbound queues in the afternoon can extend as far as the Michigan Avenue exit ramp, nearly ¾-mile to the north. Eastbound Chicago Avenue experiences long vehicle queues during the P.M. peak period as well. The intersection LOS in the P.M. peak hour is Level “F” (average delay = 2.2 minutes/vehicle).



In the A.M. peak period southbound queuing is not an issue because turning movements to and from Chicago Avenue from the Outer Drive are prevented by traffic cones during the morning peak period (i.e. Chicago Avenue only intersects with the Inner Driver during these times). The A.M. road closure,

however, creates accessibility issues for educational institutions and hospitals located on Chicago Avenue west of NLSD.

Belmont Avenue Junction - The area adjacent to the Belmont junction is the most densely populated area in the city outside of the downtown. Belmont Avenue also provides the only access to NLSD for a distance of two miles which concentrates high levels of traffic at this location. As a result, travel demand at the junction overwhelms the capacity of the existing roadway facilities. The junction ramp intersections operate at low Levels of Service during peak periods. The northbound ramp intersection operates at Level of Service "F" (average delay = 7.3 minutes/vehicle). Northbound traffic queues during these times can extend nearly a mile to the south on mainline NLSD. The southbound on-ramp at Belmont Avenue in the morning peak period is heavily congested which backs up traffic in three directions through the adjacent closely spaced intersections.



North Lake Shore Drive/Hollywood Avenue/Sheridan Road Intersection - Hollywood Avenue is the northern terminus of Lake Shore Drive. The high volume of vehicle traffic entering and leaving Lake Shore Drive at this terminus, which approaches nearly 70,000 vpd, is funneled through the Sheridan/Hollywood/Lake Shore Drive intersection (see Exhibit 3).

To accommodate traffic volumes of this magnitude while minimizing congestion, a manual traffic management operation has been instituted by CDOT in the weekday morning peak period at the Hollywood/Sheridan/NLSD intersection in concert with special traffic signal phasing. This manual traffic management operation employs traffic cones and unconventional signal phasing where southbound to eastbound left turns flow at the same time as eastbound through vehicles.

The southbound left turns are routed in the wrong direction onto northbound NLSD via a temporary reversible lane configuration on mainline Lake Shore Drive north of Bryn Mawr before crossing over to the southbound lanes. North/westbound traffic on Lake Shore Drive approaching this intersection is forced into



a single right turn lane onto northbound Sheridan Road. The northbound queue on Lake Shore Drive due to the lane reduction can extend all the way to Foster Avenue at times. When the queue reaches

the Bryn Mawr exit ramp, traffic begins to divert to Bryn Mawr, and then turns north at Sheridan or at Kenmore.

An important project improvement goal is to eliminate the need for the morning manual traffic control operations at the Hollywood Avenue/Sheridan Road intersection. Without the manual traffic management operation, the intersection would operate at LOS “F” in the A.M. peak hour (average delay = 3.1 minutes/vehicle), with a maximum eastbound queue length of more than 2,500 feet on Hollywood Avenue and a maximum southbound queue length on Sheridan Road of 7,250 feet. With the manual traffic management operation, the intersection operates at LOS “D” (average delay = 0.8 minutes per vehicle) with a 200-foot queue length on eastbound Hollywood and a 1,460-foot queue length on southbound Sheridan.

1.4.3 Address Infrastructure Deficiencies

This section evaluates the need to address deficiencies in pavement and structure conditions, the ability of the existing facilities to meet current design standards related to pedestrian, bicycle and transit facilities, and the adequacy of the existing drainage system. Exhibit 7 in Appendix A depicts a graphical summary of infrastructure conditions along NLS. Structures were rated based on their condition, an appraisal of their ability to meet current functional requirements and their compliance with the requirements of the Americans with Disabilities Act (ADA).



1.4.3.1 Structures

Structure condition ratings were obtained directly from the latest Structure Condition Reports or, where Structure Condition Reports did not exist (i.e. for some pedestrian tunnels), they were developed from visual inspections of structures conducted in 2013. Ratings comply with FHWA rating criteria for evaluating structure components (e.g. bridge deck, superstructure and substructure components of bridges). For the purposes of Exhibit 7, a single condition rating was presented for each structure which coincided the lowest rating given to any one of the individual structure components.

The structure condition rating was then combined with an evaluation of the functional adequacy of the structure to develop a **Structure Appraisal Rating**. The Structure Appraisal Rating falls into one of three categories: *Meets Standards*, *Functionally Obsolete* or *Structurally Deficient*. The functional adequacy of structures was determined by examining geometric standards for widths and clearances alongside peak motorized and/or non-motorized user demands. Structures which did not meet current standards for deck geometry, load carrying capacity, clearance or approach roadway alignment or which could not adequately serve user demands were judged to be functionally obsolete.

Bridges were classified as structurally deficient where significant load carrying elements were rated to be in *poor* or worse condition due to deterioration or damage. It should be noted that any structure classified as structurally deficient was excluded from the functionally obsolete category as structures that are both structurally deficient and functional obsolete are reported together as deficient structures.



Because much of the NLSD infrastructure was constructed in the 1930s, bridges and pedestrian tunnels have exceeded their typical service lives by 30 or more years. Regular cycles of maintenance and rehabilitation have been successful in extending their service lives; however, maintenance cycles are becoming more frequent and can no longer address many of the underlying issues. As detailed on Exhibit 7, two of the eleven roadway structures (the Wilson Avenue and Lawrence Avenue overpasses) are in poor condition and thus would be considered structurally deficient. Pedestrian tunnels at the Michigan Avenue/Oak Street intersection are also in poor condition and are considered structurally deficient.

Although all other pedestrian/cyclist structures in the corridor are in fair or better condition, three-quarters of the structures can be considered functionally obsolete as the size of the facility does not adequately accommodate the current demand. Most of the pedestrian/cyclist structures are only 10 feet wide and 8 feet high, but must accommodate as many as 22,000 pedestrians and cyclists per day. Pedestrian structures that are considered functionally obsolete include the following:

- Chicago Avenue
- Michigan Avenue
- Oak Street
- Division Street
- North Avenue
- Passerelle Bridge
- Diversey Parkway
- Roscoe Street
- Addison Street

Stakeholders have also identified sight distance problems and the lack of bicycle access at some structures, as well as a general need to improve lighting under bridges and within pedestrian tunnels.

1.4.3.2 ADA Requirements

Much of the NLSD infrastructure fails to meet the requirements of the Americans with Disabilities Act. Eleven of the twelve pedestrian tunnels and the single pedestrian bridge do not meet ADA requirements. In addition, the accessible routes at six of the nine roadway junctions fail to provide adequate handicap accessibility (see Exhibit 7). Pedestrian tunnels typically fail to meet ADA requirements due to approach ramps with excessive grades and/or a lack of landings and handrails. The Chicago Avenue and Division Street tunnels lack any ramps at all and only have stairs.

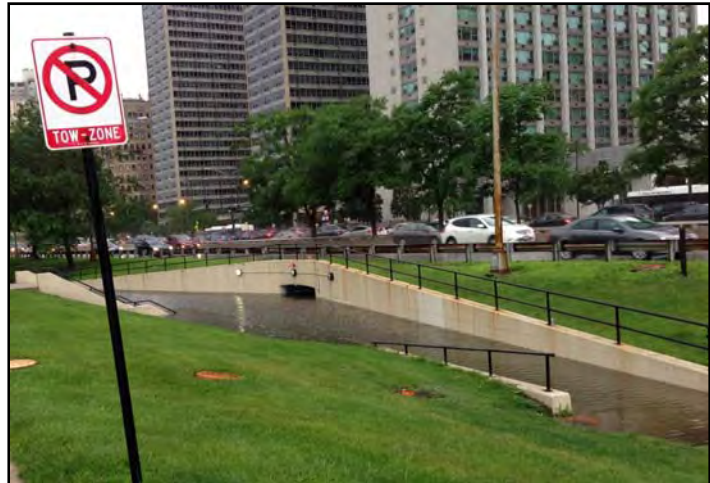
1.4.3.3 Roadway

Though the NLSD pavement between Grand Avenue and Irving Park Road has been repaired and resurfaced many times over the years, the underlying roadway structure is the original 1932 pavement. The pavement north of Irving Park Road was originally built in 1953-54 and was subsequently reconstructed in 1967. Large scale improvement projects to repair drainage structures, improve median barriers and guard rails and to patching and resurface the pavement have occurred along sections of NLSD in 1976, 1991, 1996, 1999, 2011 and 2012. The repair cycle for pavement maintenance and renewal as well as structure and lighting system repairs along all of NLSD is becoming more frequent due to the age and condition of the facilities.

1.4.3.4 Drainage Deficiencies

Another identified deficiency is the accommodation of roadway drainage. Flooding regularly occurs at several locations along the corridor and affects not only the cross street underpasses, the pedestrian underpasses and the Lakefront Trail, but at times can affect mainline NLSD as well. Common flooding locations are illustrated on Exhibit 7.

Flooding occurs as a result of large rain events and from high wave action on Lake Michigan. Most of NLSD drains into the City's combined sewer system, which cannot adequately accommodate heavy storm water flows and results in the flooding of underpasses and adjacent streets. Flooding impacts buses earlier and more often than other vehicles, and weather-related detours quite often require buses to navigate through congested streets, impacting and sometimes stranding thousands of transit commuters.



Due to the proximity of NLSD and the Lakefront Trail to Lake Michigan, they are subject to occasional flooding as a result of high wave action. This flooding causes hazardous conditions, particularly in the wintertime when the roadway and the Lakefront Trail can quickly become ice covered. Portions of the trail are impassible for extended periods of time due to ice buildup in the winter.



1.4.3.5 Wayfinding

Another deficiency identified by stakeholders is the general lack of signage within the study area that is designed to give users who are unfamiliar with the area information on wayfinding, restrictions or special conditions within Lincoln Park. Tourists on foot often are unable to find locations of pedestrian underpasses to cross NLSD and enter Lincoln Park, as identification and/or directional signing is lacking at these locations. Once inside the park, directional signing to major attractions is also lacking. Runners and bicyclists have requested location signing and mile markers along the Lakefront Trail and parallel jogging paths to tie path locations to adjacent urban streets.

During times of peak summer usage, auto drivers have no advance warnings that parking lots are full, that park roadways have been closed to auto traffic or where alternate parking could be found. The lack of advanced driver information often leads to gridlocked travel conditions during peak summer weekends on roadways approaching Lincoln Park as drivers first attempt to drive to the lakefront before discovering they must seek alternate parking accommodations. The lack of advance truck prohibition signing often results in truck drivers who are unfamiliar with the area discovering too late that trucks are prohibited on US 41. The lack of facilities for trucks to turn around at NLSD often results in trucks illegally entering the Outer Drive.

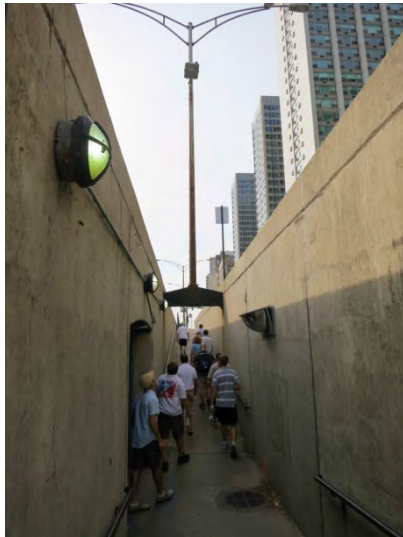
1.4.5 Improve Access and Circulation

North Lake Shore Drive and Lincoln Park attract tens of thousands of users to the study area every day. The Lakefront Trail serves thousands of recreational users, commuters and tourists each day. In addition, adjacent neighborhoods generate tens of thousands of daily transit riders on corridor bus routes. Of the 155,000 vehicles per day on the Outer Drive, nearly half enter or leave NLSD via junctions serving the adjacent neighborhoods. This intense daily urban activity overburdens the access and circulation systems of both the park and roadway.

1.4.5.1 Non-Motorized Access to Lincoln Park

Non-motorized access to Lincoln Park and the lakefront is limited to nine roadway junctions, twelve pedestrian tunnels and one pedestrian bridge along the seven-mile project area. Access facilities along the northern third of the project area north of Irving Park Road are spaced approximately one-quarter mile apart. Along the remainder of the project area, however, access points generally are spaced one-half to three-quarters of a mile apart. Moreover, many of these access points are at junctions where park users are impeded by heavy traffic flows at ramp intersections. Non-motorized access at roadway junctions occurs via sidewalks that are often too narrow for typical pedestrian demands and few intersecting cross streets provide bicycle accommodations.

Many of the pedestrian tunnels that provide access to Lincoln Park are undersized for current park user demands, flood during heavy rain falls and do not meet ADA requirements for handicapped accessibility (see Exhibit 7). Several tunnels have blind corners and sight distance restrictions at entries.



Two of the stated purposes of the 1973 *Lake Michigan and Chicago Lakefront Protection Ordinance* are:

- “(f) To promote and provide for continuous pedestrian movement along the shoreline;
- (g) To promote and provide for pedestrian access to the Lake and Lakefront Parks through areas adjacent thereto at regular intervals of one-fourth mile and additional places wherever possible...”

Table 5 summarizes conditions at non-motorized access points to Lincoln Park which include peak hour Levels of Service along the access route segments at the Outer Drive, the compliance of these routes with ADA standards, and the adequacy of spacing of the access locations according to the criterion listed in the *Lakefront Protection Ordinance*.

**Table 5
Existing Conditions at
Non-motorized Access Points to Lincoln Park**

Access Location	Access Width	Daily/Peak Hour Volume ⁽¹⁾	Peak Hour LOS ⁽²⁾	ADA Compliant	Access Spacing (mi)	Spacing Adequacy ⁽³⁾
Ohio Street Pedestrian Tunnel	23'-5"	9,170/853	F	No	0.34	No
Chicago Avenue Pedestrian Tunnel	9'	3,420/319	F	No	0.51	No
Oak Street Pedestrian Tunnel	12'	21,690/2,632	F	No	0.17	Yes
Division Street Pedestrian Tunnel	10'	8,120/978	F	No	0.49	No
North Avenue Pedestrian Tunnel	10'	3,460/314	F	No	0.11	Yes

LaSalle Drive Junction – S Walk	10'	940/95	C	Yes	0.19	Yes
Lincoln Park Passerelle Bridge	14'	5,410/491	F	No	0.78	No
Fullerton Parkway Junction – N Walk	15'-10"	5,310/466	E	Yes	0.44	No
Diversey Parkway Bridge – S Walk	6'	420/128	F	No	0.46	No
Diversey Parkway Bridge – N Walk	6'	1,570/215	F			
Barry Avenue Pedestrian Tunnel	22'	8,760/1,610	F	Yes	0.19	Yes
Belmont Avenue Junction – N Walk	15'	3,550/294	D	Yes	0.20	Yes
Roscoe Street Pedestrian Tunnel	10'	2,760/274	F	No	0.48	No
Addison Street Pedestrian Tunnel	9'	3,400/301	F	No	0.37	No
Irving Park Road Junction – S Walk	6'	310/40	A	No	0.27	Yes
Irving Park Road Junction- N Walk	6'	2,540/215	F			
Buena Avenue Pedestrian Tunnel	12'	1,910/166	B	No	0.24	Yes
Montrose Avenue Junction – S Walk	7'	N/A	-	No	0.26	Yes
Montrose Avenue Junction – N Walk	7'	2,690/228	F	No		
Wilson Avenue Junction – S Walk	12'	920/108	B	No	0.26	Yes
Wilson Avenue Junction – N Walk	12'	880/104	B			
Lawrence Avenue Junction – S Walk	12'	780/94	B	No	0.26	Yes
Lawrence Avenue Junction – N Walk	12'	990/106	B			
Argyle Street Pedestrian Tunnel	11'-4"	2,440/319	E	No	0.26	Yes
Foster Avenue Junction – S Walk	8'-5"	900/113	D	No	0.21	Yes
Foster Avenue Junction – N Walk	8'-5"	1,390/164	E			
Berwyn Avenue Pedestrian Tunnel	18'-11"	2,310/202	B	No	0.31	Yes
Bryn Mawr Avenue Junction – S Walk	7'-2"	650/60	D	No	0.21	Yes
Bryn Mawr Avenue Junction – N Walk	7'-6"	1,330/126	E			

(1) Saturday Count Data collected June - July 2013. Volume includes pedestrians and bikes.

(2) Source: *Shared-Use Path Level of Service Calculator*, FHWA. Level of Service (LOS) is for section of path that crosses NLSL.

(3) Access spacing adequacy based on desirable spacing of approximately 1/4 mile or less.

There is a need to create functional and inviting entries into Lincoln Park that are unencumbered by vehicular traffic, are regularly spaced and accommodate varying access demands along the route. There

is also a need to enhance the east-west connectivity of pedestrian and bicycle facilities in adjacent neighborhoods to Lincoln Park and the Lakefront Trail.

1.4.5.2 Vehicular Access to North Lake Shore Drive

Vehicular access to NLSD occurs at eleven roadway junctions and two signalized intersections. Roadway junctions, however, are not evenly spaced along the length of the Drive. Belmont Avenue is the only junction for a two-mile stretch of NLSD. The Belmont Avenue junction and to a lesser extent, the Irving Park Road junction (see Exhibit 8), as well as the local street network adjacent to these junctions are overburdened with travel demand during peak periods due to the long distances between access points in this area of NLSD.

Whereas junctions are widely spaced near Belmont Avenue, they are closely spaced between Montrose and Lawrence Avenues (see Exhibit 2). The junctions at Montrose, Wilson and Lawrence are spaced only one-quarter mile apart, which causes safety and operational problems at the short weaving areas on NLSD. There is a need to evaluate the spacing of junctions along NLSD to see if adding or deleting access points could reduce congestion on the adjacent local street network and/or improve safety and operation on the Outer Drive.

1.4.5.3 Access to Transit

Pedestrian access to transit in the corridor is highly developed. Bus stops along the Inner Drive are closely spaced, located nearly every block. However, most CTA services provide either a local bus, or an express bus directed to downtown. For travelers seeking a reliable and rapid trip between intermediate locations along the lakefront (for instance, someone traveling from Rogers Park to the Lincoln Park Zoo), there is no express transit option for that trip—further encouraging that trip to be served by an auto. A number of stakeholders have noted a need for transit service within Lincoln Park itself, particularly on weekends. There have been past proposals for trolley service within and adjacent to Lincoln Park. These suggestions and proposals echo one of the basic policies contained in the *Lakefront Plan of Chicago* which is to “Improve access to the lakeshore parks and reduce through vehicular traffic on secondary park roads”. The Plan goes on to suggest exploring the feasibility of internal shuttle service through major portions of the park. There is a need to consider these internal transit access needs when exploring improvement alternatives.

Bicycle access to transit is also limited, as virtually none of the bus stops have accommodations for bicycle parking. The Divvy Bike system, introduced in 2013, may enhance bike access to transit in the area.

1.4.5.4 Transit Access to Lincoln Park

East-west transit access to Lincoln Park along the NLSD corridor is hampered by the inability of local buses to turn around upon reaching the Inner Drive. Along most of the corridor, local east-west buses are not able to enter Lincoln Park because of these operational constraints. Most of these routes are forced to use the adjacent arterial street system to turn around, which adds additional mileage and travel time to these routes. On summer weekends when transit connections to Lincoln Park are needed most, east-west arterial roadways are gridlocked with traffic, trapping buses in the traffic queues. Table 6 lists locations where bus turnarounds are needed to improve transit access to Lincoln Park as well as to enhance the efficiency of east-west transit service.

In addition to bus turnarounds, there is a need for bus staging and layover areas. The magnitude of the daily transit operations that occur in the NLSL corridor requires areas for buses to stage and layover for their next run. Much of this bus staging presently occurs within Lincoln Park on park roadways and on ramps to and from the Outer Drive.

Table 6
Needs for Bus Turnarounds and Bus Staging/Layover Areas

Location	Bus Turnaround & Layover for E-W Route	Bus Staging & Layover For N-S Routes
Chicago Avenue	√	
Division Street	√	
LaSalle Drive	√	√
Fullerton Parkway	√	√
Diversey Parkway	√	
Belmont Avenue	√	√
Addison Street	√	
Irving Park Road	√	√
Montrose Avenue	√	
Simonds Drive	√	
Lawrence Avenue	√	
Foster Avenue	√	√

There is a need to improve the efficiency of east-west transit service that connects to NLSL and Lincoln Park and to provide transit facilities that will enhance operational flexibility.

Appendix A

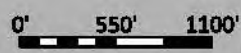
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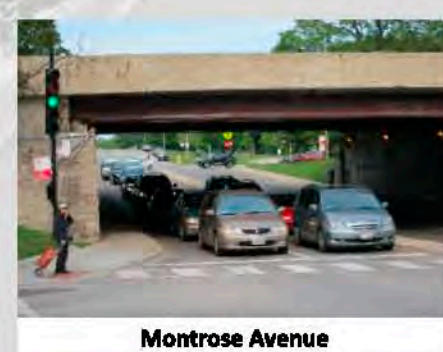
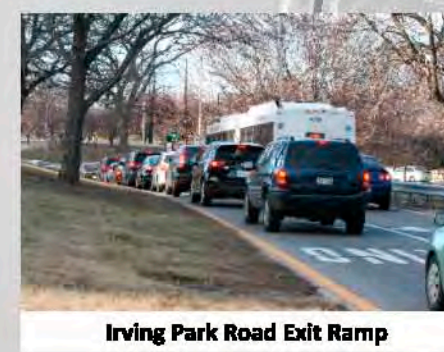
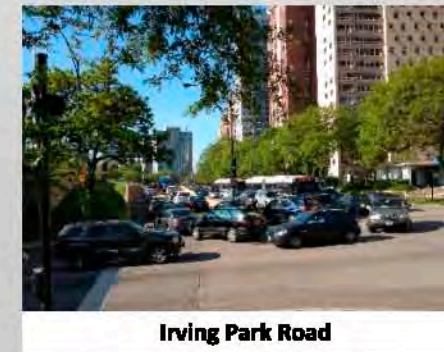
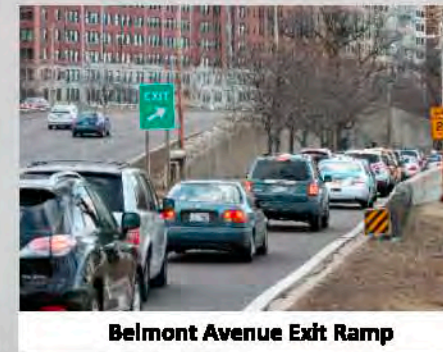
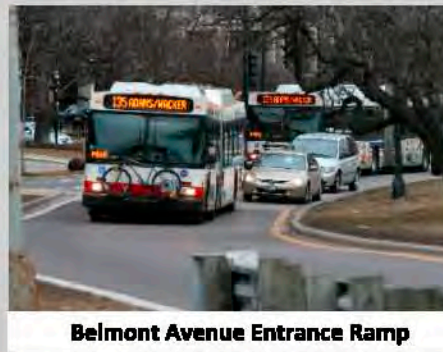
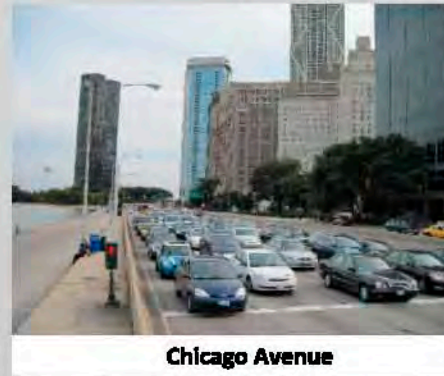




	Roadways		Lincoln Park
	Structures		Study Limits
	Lakefront Trail		Other Paths

North Lake Shore Drive Phase I Study
Study Area Map
 Grand Avenue to Hollywood Avenue
 January 2, 2014



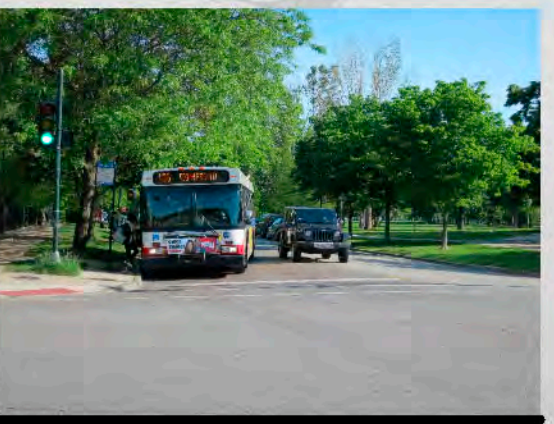
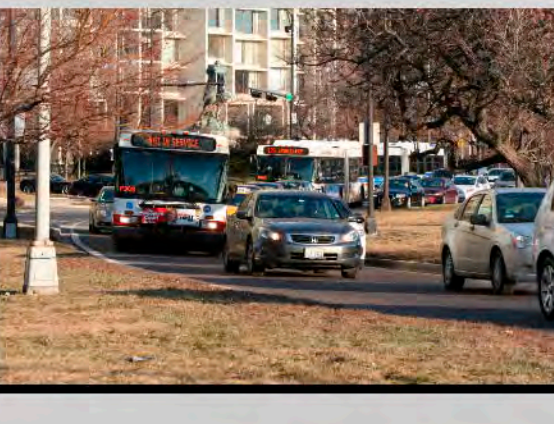
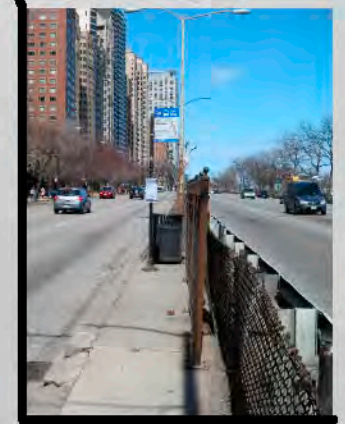
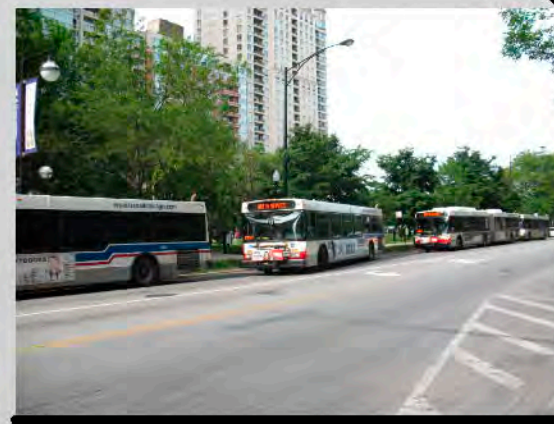
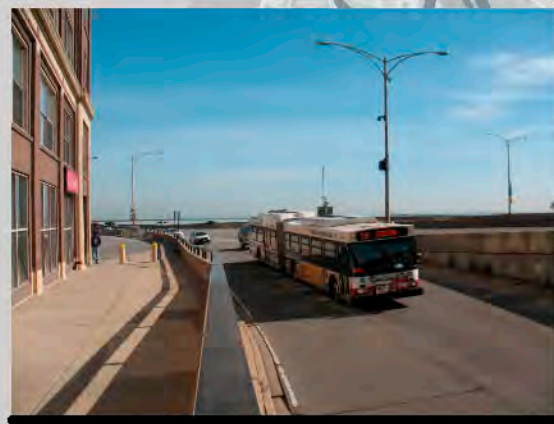
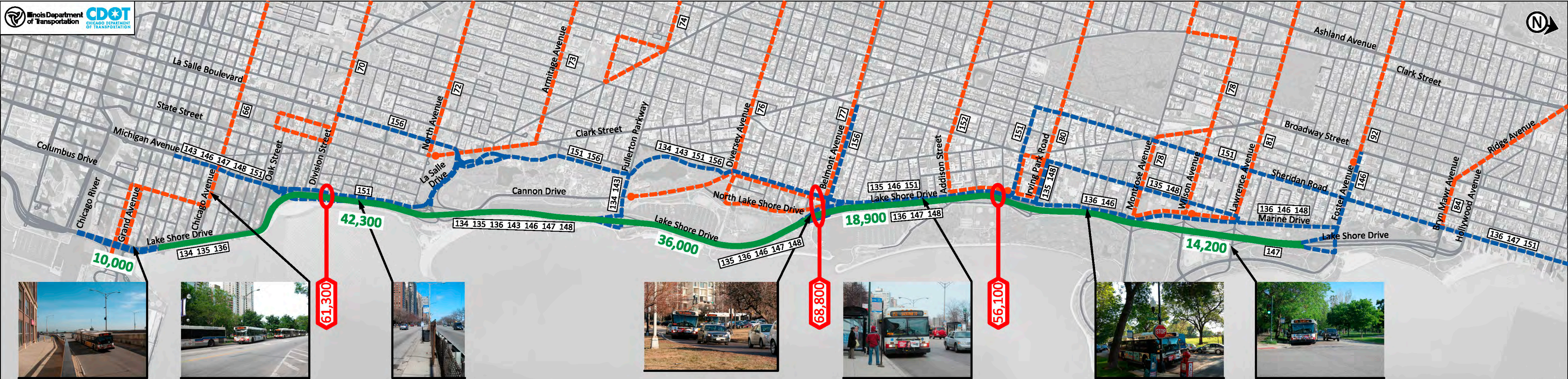


0' 600' 1200'

XXX,XXX 2013 Average Daily Traffic Volume
X,XXX 2013 Average Daily Traffic Volume (Inner Lake Shore Drive, Marine Drive, Sheridan Road)

Existing North Lake Shore Drive Traffic Mainline Signal
 Existing North Lake Shore Drive Junction Ramp Signal

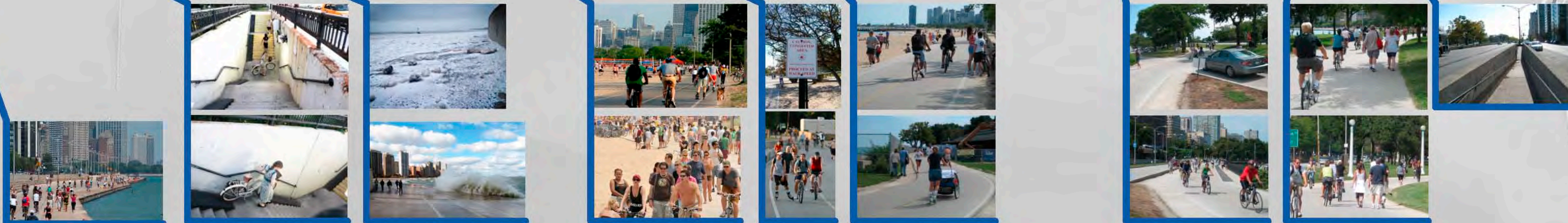
North Lake Shore Drive Phase I Study
Existing Average Daily Traffic
 January 2, 2014
Exhibit 3



0' 600' 1200'

XXX	Bus Route Number	XX,XXX	NLSD Average Daily Weekday Transit Ridership
	N/S Express Bus Route		Average Weekday Total Corridor Transit Ridership
	N/S Local Bus Route		
	E/W Local Bus Route		

North Lake Shore Drive Phase I Study
Existing Weekday Transit Ridership
 July 18, 2014
Exhibit 4



█ Lakefront Trail
⇄ Two-way Park Entrance Counts ⁽¹⁾
⇄ Two Way Trail Counts ⁽²⁾

XX,XXX Weekday Daily Trail Volume ⁽¹⁾
(XX,XXX) Weekend Daily Trail Volume ⁽²⁾
(1) Bicycles, Pedestrians, and Others
 (2) Source: Lakefront Trail Counts
 June - August 2013

North Lake Shore Drive Phase I Study
Existing Lakefront Trail Usage

0' 600' 1200'



STATE-WIDE SAFETY COMPARISON

14 of Top 144

6 of Top 10

Number of NLSD roadway segments in State-wide Five Percent Peer Group

5-YEAR CRASH SUMMARY

17 Fatal Crashes
1,005 Injury Crashes
5,824 Total Crashes

37% Rear End 21% Sideswipe 20% Fixed Object 23% Other

1,165 Crashes/Year

Average Annual Crash Total

High Crash Roadway Segment
 Top 5% of Statewide Roadway Segments
 Peer Group 9 - Urban Multilane Divided Highway

High Crash Intersection
 Top 1% of Statewide Intersections
 Peer Group - Urban Minor Leg Stop Control

NLSD High Crash Location

Fatal Crashes

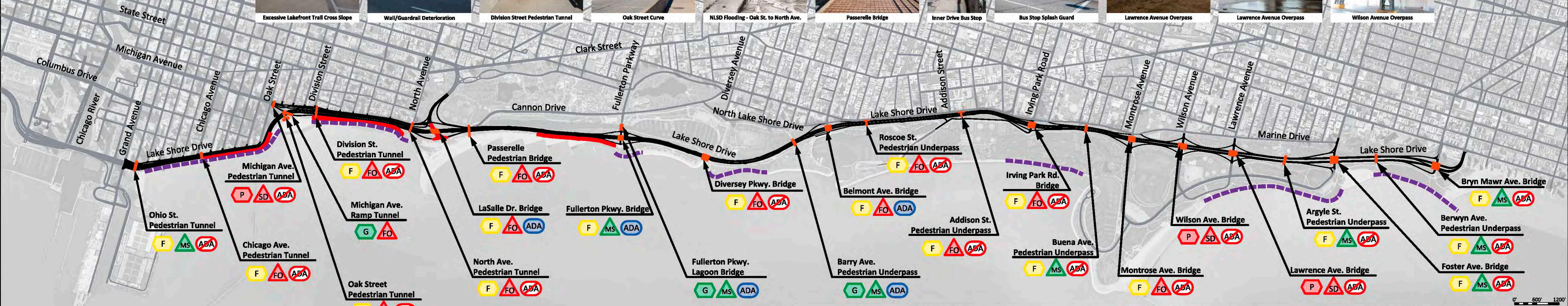
Injury Crashes

Total Crashes

*Source: 2012 FHWA HSIP Five Percent Report State of Illinois 0' 600' 1200'

North Lake Shore Drive Phase I Study

2007-2011 Crash Data*



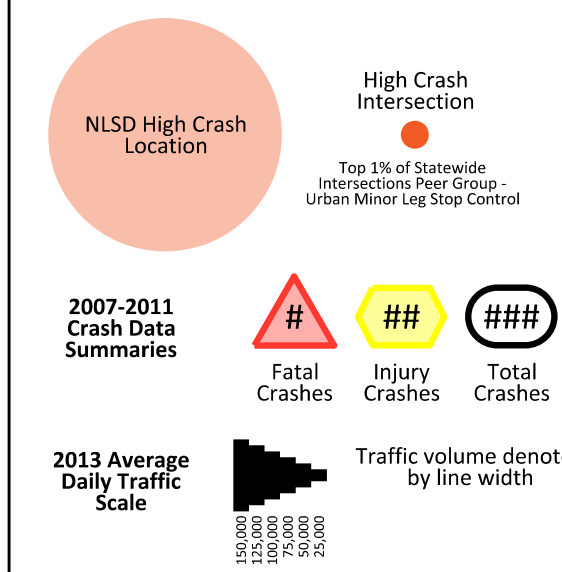
0' 600' 1200'

Notes:
 * Structure Condition is based on lowest condition rating for Deck, Superstructure, and Substructure.
 ** ADA Compliance applies to structure and approach pathways.

Structure Location	Structure Condition*	Structure Appraisal	ADA Compliance**	Shoreline Protection
	Good	Meets Standards	Meets ADA Requirements	Roadway/Lakefront Trail Flooding
	Fair	Structurally Deficient	Does not meet ADA Requirements	Deteriorated Shoreline Revetment
	Poor	Functionally Obsolete		

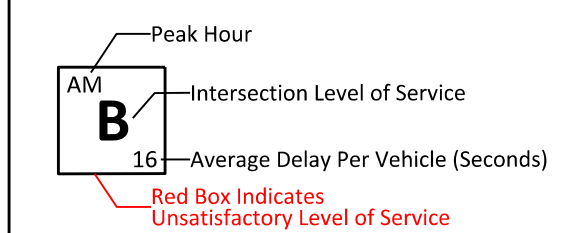
North Lake Shore Drive Phase I Study
Existing Infrastructure Conditions

Crash Data & Traffic Volumes Legend



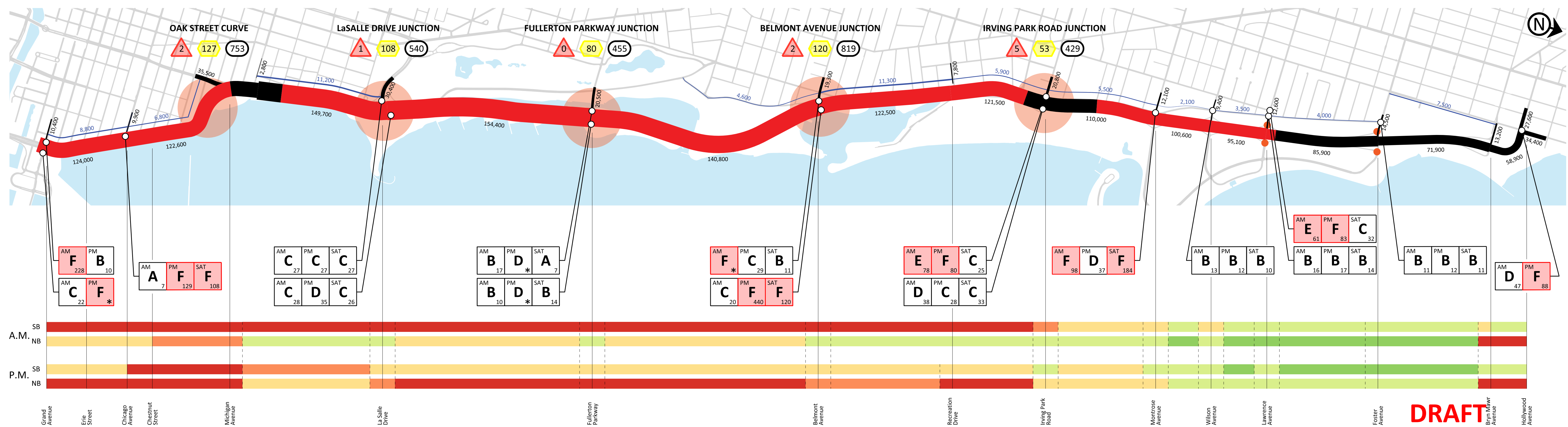
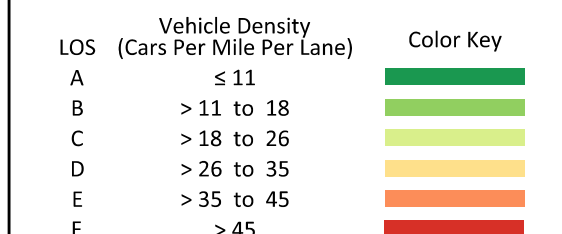
Red roadway denotes top 5% High Crash Roadway Segment
 Blue ADT data refer to Inner Lake Shore Drive, Marine Drive, and Sheridan Road

Intersection Level of Service Legend



* Denotes LOS determined from field observations

NLSD Mainline Level of Service Criteria



DRAFT
 North Lake Shore Drive Phase I Study
Intersection and Mainline Levels of Service
 with Traffic and Crash Data Overlay