

APPENDIX H

Landside Facilities Technical Report

This page is left intentionally blank.

Landside Facilities Technical Report

HNTB

December 2011

**Minneapolis-St. Paul International Airport
2020 Improvements
Environmental Assessment/
Environmental Assessment Worksheet**

This page is left intentionally blank.

TABLE OF CONTENTS		<u>Page</u>
1	Introduction	1
2	Existing Conditions.....	1
2.1	Methodology.....	1
2.1.1	Study Area	1
2.1.2	Data Collection.....	2
2.1.3	Data Development	4
2.1.4	Operational Analysis	9
2.2	Existing Conditions Operation Analysis	13
2.2.1	Existing Landside Facilities.....	13
2.2.2	Operational Analysis	17
2.3	Summary of Findings	25
3	Traffic Volume Forecast	26
3.1	Methodology.....	26
3.2	No Action Traffic Volumes.....	26
3.2.1	2020 No Action Alternative	26
3.2.2	2025 No Action	27
3.3	Airlines Remain Alternative Traffic Volumes	27
3.3.1	2020 Airlines Remain Alternative.....	27
3.3.2	2025 Airlines Remain Alternative.....	27
3.4	Airlines Relocate Alternative Traffic Volumes	28
3.4.1	2020 Airlines Relocate Alternative	28
3.4.2	2025 Airlines Relocate Alternative	29
4	Landside Facility Requirements	29
4.1	Terminal Access Roads	30
4.2	Terminal Curb Roadways.....	34

4.3	Parking Facilities	40
4.3.1	Parking Stalls	40
4.3.2	Parking Entrance & Exit Plazas	45
4.4	Rent-a-Car (RAC) Ready/Return Spaces and Quick Turn Around (QTA) Area	49
4.5	Ground Transportation	51
4.5.1	Ground Transportation Center (GTC).....	52
4.5.2	Transit Center	53
5	Future Alternative Concepts.....	53
5.1	Airlines Remain Alternative	54
5.2	Airlines Relocate Alternative	61

LIST OF FIGURES

On or Following Page

Figure H.2-1	Terminal 1-Lindbergh Study Area.....	2
Figure H.2-2	Terminal 2-Humphrey Study Area	2
Figure H.2-3	Terminal 1-Lindbergh Data Collection Location Map	2
Figure H.2-4	Terminal 2-Humphrey Data Collection Location Map.....	2
Figure H.2-5	Base Case- Terminal 1-Lindbergh: 2010 Peak Hour Volumes.....	6
Figure H.2-6	Base Case- Terminal 2-Humphrey: 2010 Peak Hour Volumes.....	6
Figure H.3-1	No Action - Terminal 1-Lindbergh: 2020 Peak Hour Volumes.....	27
Figure H.3-2	No Action - Terminal 2-Humphrey: 2020 Peak Hour Volumes	27
Figure H.3-3	No Action - Terminal 1-Lindbergh: 2025 Peak Hour Volumes.....	27
Figure H.3-4	No Action - Terminal 2-Humphrey: 2025 Peak Hour Volumes	27
Figure H.3-5	Alternative 1 – Airlines Remain - Terminal 1-Lindbergh: 2020 Peak Hour Volumes	27
Figure H.3-6	Alternative 1 – Airlines Remain - Terminal 2-Humphrey: 2020 Peak Hour Volumes	27

Figure H.3-7	Alternative 1 – Airlines Remain - Terminal 1-Lindbergh: 2025 Peak Hour Volumes	27
Figure H.3-8	Alternative 1 – Airlines Remain - Terminal 2-Humphrey: 2025 Peak Hour Volumes	27
Figure H.3-9	Alternative 2 – Airlines Relocate - Terminal 1-Lindbergh: 2020 Peak Hour Volumes	29
Figure H.3-10	Alternative 2 – Airlines Relocate -Terminal 2-Humphrey: 2020 Peak Hour Volumes	29
Figure H.3-11	Alternative 2 – Airlines Relocate - Terminal 1-Lindbergh: 2025 Peak Hour Volumes	29
Figure H.3-12	Alternative 2 – Airlines Relocate - Terminal 2-Humphrey: 2025 Peak Hour Volumes	29
Figure H.5-1	Alternative 1 - Airlines Remain Terminal 1-Lindbergh: 2020 Overall Landside Concept.....	54
Figure H.5-2	Alternative 1 - Airlines Remain Terminal 2-Humphrey: 2020 Overall Landside Concept.....	58
Figure H.5-3	Alternative 2 - Airlines Relocate Terminal 1-Lindbergh: 2020 Overall Landside Concept.....	61
Figure H.5-4	Alternative 2 - Airlines Relocate Terminal 2-Humphrey: 2020 Overall Landside Concept.....	67

LIST OF TABLES

Page

Table H.2.1.1	Data Collection Locations	3
Table H.2.1.2	Peak House Traffic Volumes, Average Day Peak Month (ADPM) (2010 July)...	5
Table H.2.1.3	Vehicular Dwell Times Used in Analysis	6
Table H.2.1.4	Classification Counts – 3-Hour Morning Peak Period	7
Table H.2.1.5	Classification Counts – 3-Hour Afternoon Peak Period.....	8
Table H.2.1.6	Parking Entrance/Exit Processing Times	9
Table H.2.1.7	Terminal Area Roadway LOS Standards	11
Table H.2.1.8	Terminal Area Roadway LOS Standards (Weaving Segments Only).....	11

Table H.2.1.9	Terminal Area Roadway LOS Standards (Signalized Intersections).....	12
Table H.2.1.10	Terminal Curb Roadway LOS Standards	12
Table H.2.1.11	Parking Entrance/Exit LOS Standards	12
Table H.2.2.1	Existing Terminal Area Parking Facilities Breakdown	15
Table H.2.2.2	Traffic Analysis Results: Access Roadways - Overall Peak Hour	18
Table H.2.2.3	Traffic Analysis Results: Access Roadways - Departures Peak Hour.....	19
Table H.2.2.4	Traffic Analysis Results: Access Roadways - Arrivals Peak Hour	20
Table H.2.2.5	Capacity Analysis Results: Curb Roadways.....	21
Table H.2.2.6	Traffic Analysis Results: Parking Entrances - Overall Peak Hour	22
Table H.2.2.7	Traffic Analysis Results: Parking Entrances - Departures Peak Hour	22
Table H.2.2.8	Traffic Analysis Results: Parking Entrances - Arrivals Peak Hour	23
Table H.2.2.9	Capacity Analysis Results: Parking Stalls	24
Table H.2.2.10	Capacity Analysis Results: Rental Car and Quick Turn Around Facilities	24
Table H.2.2.11	Capacity Analysis Results: Ground Transportation Center	25
Table H.3.4.1	Mode Share Change in Alternative 2 - Airlines Relocate	28
Table H.4.1.1	Landside Facility Requirement Drivers.....	30
Table H.4.1.2	Summary of 2020 No Action Terminal Access Roadway Operations	32
Table H.4.1.3	Summary of 2025 No Action Terminal Access Roadway Operations	33
Table H.4.2.1	Vehicular Dwell Times Used in Terminal Curb Roadway Analysis	35
Table H.4.2.2	Peak Hour Vehicle Class Curb Volumes (2020 No Action).....	35
Table H.4.2.3	Peak Hour Vehicle Class Curb Volumes (2020 Alternative 1 - Airlines Remain)..	36
Table H.4.2.4	Peak Hour Vehicle Class Curb Volumes (2020 Alternative 2 - Airlines Relocate)	36
Table H.4.2.5	Peak Hour Vehicle Class Curb Volumes (2025 No Action).....	36
Table H.4.2.6	Peak Hour Vehicle Class Curb Volumes (2025 Alternative 1 - Airlines Remain)..	37

Table H.4.2.7	Peak Hour Vehicle Class Curb Volumes (2025 Alternative 2 - Airlines Relocate)	37
Table H.4.2.8	Existing Terminal Curb Roadway Requirement	38
Table H.4.2.9	No Action Terminal Curb Roadway Requirement	38
Table H.4.2.10	Alternative 1 - Airlines Remain Terminal Curb Roadway Requirement	39
Table H.4.2.11	Alternative 2 - Airlines Relocate Terminal Curb Roadway Requirement	40
Table H.4.3.1	Parking Durations Used in Analysis	41
Table H.4.3.2	Existing Parking Stall Requirement	42
Table H.4.3.3	No Action Parking Stall Requirement	43
Table H.4.3.4	Alternative 1 - Airlines Remain Parking Stall Requirement	44
Table H.4.3.5	Alternative 2 - Airlines Relocate Parking Stall Requirement	45
Table H.4.3.6	Entrance and Exit Plaza Processing Times	46
Table H.4.3.7	Existing Parking Plaza Requirement	47
Table H.4.3.8	No Action Parking Plaza Requirement	47
Table H.4.3.9	Alternative 1 - Airlines Remain Parking Plaza Requirement	48
Table H.4.3.10	Alternative 2 - Airlines Relocate Parking Plaza Requirement	48
Table H.4.4.1	Existing Rental Car Facility Requirement	50
Table H.4.4.2	No Action Rental Car Facility Requirement	50
Table H.4.4.3	Alternative 1 - Airlines Remain Rental Car Facility Requirement	50
Table H.4.4.4	Alternative 2 - Airlines Relocate Rental Car Facility Requirement	51
Table H.4.5.1	Ground Transportation Vehicle Dwell Times	51
Table H.4.5.2	Existing GTC Requirement	52
Table H.4.5.3	No Action GTC Requirement	52
Table H.4.5.4	Alternative 1 - Airlines Remain GTC Requirement	53
Table H.4.5.5	Alternative 2 - Airlines Relocate GTC Requirement	53
Table H.5.1.1	Alternative 1 - Airlines Remain Parking Capacity	55

Table H.5.1.2	Alternative 1 - Airlines Remain Parking Plaza Capacity.....	56
Table H.5.1.3	Alternative 1 - Airlines Remain Terminal Curb Roadway Capacity	57
Table H.5.1.4	Alternative 1 - Airlines Remain GTC Capacity.....	57
Table H.5.1.5	Summary of 2020 Alternative 1 - Airlines Remain Terminal Access Roadway Operations	59
Table H.5.1.6	Summary of 2025 Alternative 1 - Airlines Remain Terminal Access Roadway Operations	60
Table H.5.1.7	Alternative 1 - Airlines Remain Rental Car Facility Capacity.....	61
Table H.5.2.1	Alternative 2 - Airlines Relocate Parking Capacity	62
Table H.5.2.2	Summary of 2020 Alternative 2 - Airlines Relocate Terminal Access Roadway Operations	63
Table H.5.2.3	Summary of 2025 Alternative 2 - Airlines Relocate Terminal Access Roadway Operations	64
Table H.5.2.4	Alternative 2 - Airlines Relocate Parking Plaza Capacity	65
Table H.5.2.5	Alternative 2 - Airlines Relocate Terminal Curb Roadway Capacity	66
Table H.5.2.6	Alternative 2 - Airlines Relocate GTC Capacity.....	66
Table H.5.2.7	Alternative 2 - Airlines Relocate Rental Car Facility Capacity.....	67

APPENDIX H

Landside Facilities Technical Report

1 Introduction

This appendix presents the landside analysis that was completed subsequent to the Long Term Comprehensive Plan (LTCP) Update for the Minneapolis-St. Paul International Airport (MSP) in 2009. Since completion of the LTCP Update, the forecast has been updated for the EA to represent the current economic conditions and lagging recovery. Landside requirements and concepts presented in this appendix represent landside facility improvements needed to accommodate passenger demand through 2020 as represented in the gated flight schedule presented in *Appendix A, Aviation Activity Technical Report*. The facility requirements and improvements were developed in sufficient detail to ensure the facilities would provide adequate capacity through 2020.

The existing conditions, requirements and alternative development, and operational analysis for landside facilities under the No Action, Airlines Remain and Airlines Relocate alternatives are summarized in this Appendix.

2 Existing Conditions

The operational analysis of existing landside facilities at the airport serves the following purposes:

- Provides a quantitative evaluation of the current operational performance; and
- Provides a baseline to compare future improvements.

This section of the report describes the methodology, process and results of the analysis of the existing landside facilities, including access roadways, curb roadways, ground transportation center (GTC), parking facilities and rental car facilities.

2.1 Methodology

2.1.1 Study Area

This analysis includes key landside facilities of Terminal 1-Lindbergh and Terminal 2-Humphrey, including:

- Access and Egress Roadways;
- Curb Roadway (departures curb and arrivals curb);
- Ground Transportation Center (GTC);

- Parking (short term and general parking); and
- Rental Car Facility.

The study areas are depicted in **Figure H.2-1** and **Figure H.2-2**.

2.1.2 Data Collection

Traffic volume data was collected during the week of November 8-12, 2010, which represents a typical week with no holidays, inclement weather, airport incidents or other factors that might change typical traffic patterns.

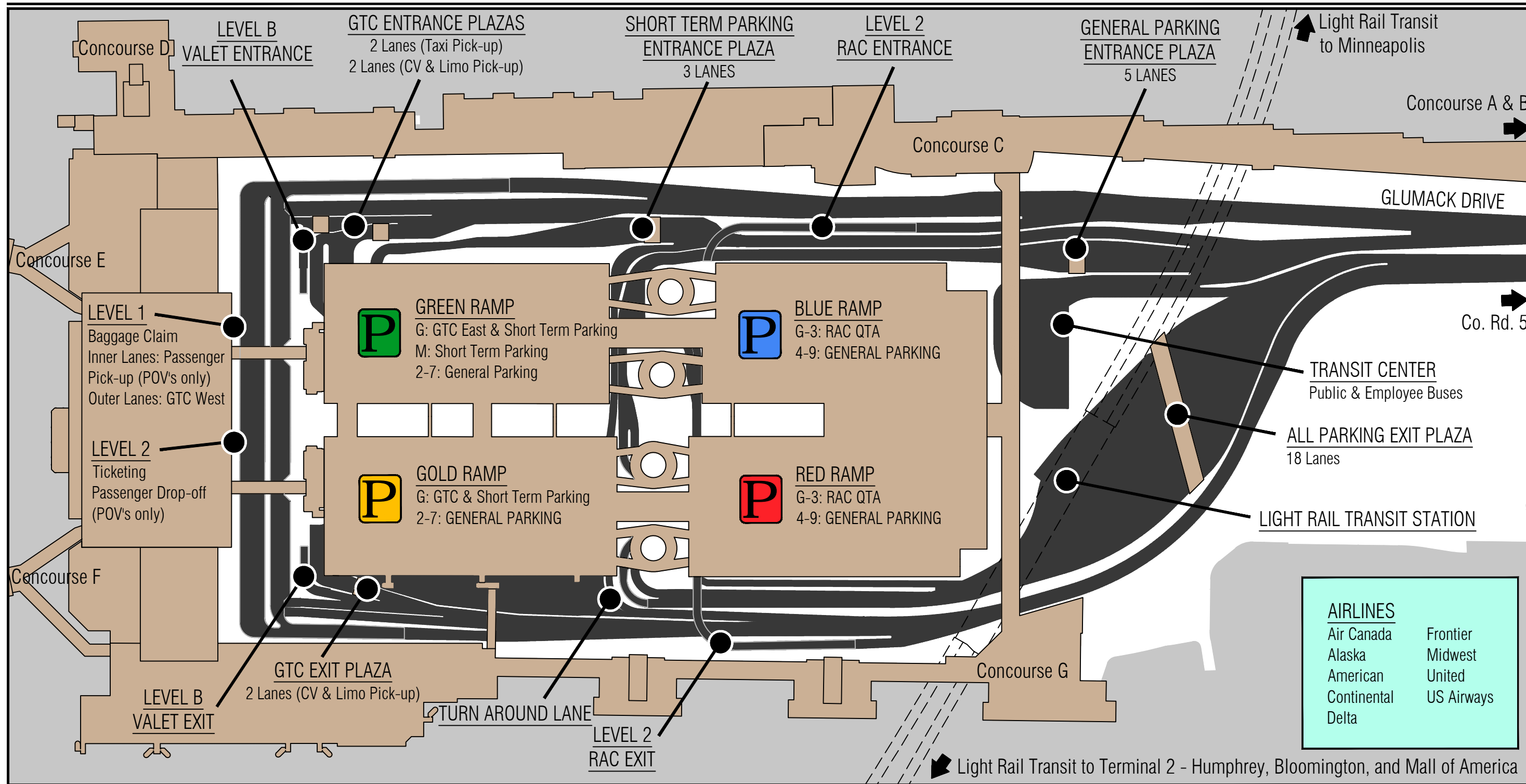
The data collected included automatic traffic recorder counts, vehicular curbside dwell times and vehicle classification counts at key locations. These locations are shown on **Figure H.2-3** and **Figure H.2-4** and are also listed in **Table 2.1.1**.

The automatic traffic recorder counts were collected for the following days:

- November 8, Monday, 10AM through midnight;
- November 9, Tuesday, 24 hours;
- November 10, Wednesday, 24 hours;
- November 11, Thursday, 24 hours;
- November 12, Friday, 24 hours.

The manual counts for curbside vehicle dwell time and classification took place the same week during the following peak hours: Terminal 1-Lindbergh – from 5AM to 8AM and from 6PM to 9PM; Terminal 2-Humphrey – from 5AM to 8AM and from 12PM to 3PM. These hours were selected based on passenger originations and terminations, flight schedules, discussions with airport staff and consultant team experience. Additionally, parking transaction data were collected from MAC Landside Operations staff.

Facility geometries, such as curb layout, lane configuration and parking entry and exit plaza configuration, were collected from MAC staff and previous studies. These data were verified in the field to confirm they reflect the current configuration and operations.



LEGEND

- | | | |
|----------------------------|----------------------------------|-----------------------|
| Existing Roadway | QTA Quick Turn Around | CV Commercial Vehicle |
| Existing Airport Building | RAC RENT-A-CAR | M Mezzanine Level |
| Existing Airfield Pavement | POV Privately Owned Vehicle | G Ground Level |
| | GTC Ground Transportation Center | |

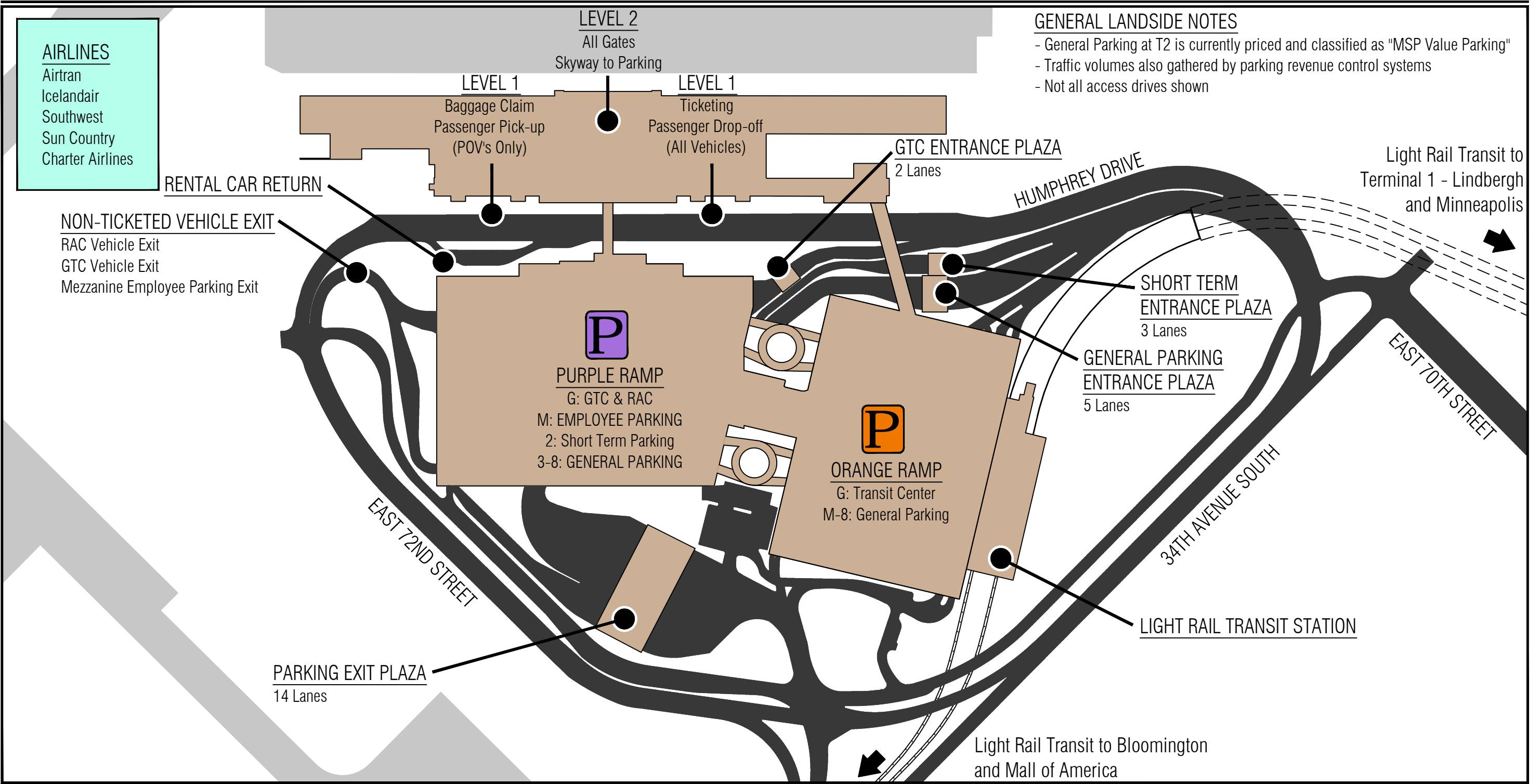
Terminal 1-Lindbergh Study Area



Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.

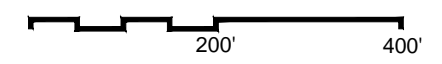




LEGEND

- | | | | | | |
|--|----------------------------|-----|------------------------------|---|-----------------|
| | Existing Roadway | RAC | RENT-A-CAR | M | Mezzanine Level |
| | Existing Airport Building | POV | Privately Owned Vehicle | G | Ground Level |
| | Existing Airfield Pavement | GTC | Ground Transportation Center | | |

Terminal 2 - Humphrey Study Area

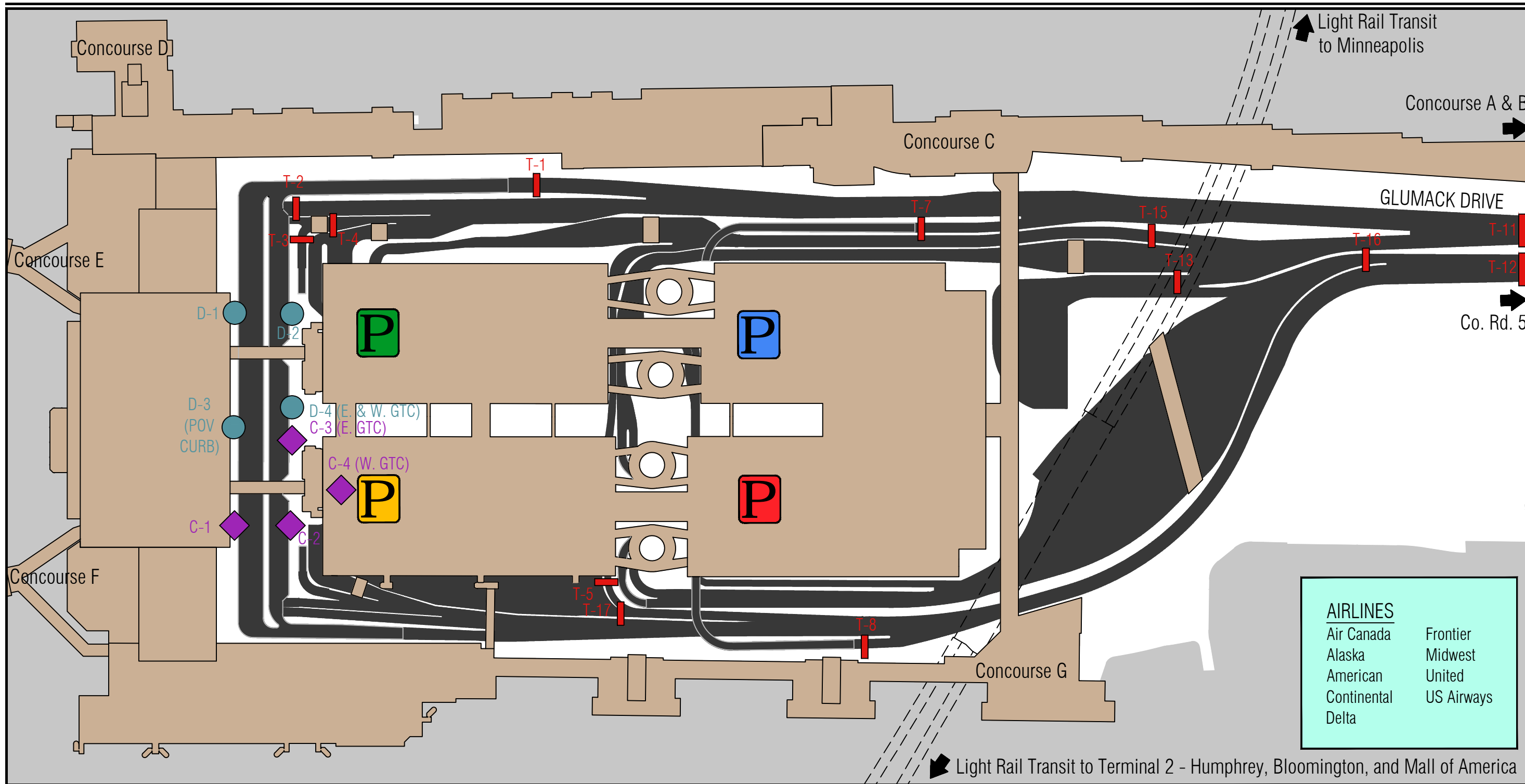


Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



J:\Jobs\44692 MAC Planning Consultant\PL 034 - MSP 2020 Improvements EA\TechProd\Work\CADD\side\Traffic Figures\Final Figures\Fig 1.2_T2_Study Area.dwg 12/19/2011 1:54:12 PM



LEGEND

- | | | |
|----------------------------|--------------------------------------|----------------------------------|
| Existing Roadway | T-# Tube Count Location | QTA Quick Turn Around |
| Existing Airport Building | D-# Dwell Time Observation Location | RAC RENT-A-CAR |
| Existing Airfield Pavement | C-# Class Count Observation Location | POV Privately Owned Vehicle |
| | | GTC Ground Transportation Center |

Terminal 1-Lindbergh Data Collection Location Map

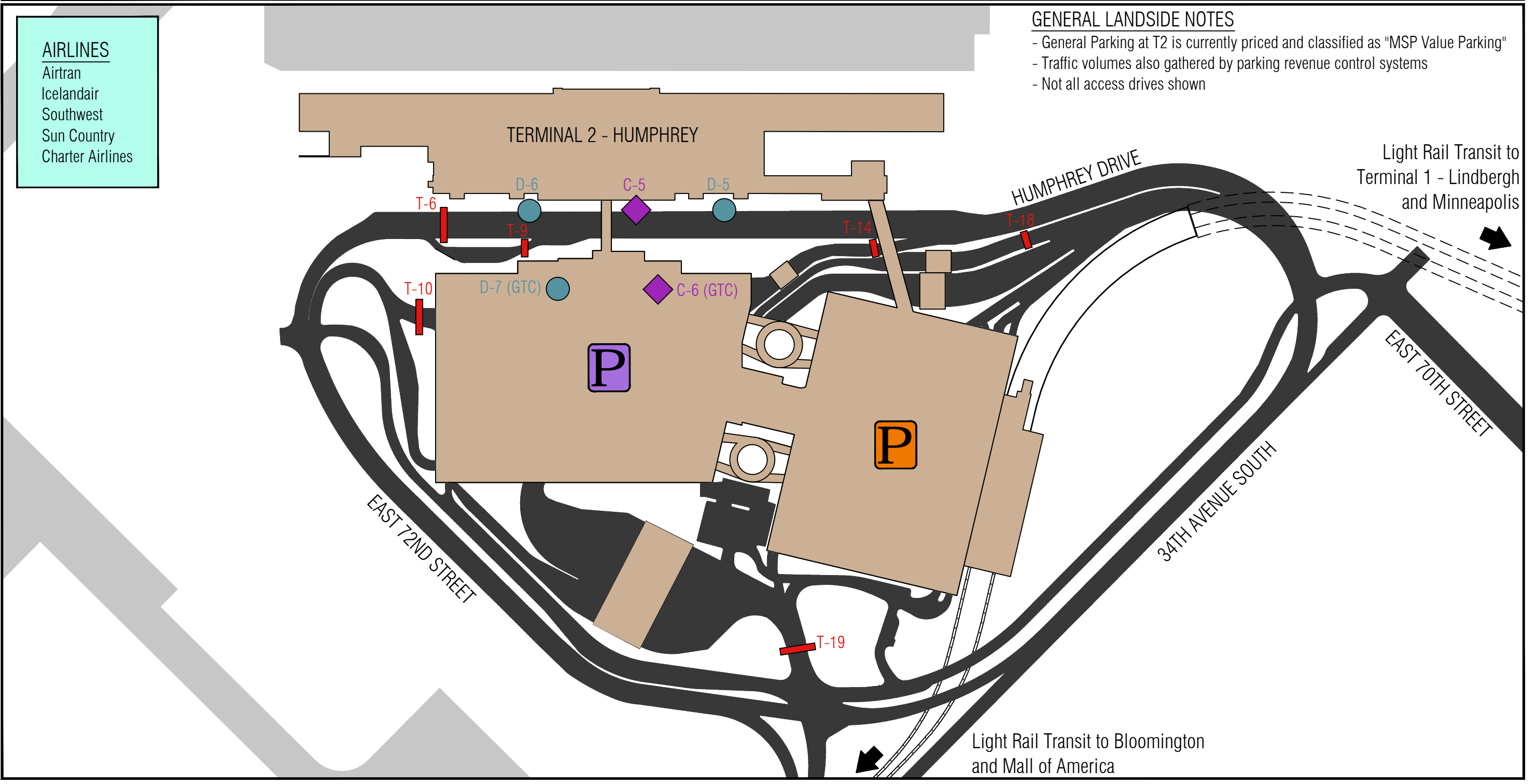


Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



HNTB



- AIRLINES**
- Airtran
 - Icelandair
 - Southwest
 - Sun Country
 - Charter Airlines

GENERAL LANDSIDE NOTES

- General Parking at T2 is currently priced and classified as "MSP Value Parking"
- Traffic volumes also gathered by parking revenue control systems
- Not all access drives shown

J:\Jobs\44692 MAC Planning Consultant\PL 034 - MSP 2020 Improvements EA\TechProd\Work\CADD\side\Traffic Figures\Final Figures\Fig 1-4_T2 Col Loc Map.dwg 12/19/2011 11:41:38 PM

LEGEND

Existing Roadway	T-# Tube Count Location	RAC RENT-A-CAR
Existing Airport Building	D-# Dwell Time Observation Location	POV Privately Owned Vehicle
Existing Airfield Pavement	C-# Class Count Observation Location	GTC Ground Transportation Center

Terminal 2 - Humphrey Data Collection Location Map

200' 400'

Source: Data compiled and maintained by MAC, HNTB, TKDA
Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.2.1.1

Data Collection Locations

Data Type	ID	Location Description
<i>Tube Counts</i>	T-1	Terminal 1 - Upper Curb (inner & outer curbs combined)
	T-2	Terminal 1 - Lower Curb (public)
	T-3	Terminal 1 - Lower Curb (valet parking)
	T-4	Terminal 1 - Ground Transportation Center
	T-5	Terminal 1 - Turnaround Lane between garages
	T-7	Terminal 1 - Rental Car Access
	T-8	Terminal 1 - Rental Car Egress
	T-11	Terminal 1 - Inbound Roadway
	T-12	Terminal 1 - Outbound Roadway
	T-13	Terminal 1 - Transit Center
	T-15	Terminal 1 - Short-Term Parking Entrance
	T-16	Terminal 1 - Parking Exit (short term & general)
	T-17	Terminal 1 - Employee Parking Exit (west of Gold Ramp)
	T-6	Terminal 2 - Curb
	T-9	Terminal 2 - Rental Car Access
	T-10	Terminal 2 - Rental Car Egress
	T-14	Terminal 2 - Commercial Entrance
	T-18	Terminal 2 - Short Parking Entrance
	T-19	Terminal 2 - Parking Exit (hourly & daily)
<i>Dwell Time</i>	D-1	Terminal 1 - Upper Curb (inner)
	D-2	Terminal 1 - Upper Curb (outer)
	D-3	Terminal 1 - Lower Curb (public)
	D-4	Terminal 1 - Ground Transit Center
	D-5	Terminal 2 - Curb East (departures)
	D-6	Terminal 2 - Curb West (arrivals)
	D-7	Terminal 2 - Ground Transit Center
<i>Classification Count</i>	C-1	Terminal 1 - Upper Curb (inner)
	C-2	Terminal 1 - Upper Curb (outer)
	C-3	Terminal 1 - West Commercial Roadway
	C-4	Terminal 1 - Ground Transit Center
	C-5	Terminal 2 - Public Curb
	C-6	Terminal 2 - Ground Transit Center

Source: HNTB Field Count, 2011.

2.1.3 Data Development

The traffic volumes collected in November 2010 were converted to July volumes using aggregated originations/terminations (O&D) growth factors to reflect the peak month. The aggregated O&D growth factors are resultant of dissimilar growth of different vehicle classes which were driven by three different factors:

- Demand-driven vehicles including private vehicles, taxis, limousines and shared ride vehicles are directly related to the passenger O&D; therefore they were grown by the same ratio as passenger O&D activity grew;
- Schedule-driven vehicles including hotel shuttles, transit buses, parking shuttles and chartered buses are operated based on schedules. These vehicles were grown by 30% of the passenger growth reflecting that operators would first fill excess capacity before adding additional vehicles;
- Employee and service vehicles are related to flight operations; therefore they were grown using the same ratio that flight operations (aircraft take-offs) grew.

These growth factors, combined with the vehicle classification counts collected at various locations, were used to develop the aggregated growth factors by location, usually less than the overall O&D growth factors.

The traffic volumes for the three peak hours are listed in **Table H.2.1.2**.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.2.1.2

Peak Hour Traffic Volumes, Average Day Peak Month (ADPM) (2010 July)

Location	Traffic Volume (veh/hr)		
	Departures Peak Hour (5-6AM)	Overall Peak Hour (4-5PM)	Arrivals Peak Hour (8-9PM)
Terminal 1-Lindbergh			
<i>Inbound roadway</i>	1,906	2,465	1764
<i>Outbound roadway</i>	1,010	2,651	2591
<i>Upper level roadway</i>	875	654	324
<i>Inner curb</i>	620	465	229
<i>Outer curb</i>	255	189	95
<i>Lower level roadway (baggage claim)</i>	36	708	844
<i>Valet parking</i>	22	8	3
<i>East commercial roadway</i>	6	71	80
<i>West commercial roadway</i>	3	207	232
<i>Valet / GTC West exit</i>	25	215	235
<i>Turnaround lane between garages</i>	11	6	6
<i>Rental car entry ramp</i>	160	394	81
<i>Rental car exit ramp</i>	14	317	262
<i>Transit center</i>	14	22	19
<i>Short term parking entrance</i>	136	229	129
<i>Parking exit (short term & general)</i>	29	638	821
<i>Employee parking exit (west of gold ramp)</i>	11	26	6
<i>General parking entrance</i>	644	146	46
Terminal 2-Humphrey			
<i>Inbound roadway</i>	434	527	582
<i>Short term parking entrance</i>	15	25	47
<i>Value parking (general parking) entrance</i>	233	86	109
<i>Ground Transportation Center entrance</i>	2	53	53
<i>Public curb (including Rental car access)</i>	319	535	574
<i>Departures</i>	262	200	125
<i>Arrivals</i>	0	178	240
<i>Rental car access</i>	57	157	209
<i>Rental car egress at Humphrey (including GTC exit)</i>	8	221	158
<i>Employee entrance from 72nd</i>	18	4	30
<i>Employee exit</i>	5	26	15
<i>Outbound Humphrey Dr. prior to Parking exit</i>	275	625	538
<i>Parking exit (short term & general & employee)</i>	33	285	124
<i>Outbound roadway</i>	205	573	495

Source: HNTB Field Count and MAC Landside Operation Data, with calibration, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

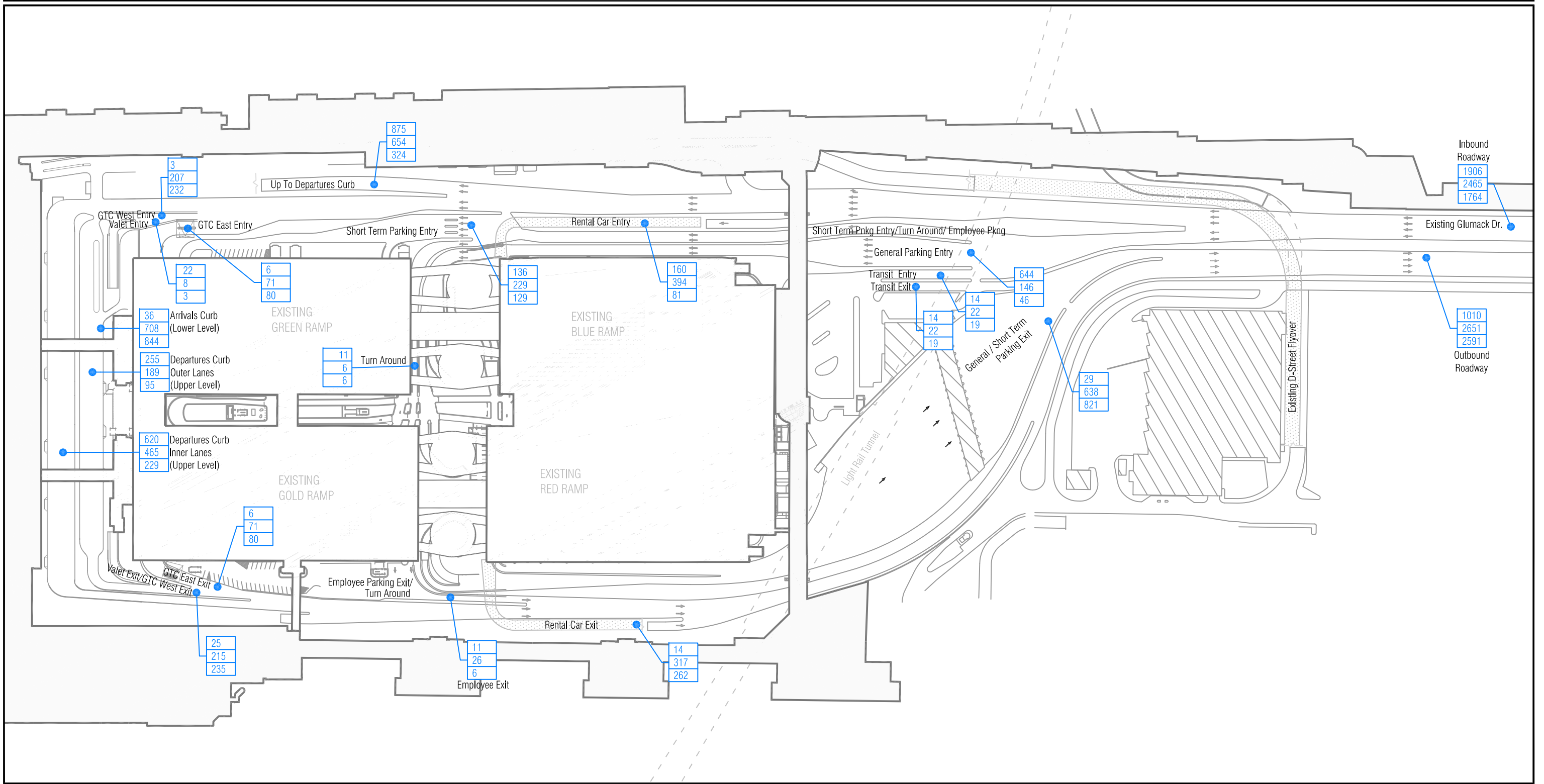
These volumes are also graphically depicted in **Figure H.2-5** and **Figure H.2-6**.

Vehicle dwell times at the curbs were collected and the results were adjusted slightly for consistency. The results are presented in **Table H.2.1.3**.

Table H.2.1.3

Vehicular Dwell Times Used in Analysis	
Vehicle Type	Dwell Time
<i>POVs (Arrivals)</i>	3.5 minutes
<i>POVs (Departures)</i>	2 minutes
<i>Taxis & Limos (Departures)</i>	2 minutes
<i>Commercial Vehicles (Departures)</i>	3 minutes
<i>Notes:</i>	
POV = privately operated vehicle	
Source: HNTB Field Count as adjusted, 2011.	

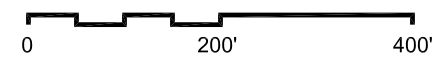
Vehicle classification data were collected at six key locations at both terminals. For other locations, assumptions were made based on field observations and information from the airport staff. The results are listed in **Table H.2.1.4** and **Table H.2.1.5**.



LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (4PM - 5PM)
Arrivals Peak Hour (8PM - 9PM)
Units: Vehicles/Hour

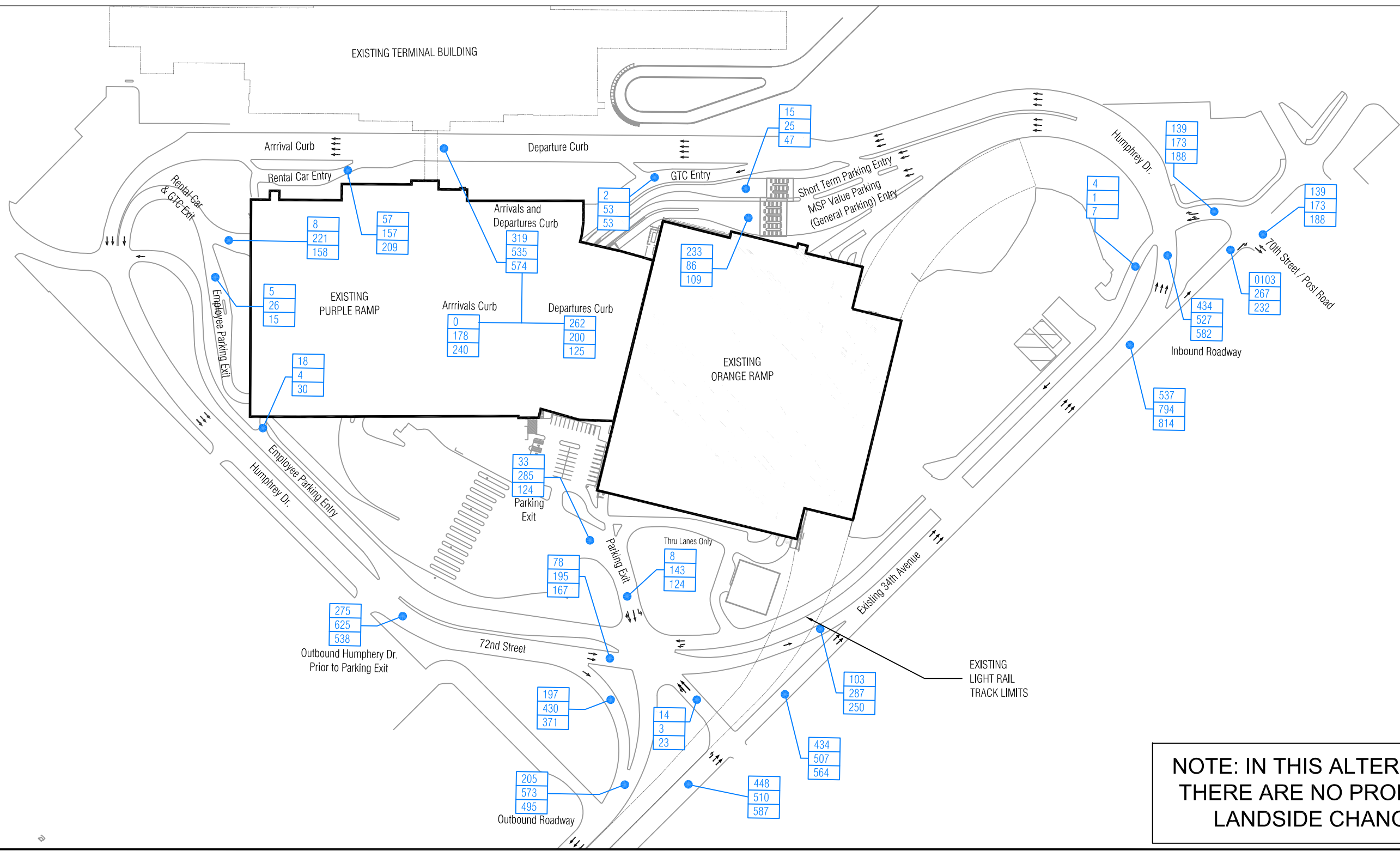
Base Case- Terminal 1-Lindbergh: 2010 Peak Hour Volumes



Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



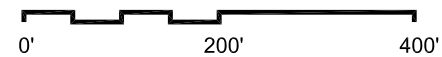


LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (3PM - 4PM)
Arrivals Peak Hour (2PM - 3PM)

Units: Vehicles/Hour

Base Case - Terminal 2 - Humphrey: 2010 Peak Hour Volumes



Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



\\alkw001\pdoc\MSP EA - Landside_Transportation Assessment - 44692\Phase II - Complete EACAD, PDF, & Photos\Cad\Traffic_Volumes\All Concepts\060111_Alt 1 - Standard\8_Volumes_T2 Concept_BaseCase.dwg
 12/19/2011 4:07:34 PM

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.2.1.4

Classification Counts – 3-Hour Morning Peak Period

Location*		Volume (veh/hr)	Total	Private Vehicle	Taxi	Hotel Shuttle	Shared Ride (Van)	Limo	Transit Bus	Chartered Shuttle /Bus	Parking Shuttle	Others (Employee or Service vehicles)
Departures Peak												
T1	C-1: Departures Curb (upper/inner)	620	100%	80%	14%	-	-	5%	-	1%	-	-
	C-2: Departures Curb (upper/outer)	255	100%	10%	1%	45%	8%	-	-	2%	34%	1%
	C-3: West Commercial Roadway (CV Hold)	3	100%	-	66%	30%	4%	-	-	-	-	-
	C-4: East Commercial Roadway (GTC)	6	100%	-	2%	-	7%	5%	-	-	39%	47%
	Arrivals Curb Roadway (lower/Inner)	36	100%	100%	-	-	-	-	-	-	-	-
	Valet Parking Entrance	22	100%	100%	-	-	-	-	-	-	-	-
	RAC Entrance	160	100%	95%	-	-	-	-	-	-	-	5%
	Turn Around	11	100%	90%	-	-	-	-	-	-	-	10%
	Short-Term Parking Entrance	136	100%	100%	-	-	-	-	-	-	-	-
	General Parking Entrance	644	100%	100%	-	-	-	-	-	-	-	-
	Transit Center	14	100%	-	-	-	-	-	90%	10%	-	-
	RAC Exit	14	100%	95%	-	-	-	-	-	-	-	5%
	Parking Exit Plaza	29	100%	100%	-	-	-	-	-	-	-	-
T2	C-5: Curb Roadway	319	100%	80%	14%	-	-	5%	-	1%	-	-
	C-6: GTC	2	100%	-	-	-	-	-	-	-	-	100%
	RAC Entrance	57	100%	95%	-	-	-	-	-	-	-	5%
	Short Term Parking Entrance	15	100%	100%	-	-	-	-	-	-	-	-
	Value Parking Entrance (Passenger)	70	100%	100%	-	-	-	-	-	-	-	-
	Value Parking Entrance (Employee)	163	100%	-	-	-	-	-	-	-	-	100%
	Employee Entrance on 72 nd St	18	100%	-	-	-	-	-	-	-	-	100%
	RAC & GTC Exit	8	100%	95%	-	-	-	-	-	-	-	5%
	Parking Exit Plaza (Passenger)	13	100%	100%	-	-	-	-	-	-	-	-
	Parking Exit Plaza (Employee)	20	100%	-	-	-	-	-	-	-	-	100%
	Employee Exit	5	100%	-	-	-	-	-	-	-	-	100%

Source: HNTB Data collection and analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.2.1.5

Classification Counts – 3-Hour Afternoon Peak Period

Location*		Volume (veh/hr)	Total	Private Vehicle	Taxi	Hotel Shuttle	Shared Ride (Van)	Limo	Transit Bus	Chartered Shuttle /Bus	Parking Shuttle	Others (Employee or Service vehicles)
Arrivals Peak												
T1	C-1: Departures Curb (upper/inner)	229	100%	92%	4%	-	-	3%	-	-	-	-
	C-2: Departures Curb (upper/outer)	95	100%	35%	1%	30%	1%	-	-	10%	24%	-
	C-3: West Commercial Roadway (CV Hold)	232	100%	0%	74%	24%	2%	-	-	-	-	-
	C-4: East Commercial Roadway (GTC)	80	100%	0%	18%	-	12%	20%	-	1%	49%	1%
	Arrivals Curb Roadway (lower/Inner)	844	100%	100%	-	-	-	-	-	-	-	-
	Valet Parking Entrance	3	100%	100%	-	-	-	-	-	-	-	-
	RAC Entrance	81	100%	95%	-	-	-	-	-	-	-	5%
	Turn Around	6	100%	90%	-	-	-	-	-	-	-	10%
	Short-Term Parking Entrance	129	100%	100%	-	-	-	-	-	-	-	-
	General Parking Entrance	46	100%	100%	-	-	-	-	-	-	-	-
	Transit Center	19	100%	-	-	-	-	-	90%	10%	-	-
	RAC Exit	262	100%	95%	-	-	-	-	-	-	-	5%
	Parking Exit Plaza	821	100%	100%	-	-	-	-	-	-	-	-
T2	C-5: Curb Roadway	574	100%	82%	6%	2%	1%	1%	-	2%	4%	1%
	C-6: GTC	53	100%	0%	43%	13%	15%	2%	5%	8%	14%	1%
	RAC Entrance	209	100%	95%	-	-	-	-	-	-	-	5%
	Short Term Parking Entrance	47	100%	100%	-	-	-	-	-	-	-	-
	Value Parking Entrance (Passenger)	54	100%	100%	-	-	-	-	-	-	-	-
	Value Parking Entrance (Employee)	55	100%	-	-	-	-	-	-	-	-	100%
	Employee Entrance on 72 nd St	30	100%	-	-	-	-	-	-	-	-	100%
	RAC & GTC Exit	158	100%	76%	11%	3%	4%	1%	1%	2%	3%	-
	Parking Exit Plaza (Passenger)	110	100%	100%	-	-	-	-	-	-	-	-
	Parking Exit Plaza (Employee)	14	100%	-	-	-	-	-	-	-	-	100%
	Employee Exit	15	100%	-	-	-	-	-	-	-	-	100%

Source: HNTB Data collection and analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

At parking entrance and exit plazas, the processing times defined as the time that it takes to receive and process the payment information were calculated based on MAC parking transaction data, with adjustment for consistency. The results are summarized in **Table H.2.1.6**.

Table H.2.1.6

Parking Entrance/Exit Processing Times		
Facility and Payment Type	Processing Time	
	Average Transaction Time Per Vehicle (sec/veh)	Capacity of Lane Per Hour (veh/hr)
<i>Entrance Plaza</i>		
<i>Ticket</i>	15	240
<i>ePark</i>	15	240
<i>Exit Plaza</i>		
<i>Cashier⁽¹⁾</i>	40	90
<i>ePark</i>	23	160

Notes:
(1) Cashier lanes process all tickets and lost tickets. Methods of payment include cash, credit card, check, and IOU

Source: MAC Parking Data with HNTB adjustment, 2011.

2.1.4 Operational Analysis

Level of service (LOS) is a measure to describe the quality of operation of facilities as experienced by the user. For regular freeways/roadways, including the airport access roadways to the terminals, the LOS defined in the *Highway Capacity Manual¹ (HCM 2010)* and *ACRP Report 40²* uses letters “A” through “F” to identify the operational performance, with “A” representing free flow conditions with no delay, therefore producing the best passenger experience, and “F” representing the worse gridlock situation with the worst passenger experience.

However, for airport curb roadways and parking entrances/exits, there is no well accepted letter-rating system due to their unique operational characteristics. In the past few decades, HNTB has developed non-lettering LOS classification standards for airport curbs and parking entrances/exit which have been proved to be reasonably accurate and effective. These HNTB LOS standards were used in this project for facilities where the HCM standards are not applicable.

Due to the variety and complexity of the airport landside facility functionality, including access/egress roadways, curb roadways and parking entrances/exits, a variety of analysis methods and measures of effectiveness (MOEs) were used to evaluate the LOS at the different types of facilities:

- VISSIM microscopic simulation software was utilized to model the entire landside network at the two terminals. The processed geometric, traffic volume and operational parameter data were input to the models. The models were then calibrated using field observations and past experiences to make sure they accurately reflected the actual operation, before they were used for retrieving analysis results or modified to model future alternatives.
- For roadway segments, the results from the VISSIM simulation were used to judge the LOS. Density from the VISSIM models was used to evaluate the LOS of a segment according to the thresholds listed in *HCM 2010* (all segments other than Weaving segments) or *ACRP Report 40* (all Weaving segments). Typically LOS D or above is acceptable for roadway segments. The LOS thresholds are listed in **Table H.2.1.7** through **Table H.2.1.9**. It should be noted that the LOS table from HCM was developed for regular highways where speed limits are a minimum of 45 mph; whereas the speed limits on the airport access roadways are 35 mph or less. This tends to create over-conservative LOS. Therefore, when judging the LOS threshold, other factors were also reviewed, including volume, speed and visual observations in the simulation. When an LOS based solely on the HCM table was found unreasonable and inconsistent, professional judgment was used to make the correction.
- Terminal curb roadway capacity is considered a function of the through capacity (number of lanes), the service capacity (length of curb available to load and unload passengers), and the ideal capacity balance of those activities. The measure of effectiveness is represented by the volume to capacity (v/c) ratio which determines the level of congestion on the curb as measured against the through capacity and service capacity. A v/c ratio of 1.0 represents the capacity of the roadway in a gridlock situation. A v/c ratio of 0.70 during peak periods represents an adequate LOS where conditions are busy but have not reached a gridlock scenario and is the level to which facilities should be planned to operate. Congestion on a curb roadway increases disproportionately at v/c ratios above approximately 0.70 and curb conditions deteriorate very quickly under such circumstances. Thus, a v/c ratio over 0.70 is considered an inadequate LOS while a v/c ratio below 0.70 represents an acceptable LOS. The LOS thresholds are listed in **Table H.2.1.10**.
- For parking entrances and exits, queuing length calculated by multi-server queuing analysis was used to evaluate the LOS. Typically two or fewer vehicles in the queue is acceptable for parking entrance/exit plazas. The LOS thresholds are listed in **Table H.2.1.11**.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.2.1.7

Terminal Area Roadway LOS Standards

Density (veh/mi/ln)	LOS
0 - 11	A
11 - 18	B
18 - 26	C
26 - 35	D
35 - 45	E
> 45	F

Notes:

LOS D or better is acceptable.

Source: Transportation Research Board, *Highway Capacity Manual 2010*, Exhibit 14-4.

Table H.2.1.8

**Terminal Area Roadway LOS Standards
(Weaving Segments Only)**

Density (veh/mi/ln)	LOS
0 - 20	A
20 - 30	B
30 - 40	C
40 - 50	D
50 - 60	E
v/c > 1.0	F

Notes:

LOS D or better is acceptable.

Source: *ACRP Report 40 Airport Curbside and Terminal Area Roadway Operations*, 2010, Table 4-3.

Table H.2.1.9

**Terminal Area Roadway LOS Standards
(Signalized Intersections)**

Control Delay (sec/veh)	LOS
0 - 10	A
10 - 20	B
20 - 35	C
35 - 55	D
55 - 80	E
> 80	F

Notes:

LOS D or better is acceptable.

Source: Transportation Research Board, *Highway Capacity Manual 2010*, Exhibit 18-4.

Table H.2.1.10

Terminal Curb Roadway LOS Standards

Volume to Capacity (v/c) Ratio Range	Level of Congestion	LOS
0 - 0.5	<i>None</i>	Excellent
0.5 - 0.7	<i>Low</i>	Adequate
0.7 - 1.0	<i>Moderate</i>	Inadequate
> 1.0	<i>High</i>	Failure

Source: HNTB analysis, 2011.

Table H.2.1.11

Parking Entrance/Exit LOS Standards

Queue Length (No. of Cars in Queue per Lane)	LOS
≤ 2	Adequate
> 2	Inadequate

Source: HNTB analysis, 2011.

2.2 Existing Conditions Operation Analysis

2.2.1 Existing Landside Facilities

Airport Terminal Roadways

All inbound traffic enters the Terminal 1-Lindbergh area from Trunk Highway (TH) 5 eastbound (EB) and westbound (WB) onto Glumack Drive. Parking traffic, rental car returns and commercial vehicles bound for the Ground Transportation Center (GTC) and the Transit Center exit on the left side of Glumack Drive prior to the curbside roadway. All outbound traffic exits Terminal 1-Lindbergh via outbound Glumack Drive to TH 5.

At Terminal 2-Humphrey, the majority of inbound traffic uses 34th Avenue to access the terminal facilities, with the exception of taxis traveling from the taxi hold area and a portion of other vehicles entering at Post Road and 70th Street. The majority of outbound traffic exits via 34th Avenue.

Terminal Curb Roadways

Terminal curb roadways are where passengers are dropped-off or picked-up in front of the terminal. At Terminal 1-Lindbergh there is a two-level curb roadway system with two parallel curbs on both the ticketing (departures) and baggage claim (arrivals) levels. The departures curb roadway (upper level) is designated for drop-offs of all departing passengers and is illustrated in Figure H.2-1. The inner departures curb is the primary curb for drop-offs. It is 830 feet long with four striped lanes of traffic. The outer departures curb is currently used as a “backup” curb for peak periods, and for public transit, shuttles and shared ride vans. It is 40 feet wide with two full (12-foot wide) lanes and three 16-foot wide left lane curb pockets, totaling 630 linear feet of curbside for passenger drop-off. This configuration allows two through lanes of traffic with opposite-side unloading in the curb pockets.

The Terminal 1-Lindbergh arrivals curb roadway (lower level) is designated for pick-ups of all arriving passengers and is illustrated in Figure H.2-1. The inner arrivals curb, used for passenger pick-up by private vehicles, is 700 feet long and 60 feet wide with five striped lanes of traffic. This roadway generally operates with the outer two lanes accommodating moving traffic. The remaining three lanes are used for loading, standing or through traffic, depending on the airport’s level of activity. The “outer arrivals curb” is the GTC used for commercial vehicle pickups, and is separated from the inner curb by a barrier preventing pedestrians from crossing to/from the GTC across the curb roadways.

The Terminal 2-Humphrey curb roadway, illustrated in Figure H.2-2, is 700-feet long. The curb is a single-level, four-lane roadway, half of which is used for passenger drop-off at ticketing/check-in, and half of which is used for passenger pickup at baggage claim. The left lane is assigned to direct rental car return traffic to the rental car area.

Parking

MSP currently operates and maintains over 23,800 terminal area parking stalls for airport passengers, employees and rental cars. The majority of these stalls are located in six multi-level parking ramps (four at Terminal 1-Lindbergh and two at Terminal 2-Humphrey). The four ramps

at Terminal 1-Lindbergh are designated the Green, Gold, Red and Blue ramps. As shown on Figure H.2-1, the Green and Gold ramps are located closest to the terminal and are seven levels with an additional mezzanine level included in the Green ramp. The Red and Blue ramps are nine levels and are located east of the Green and Gold ramps. The Red and Blue ramps have a designated carry-on only security checkpoint providing easy access to Terminals A, B, C and G. An Automated People Mover (the tram) in a tunnel below the Terminal 1-Lindbergh ramps transports people between the western and eastern ramps. The two ramps at Terminal 2-Humphrey, shown on Figure H.2-2, are designated the Purple and Orange ramps. Both ramps are eight levels with a mezzanine level located between the first and second floors. Both ramps are connected to the terminal building with pedestrian access.

The following types of parking are provided at Terminal 1-Lindbergh and Terminal 2-Humphrey:

- Short-Term Parking: Short-term parking serves primarily meeter/greeters and well-wishers or travelers parking for less than a day. The short term parking facilities of both terminals are located directly adjacent to the terminal buildings with easy access to the terminals (escalators to the lobby at Terminal 1-Lindbergh and a pedestrian bridge at Terminal 2-Humphrey).
- General Parking: These areas are designated as the cheapest alternative for passengers intending to park at the airport for extended periods of time. General Parking, called MSP Value Parking at Terminal 2-Humphrey, serves passenger parking for more than a day. When Terminal 1-Lindbergh General Parking fills up during peak periods, the parkers are directed to Terminal 2-Humphrey where they can park and take the Light Rail Transit (LRT) back to Terminal 1-Lindbergh.
- Employee Parking: Employee parking for both Terminal 1-Lindbergh and Terminal 2-Humphrey employees is provided at Terminal 2-Humphrey with 410 dedicated spaces on the mezzanine level of the Purple ramp and also within the public general parking area of the Orange ramp. Terminal 1-Lindbergh employees use the light rail to access Terminal 1.
- Valet Parking: Valet Parking is currently only available at Terminal 1-Lindbergh. Passengers can drop their car at a designated area east of the outer arrivals curb. Valet parked vehicles are stored under the arrivals curb level.
- ePark Elite: ePark Elite is a special program being offered at Terminal 1-Lindbergh which allows frequent fliers to purchase a membership which guarantees them a parking spot on the ground floor of the Gold ramp.

A breakdown of parking stalls at each terminal is provided in **Table H.2.2.1**.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.2.2.1

Existing Terminal Area Parking Facilities Breakdown

Parking Type	Terminal 1-Lindbergh Parking Ramps					Terminal 2-Humphrey Parking Ramps			Total Terminal Areas ⁽⁴⁾
	Green	Gold	Red	Blue	Total T1	Purple	Orange	Total T2	
<i>General Parking⁽¹⁾</i>	3,157	3,563	2,666	2,516	11,902	3,483	3,174	6,657	18,559
<i>Short-Term Parking</i>	756	106	-	-	862	505	-	505	1,367
<i>ePark Elite / Employee</i>	-	106	-	-	106	-	-	-	106
<i>Employee Parking⁽²⁾⁽³⁾</i>	-	-	-	-	-	410	-	410	410
<i>Rental Car Ready/Return</i>	-	-	885	840	1,725	145	-	145	1,870
<i>Rental Car Quick-Turn-Around (QTA)</i>	-	-	-	151,025 sq.ft.	151,025 sq.ft.	-	-	-	151,025 sq.ft.
<i>Park & Ride for LRT</i>	-	-	-	-	-	-	1,538	1,538	1,538
Total	3,913	3,775	3,551	3,356	14,595	4,543	4,712	9,255	23,850

Notes:

- (1) MSP Value parking was included under General Parking at Terminal 2-Humphrey.
- (2) Transit Center employees park directly outside the Blue ramp at Terminal 1-Lindbergh.
- (3) 410 employee parking spaces are provided on the mezzanine of the Purple ramp at Terminal 2-Humphrey. In addition, employees currently utilize excess General Parking stalls in the Orange ramp at Terminal 2-Humphrey.
- (4) MSP also operates 2,890 stalls outside of the terminal area, including 2,848 for employees and 42 for Cell Lot.

Source: MAC Inventory Data and HNTB analysis, 2011.

Separate short term and general parking entry plazas are provided at Terminal 1-Lindbergh and Terminal 2-Humphrey with employees at Terminal 2-Humphrey sharing the general parking entrance.

Both Terminal 1-Lindbergh and Terminal 2-Humphrey have combined exit plazas serving short term, general and employee parking. The Terminal 1-Lindbergh plaza provides 18 exit lanes and the Terminal 2-Humphrey plaza provides 14 lanes.

Rental Car

The rental car ready-return facilities are provided at Terminal 1-Lindbergh and Terminal 2-Humphrey, while a Quick-Turn-Around (QTA) facility where vehicles are washed and fueled between rentals is only located at Terminal 1-Lindbergh. At Terminal 1-Lindbergh, the QTA facility takes up the ground floor of both the Red and Blue ramps with the ready-return areas taking up designated space on the second and third floors of both ramps. Access is provided on the second level immediately after the Concourse C-G connector bridge. An internal circulation ramp in the southeast corner connects the second and third levels. A public exit ramp connects to the terminal exit road on the south side of the ramps. Another internal circulation ramp between the ground floor and the third level provides rental car shuttle access to the QTA without mixing with customer traffic.

The Rent-a-Car (RAC) ready/return area at Terminal 2-Humphrey occupies the ground level of the eastern half of the Purple ramp adjacent to the GTC. Customers on foot access the area either via the pedestrian bridge or walk across Humphrey Drive at grade. A special “elite” member area is designated for quick pick-up on the southwest corner of the Purple ramp. Rented vehicles exit to the south. Upon their return customers follow the curb roadway, staying left, and exit in a special RAC return lane immediately after the crosswalk across Humphrey Drive. From the Purple ramp return area, RAC company staff shuttle the vehicle to/from the QTA at Terminal 1-Lindbergh for cleaning and fueling. Currently, no QTA is provided at Terminal 2-Humphrey and all vehicles are serviced at the Terminal 1-Lindbergh QTA. Clean cars are returned through the rear of the Purple Ramp off of East 72nd Street.

Ready-return space and QTA area are shown in Table H.2.2.1 in the previous Parking section.

Ground Transportation Center (GTC) & Transit Center

Each terminal has a dedicated GTC and Transit Center. The GTC is where commercial vehicles (CVs), limos and taxis pick up passengers. The Transit Center accommodates passenger drop-off and pick-up by regularly scheduled buses, public transit and employee shuttles. A CV hold area is located adjacent to the TH 5 and Post Road interchange. Taxis and commercial vans are dispatched from this location to both the Terminal 1-Lindbergh and Terminal 2-Humphrey GTC’s.

The CV’s access Terminal 1-Lindbergh through Glumack Drive alongside the rest of the passenger traffic. Buses accessing the Transit Center exit left in conjunction with parking traffic and then left again through a gate controlled access road. Egress from the transit center is immediately adjacent to the entrance and vehicles exit onto outbound Glumack Drive. CV’s accessing the GTC follow curb traffic and exit Glumack Drive to the left prior to the arrivals curb and then enter the GTC through two access gates. Taxis enter the GTC via the outer curb of the arrivals/baggage level. In the outer curb a small taxi queue provides assurance that taxis will be ready when needed. From the queue taxis pull forward and park at an angle facing away from the GTC while loading passengers. The rest of the GTC traffic enters to the left of the valet parking entrance and proceeds to a designated loading area. All CV and taxi passengers are directed via an underground walkway from the terminal to the GTC customer service building on the ground floor of the Green and Gold ramps. All CV and taxi traffic exit via Glumack Drive, merging into the arrivals curb existing traffic prior to merging with departures curb existing traffic.

Access to the Transit Center is similar at Terminal 2-Humphrey, with transit vehicles following the parking wayfinding and exiting left prior to the parking entrance plazas. The Transit Center is located on the north part of the ground floor of the Orange ramp with vehicles egressing out the east of the ramp. GTC-bound vehicles follow the curb roadway traffic, exiting left just prior to the beginning of the curb roadway. After entering the GTC plaza, all vehicles enter the ground floor of the Purple ramp. The west portion of the Purple ramp provides designated pick-up locations for specific CVs. Passengers access the GTC through the GTC customer service building, connected to Terminal 2-Humphrey via the skyway or via an at-grade crossing of Humphrey Drive at the terminal curb roadway. All GTC traffic exits through the southeastern corner of the Purple ramp and then merges with exiting terminal curb roadway traffic on East 72nd Avenue.

2.2.2 Operational Analysis

All landside facilities were analyzed during the overall peak hours for each terminal, representing the period when originating and terminating passengers overlap to produce the overall busiest level of activity. Facilities such as the access roadways which accommodate both arriving and departing passengers typically experience their peak operations during this hour.

Each individual landside facility was also analyzed during the hours when originations and terminations peak. Facilities such as arrivals and departures curbsides and parking entry and exit plazas typically experience peak operations during these hours. The Terminal 2-Humphrey curbside is the exception as it is single level and accommodates both departing and arriving traffic in different areas. Each portion of the curb peaks with the passenger activity which it serves: departures on the upstream end at ticketing, and arrivals on the downstream end at baggage claim.

Existing Airport Terminal Roadways

Table H.2.2.2 through **Table H.2.2.4** list the analysis results of the access roadways entering and exiting both terminals.

It was found that all segments of the terminal area roadways operate adequately (LOS C or better) at both terminals.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.2.2.2

Traffic Analysis Results: Access Roadways - Overall Peak Hour

2010 Existing	Operational Measure of Effectiveness					
Location	# of Lanes	Demand (veh/hr)	Density (pc/ln/mi)	Speed (mph)	Delay* (sec/veh)	LOS**
Terminal 1 - Overall Peak Hour (4-5PM)						
<i>Inbound Road (Glumack Drive)</i>						
<i>Return-to-Terminal Roadway To Parking Entrance</i>	4/5	2465	20.3	30.1	-	B
<i>Parking Entrance to Rental Car Entrance</i>	3	2050	24.3	29.8	-	B
<i>Rental Car Entrance to Curbside Entrance (diverge)</i>	3	1656	18.9	30.1	-	B
<i>Outbound Road (Glumack Drive)</i>						
<i>Curbside Exit (diverge) to Employee Exit/Turn Around</i>	2	1656	27.5	30.3	-	C
<i>Employee Exit/Turn Around to Rental Car Exit</i>	2	1682	24.1	30.1	-	C
<i>Rental Car Exit to Service Road</i>	2	1999	35	29.4	-	C
<i>Service Road to Parking Exit</i>	3	1999	26.5	26.5	-	C
<i>Parking Exit to Return-to-Terminal Roadway</i>	4	2651	23.2	29.4	-	C
Terminal 2 - Overall Peak Hour (3-4PM)						
<i>Inbound Road (Humphrey Drive)</i>						
<i>34th Avenue South between East 72nd Street and East 70th Street (Weaving Segment)</i>	3	794	8	33.0	-	A
<i>From 34th Avenue South to East 70th Street (prior to traffic signal)</i>	3	527	-	-	9.9	A
<i>From East 70th Street to Humphrey Drive (prior to traffic signal)</i>	2	173	-	-	8.7	A
<i>From East 70th Street to Parking Entrance</i>	3	111	1.6	23.9	-	A
<i>From East 70th Street/Humphrey Drive to just before Curbs</i>	2/3	589	7.3	26.8	-	A
<i>Outbound Road (Humphrey Drive)</i>						
<i>From Rental/Employee/Ground Transportation Center Exit to 34th Avenue South N/S diverge</i>	3	625	6	33.1	-	A
<i>From Parking Exit to 34th Avenue South (prior to traffic signal)</i>	2	143	-	-	21.9	B
<i>From Humphrey Drive to 34th Avenue South - SB</i>	1	430	14	30.1	-	A
<i>From Humphrey Drive to 34th Avenue South - NB (prior to traffic signal)</i>	2	195	-	-	44.9	C

Notes:

* Applicable only for signalized intersections.

** LOS for roadway segments based on ACRP Report 40 and HCM 2010 using Density; LOS for signalized intersections based on HCM 2010 using Delay.

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.2.2.3

Traffic Analysis Results: Access Roadways - Departures Peak Hour

2010 Existing	Operational Measure of Effectiveness					
Location	# of Lanes	Demand (veh/hr)	Density (pc/ln/mi)	Speed (mph)	Delay* (sec/veh)	LOS**
Terminal 1 - Departures Peak Hour (5-6AM)						
<i>Inbound Road (Glumack Drive)</i>						
<i>Return-to-Terminal Roadway To Parking Entrance</i>	4/5	1906	14.9	30.7	-	A
<i>Parking Entrance to Rental Car Entrance</i>	3	1101	11.8	31.7	-	A
<i>Rental Car Entrance to Curbside Entrance (diverge)</i>	3	940	10.1	30.9	-	A
<i>Outbound Road (Glumack Drive)</i>						
<i>Curbside Exit (diverge) to Employee Exit/Turn Around</i>	2	940	15.1	31.9	-	A
<i>Employee Exit/Turn Around to Rental Car Exit</i>	2	951	12.8	32.1	-	A
<i>Rental Car Exit to Service Road</i>	2	965	16	31.3	-	A
<i>Service Road to Parking Exit</i>	3	956	12.3	27.4	-	A
<i>Parking Exit to Return-to-Terminal Roadway</i>	4	1010	8.3	31.4	-	A
Terminal 2 - Departures Peak Hour (5-6AM)						
<i>Inbound Road (Humphrey Drive)</i>						
<i>34th Avenue South between East 72nd Street and East 70th Street (Weaving Segment)</i>	3	537	5	33.6	-	A
<i>From 34th Avenue South to East 70th Street (prior to traffic signal)</i>	3	434	-	-	9	A
<i>From East 70th Street to Humphrey Drive (prior to traffic signal)</i>	2	139	-	-	9.3	A
<i>From East 70th Street to Parking Entrance</i>	3	248	3.7	24.0	-	A
<i>From East 70th Street/Humphrey Drive to just before Curbs</i>	2/3	325	3.6	27.0	-	A
<i>Outbound Road (Humphrey Drive)</i>						
<i>From Rental/Employee/Ground Transportation Center Exit to 34th Avenue South N/S diverge</i>	3	275	2.3	33.8	-	A
<i>From Parking Exit to 34th Avenue South (prior to traffic signal)</i>	2	8	-	-	27.1	A
<i>From Humphrey Drive to 34th Avenue South - SB</i>	1	197	5.7	30.6	-	A
<i>From Humphrey Drive to 34th Avenue South - NB (prior to traffic signal)</i>	2	78	-	-	48.1	C

Notes:

* Applicable only for signalized intersections.

** LOS for roadway segments based on ACRP Report 40 and HCM 2010 using Density; LOS for signalized intersections based on HCM 2010 using Delay.

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.2.2.4

Traffic Analysis Results: Access Roadways - Arrivals Peak Hour

2010 Existing Location	Operational Measure of Effectiveness					LOS**
	# of Lanes	Demand (veh/hr)	Density (pc/ln/mi)	Speed (mph)	Delay* (sec/veh)	
Terminal 1 - Arrivals Peak Hour (8-9PM)						
<i>Inbound Road (Glumack Drive)</i>						
Return-to-Terminal Roadway To Parking Entrance	4/5	1764	13.7	30.9	-	A
Parking Entrance to Rental Car Entrance	3	1564	17	31.3	-	A
Rental Car Entrance to Curbside Entrance (diverge)	3	1483	16.4	30.6	-	A
<i>Outbound Road (Glumack Drive)</i>						
Curbside Exit (diverge) to Employee Exit/Turn Around	2	1483	23.8	31.1	-	B
Employee Exit/Turn Around to Rental Car Exit	2	1489	20.6	30.9	-	B
Rental Car Exit to Service Road	2	1751	29.8	30.0	-	B
Service Road to Parking Exit	3	1751	22.6	26.8	-	B
Parking Exit to Return-to-Terminal Roadway	4	2591	22.2	29.6	-	B
Terminal 2 - Arrivals Peak Hour (2-3PM)						
<i>Inbound Road (Humphrey Drive)</i>						
34 th Avenue South between East 72 nd Street and East 70 th Street (Weaving Segment)	3	814	8.2	33.0	-	A
From 34 th Avenue South to East 70 th Street (prior to traffic signal)	3	527	-	-	9.7	A
From East 70 th Street to Humphrey Drive (prior to traffic signal)	2	188	-	-	8.3	A
From East 70 th Street to Parking Entrance	3	156	2.3	26.5	-	A
From East 70 th Street/Humphrey Drive to just before Curbs	2/3	614	7.5	26.8	-	A
<i>Outbound Road (Humphrey Drive)</i>						
From Rental/Employee/Ground Transportation Center Exit to 34 th Avenue South N/S diverge	3	538	5.2	33.3	-	A
From Parking Exit to 34 th Avenue South (prior to traffic signal)	2	124	-	-	22.5	B
From Humphrey Drive to 34 th Avenue South - SB	1	371	12	30.3	-	A
From Humphrey Drive to 34 th Avenue South - NB (prior to traffic signal)	2	167	-	-	44.4	C

Notes:

* Applicable only for signalized intersections.

** LOS for roadway segments based on *ACRP Report 40* and *HCM 2010* using Density; LOS for signalized intersections based on *HCM 2010* using Delay.

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Existing Terminal Curbs

Volume to capacity ratio (v/c) analyses were conducted to check the sufficiency of the curb roadways during the peak hours. The results are listed in **Table H.2.2.5**.

It was found that Terminal 1-Lindbergh departures curb and the Terminal 2-Humphrey combined departures/arrivals curb have sufficient capacity to accommodate the existing traffic demand. However, the Terminal 1-Lindbergh arrivals curb needs an additional 100 feet of curb length to be able to operate at acceptable LOS (v/c ratio of 0.7) as defined in Section 2.1.4.

Table H.2.2.5

Capacity Analysis Results: Curb Roadways

Curb Roadway	Existing Length	Existing Number of Lanes	2010 Existing	
			v/c ratio	LOS
<i>Terminal 1-Lindbergh Departures</i>				
<i>Inner</i>	830	4	0.70	Adequate
<i>Outer</i>	630	3	0.15	Excellent
<i>Terminal 1-Lindbergh Arrivals</i>				
<i>Inner</i>	700	5	0.80	Inadequate
<i>Outer⁽¹⁾</i>	700	4	(1)	(1)
<i>Terminal 2-Humphrey Combined</i>				
<i>Departures</i>	350	4	0.60	Adequate
<i>Arrivals</i>	350	4	0.60	Adequate
Total	700	4	0.60	Adequate

Notes:

(1) Terminal 1-Lindbergh outer arrivals curb is currently utilized as part of the GTC.

Source: MAC As-built CAD files and HNTB analysis, 2011.

Existing Parking Facilities

Parking entrances were simulated in the VISSIM models and the results are presented in **Table H.2.2.6** through **Table H.2.2.8**.

It was found that both the short term and general parking entrances at Terminal 1-Lindbergh are not sufficient to process the heavy demands during the overall and departures peak hours. At Terminal 2-Humphrey, both the short-term and general parking entrances operate adequately during peak hours.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.2.2.6

Traffic Analysis Results: Parking Entrances - Overall Peak Hour

2010 Existing		Operational Measures of Effectiveness					
Location	Arrival Rate (veh/hr)	No. of Lanes	Average Queue (ft)	Maximum Queue		Delay (sec/veh)	LOS
				Length (ft)	Equivalent No. of Cars		
Terminal 1-Lindbergh - Overall Peak Hour (4-5PM)							
<i>Short-Term Parking Entry</i>	229	4	5	93.2	4	24.6	Inadequate
<i>General Parking Entry</i>	147	5	1	49.5	2	20.9	Adequate
Terminal 2-Humphrey - Overall Peak Hour (3-4PM)							
<i>Short-Term Parking Entry</i>	25	3	1	31.4	2	20.1	Adequate
<i>MSP Value (Employee + PAX)</i>	86	5	1	0.8	0	18.2	Adequate

Notes:
PAX = passenger

Source: HNTB analysis, 2011.

Table H.2.2.7

Traffic Analysis Results: Parking Entrances - Departures Peak Hour

2010 Existing		Operational Measures of Effectiveness					
Location	Arrival Rate (veh/hr)	No. of Lanes	Average Queue (ft)	Maximum Queue		Delay (sec/veh)	LOS
				Length (ft)	Equivalent No. of Cars		
Terminal 1-Lindbergh - Departures Peak Hour (5-6AM)							
<i>Short-Term Parking Entry</i>	136	4	1	24	1	18.8	Adequate
<i>General Parking Entry</i>	644	5	25	123	6	38.6	Inadequate
Terminal 2-Humphrey - Departures Peak Hour (5-6AM)							
<i>Short-Term Parking Entry</i>	15	3	0	21	1	19.6	Adequate
<i>MSP Value (Employee + PAX)</i>	229	5	3	3	0	20.8	Adequate

Notes:
PAX = passenger

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.2.2.8

Traffic Analysis Results: Parking Entrances - Arrivals Peak Hour

2010 Existing	Operational Measures of Effectiveness						
Location	Arrival Rate (veh/hr)	No. of Lanes	Average Queue (ft)	Maximum Queue		Delay (sec/veh)	LOS
				Length (ft)	Equivalent No. of Cars		
Terminal 1-Lindbergh - Arrivals Peak Hour (8-9PM)							
<i>Short-Term Parking Entry</i>	129	4	1.2	24	1	22.3	Adequate
<i>General Parking Entry</i>	46	5	0.1	27	1	17.5	Adequate
Terminal 2-Humphrey - Arrivals Peak Hour (2-3PM)							
<i>Short-Term Parking Entry</i>	47	3	1	37	2	20.1	Adequate
<i>MSP Value (Employee + PAX)</i>	108	5	1	1	0	18	Adequate

Notes:

PAX = passenger

Source: HNTB analysis, 2011.

To evaluate the sufficiency of parking capacity at both terminals, including short term and general parking, parking requirements based on peak period parking demand were calculated and compared to the existing number of parking stalls at the ramps. To calculate the required number of spaces, the total passenger demand for each type of parking is divided by an efficiency or search factor, which represents the point at which the lot is deemed full and a new entrant would have considerable difficulty finding an available space. This factor is assumed to be 0.90 for general parking and 0.85 for short term parking. This assumes a 90% and 85% maximum occupancy, respectively, which allows vehicles searching to find an open space in a reasonable amount of time.

The results are summarized in **Table H.2.2.9**. It was found that Terminal 1-Lindbergh and Terminal 2-Humphrey currently have enough parking capacity. However, it is acknowledged that MAC parking revenue data show that from January through May 2010, passengers were directed to overflow parking at Terminal 2-Humphrey on eight Wednesdays and one Tuesday and this trend will continue as passenger levels increase.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.2.2.9

Capacity Analysis Results: Parking Stalls

Parking Stall	Existing Capacity	2010 Existing Conditions	
		Requirement	Surplus (Deficit)
<i>Terminal 1-Lindbergh Parking Stalls</i>			
<i>General Parking</i>	11,903	11,420	483
<i>Short-Term Parking</i>	<u>967</u>	<u>620</u>	<u>347</u>
Total	12,870	12,040	830
<i>Terminal 2-Humphrey Parking Stalls</i>			
<i>General Parking</i>	8,195	3,450	4,745
<i>Employee Parking(1)</i>	<u>410</u>	<u>2,100</u>	<u>(1,690)</u>
Sub Total	8,605	5,550	3,055
<i>Short-Term Parking</i>	<u>505</u>	<u>75</u>	<u>430</u>
Total	9,110	5,625	3,485

Notes:

- (1) In addition to the 410 employee spaces provided on the mezzanine level of the Purple ramp at Terminal 2-Humphrey, Terminal 1-Lindbergh airport employees currently utilize Terminal 2-Humphrey General Parking entrance lanes, parking stalls, and combined exit plaza.

Source: MAC As-built CAD files and HNTB analysis, 2011.

Existing RAC & QTA Facilities

Based on field observations and discussion with MAC staff, the rental car facilities are operating at a desirable level. The current operating level was used as a standard in the future rental car facility requirement analysis. **Table H.2.2.10** shows the existing rental car facilities.

Table H.2.2.10

Capacity Analysis Results: Rental Car and Quick Turn Around Facilities

Facility	Existing Capacity	2010 Existing Conditions	
		Requirement	Surplus (Deficit)
<i>Terminal 1-Lindbergh Rental Car Spaces</i>	1,725	1,691	34
<i>Terminal 1-Lindbergh Quick-Turn-Around Area (sf)</i>	302,050	302,050(1)	0
<i>Terminal 2-Humphrey Rental Car Spaces</i>	145	142	3
<i>Terminal 2-Humphrey Quick-Turn-Around Area (sf)</i>	0	0	0

Notes:

- (1) Currently all QTA facilities for both Terminal 1-Lindbergh and Terminal 2-Humphrey are provided at Terminal 1-Lindbergh.

Source: MAC As-built CAD files and HNTB analysis, 2011.

Existing GTC

The estimated demand for spaces within the GTC was calculated based on the existing peak hour volume and measured mean dwell time for each type of vehicle operating at the GTC. A v/c ratio of 0.55 was assumed to provide an adequate level of service, while allowing sufficient space for vehicles to wait for arriving passengers. The demand for loading spaces presented in **Table H.2.2.11** is based on providing a 0.55 v/c ratio.

As shown in Table H.2.2.11, the Terminal 1-Lindbergh GTC and the Terminal 2-Humphrey GTC have sufficient space to accommodate the required spaces.

Table H.2.2.11

Capacity Analysis Results: Ground Transportation Center

GTC	Existing Capacity	2010 Existing Conditions	
		Requirement	Surplus (Deficit)
<i>Terminal 1-Lindbergh GTC Vehicle Loading Spaces</i>	48	47	1
<i>Terminal 2-Humphrey GTC Vehicle Loading Spaces</i>	15	12	3

Source: MAC As-built CAD files and HNTB analysis, 2011.

2.3 Summary of Findings

The landside facility operational performance analysis at the two terminals found that:

- The access roadways at both terminals are operating at acceptable LOS during peak hours.
- At Terminal 1-Lindbergh, the arrivals curb shows a deficiency reflective of the frequent queues and congestion experienced on that curb roadway. The Terminal 1-Lindbergh departures curb and Terminal 2-Humphrey combined curb have no capacity issues under existing conditions.
- The parking entrances (both short term and general) at Terminal 1-Lindbergh experience congestion during peak hours due to capacity deficiency. Terminal 2-Humphrey short term and MSP Value parking entrances operate adequately during peak hours.
- At both terminals, parking stalls are sufficient for the current demand.
- Rental car facilities are currently sufficient.

The Terminal 1-Lindbergh GTC shows a deficiency of one space, while the Terminal 2-Humphrey GTC is operating adequately.

3 Traffic Volume Forecast

3.1 Methodology

Based on the 2010 Base Case traffic volumes and the future years' forecast of passenger originations/terminations (O&D), diurnal (24-hour) traffic volumes on the landside were developed for all alternatives (No Action, Airlines Remain, and Airlines Relocate) for 2020 and 2025. Three peak hours, Overall Peak Hour, Departures Peak Hour and Arrivals Peak Hour, were analyzed for each alternative:

- Overall Peak Hour is when originations and terminations overlap and result in the busiest hour during the day for the landside system. During the Overall Peak Hour, facilities such as the access roadways, short term parking entrance, rental car access/exit and combined curb roadways (when departures and arrivals traffic share the same curb) experience their individual peak operations.
- Departures Peak Hour is the hour when the passenger originations are at their daily peak. To account for the fact that passengers arrive at the airport landside facilities with a lead time ahead of the flight departure, pre-departure lead times were assumed based on flight gate schedules to identify the landside Departures Peak Hour. The assumed lead times were one-hour for domestic departures and two-hours for international departures. During the Departures Peak Hour, facilities such as departures curbs and the long-term parking entrances experience their individual peak operations.
- Arrivals Peak Hour is when the passenger terminations are at their daily peak. To account for the lag between the passenger disembarking the planes and arriving at landside facilities, typically caused by walking and waiting to claim luggage at baggage claim, one-hour lag times were assumed based on the gated flight schedule to determine the landside Arrivals Peak Hour. Arrivals curbs, ground transportation centers and parking exit plazas are the typical facilities that experience their individual peak operations during this Arrivals Peak Hour.

In a few cases, the Arrivals Peak Hour coincided with the Overall Peak Hour, only happening in the afternoon; a second peak hour during the afternoon was chosen to be analyzed when one or more of the key landside facilities reached their individual peak operation.

After the initial factoring from July 2010 values to the future years' average day peak month values, the traffic volumes across the network for these three hours were further smoothed and balanced to create a set of compatible data for each analysis period.

3.2 No Action Traffic Volumes

3.2.1 2020 No Action Alternative

The data collection and volume development for the 2010 Existing Condition (Base Case) were described in Section 2, Existing Conditions. The 2010 Base Case diurnal volumes were grown to the 2020 No Action case using the hourly passenger O&D forecast schedules for both cases,

and vehicle class counts at the various locations on the landside at both terminals. Similar to the methodology when developing 2010 Base Case volumes, vehicle growth rates at a certain location were dependent on the function, and therefore vehicle classification, of that location. Aggregated growth factors were established by location when growing the diurnal traffic volumes. For the Overall, Departures and Arrivals Peak Hours, traffic volumes were further smoothed and balanced throughout the network at both terminals. This process ensured internal data compatibility from link to adjacent link.

The peak hour traffic volumes for 2020 No Action are shown in **Figure H.3-1** and **Figure H.3-2**.

3.2.2 2025 No Action

The 2025 No Action diurnal volumes were developed based on 2020 No Action volumes, with adjustment accounting for the hourly pattern change in the passenger O&D forecast schedule. The Overall, Departures and Arrivals Peak Hour traffic volumes were further smoothed and balanced throughout the network at both terminals

The peak hour traffic volumes for 2025 No Action are shown in **Figure H.3-3** and **Figure H.3-4**.

3.3 Airlines Remain Alternative Traffic Volumes

3.3.1 2020 Airlines Remain Alternative

To determine 2020 vehicular volumes under the proposed Airlines Remain Alternative, volumes from the 2020 No Action Alternative were processed using the passenger O&D forecast schedules and proposed facility relocation or addition. The Airlines Remain Alternative differs from the No Action Alternative scenario primarily in terms of gate utilization. At Terminal 1-Lindbergh, international curb vehicle traffic was relocated from the main curb roadways to the proposed international terminal curb roadway. The Terminal 1-Lindbergh employee traffic currently using the Gold ramp was relocated to the proposed new ramp.

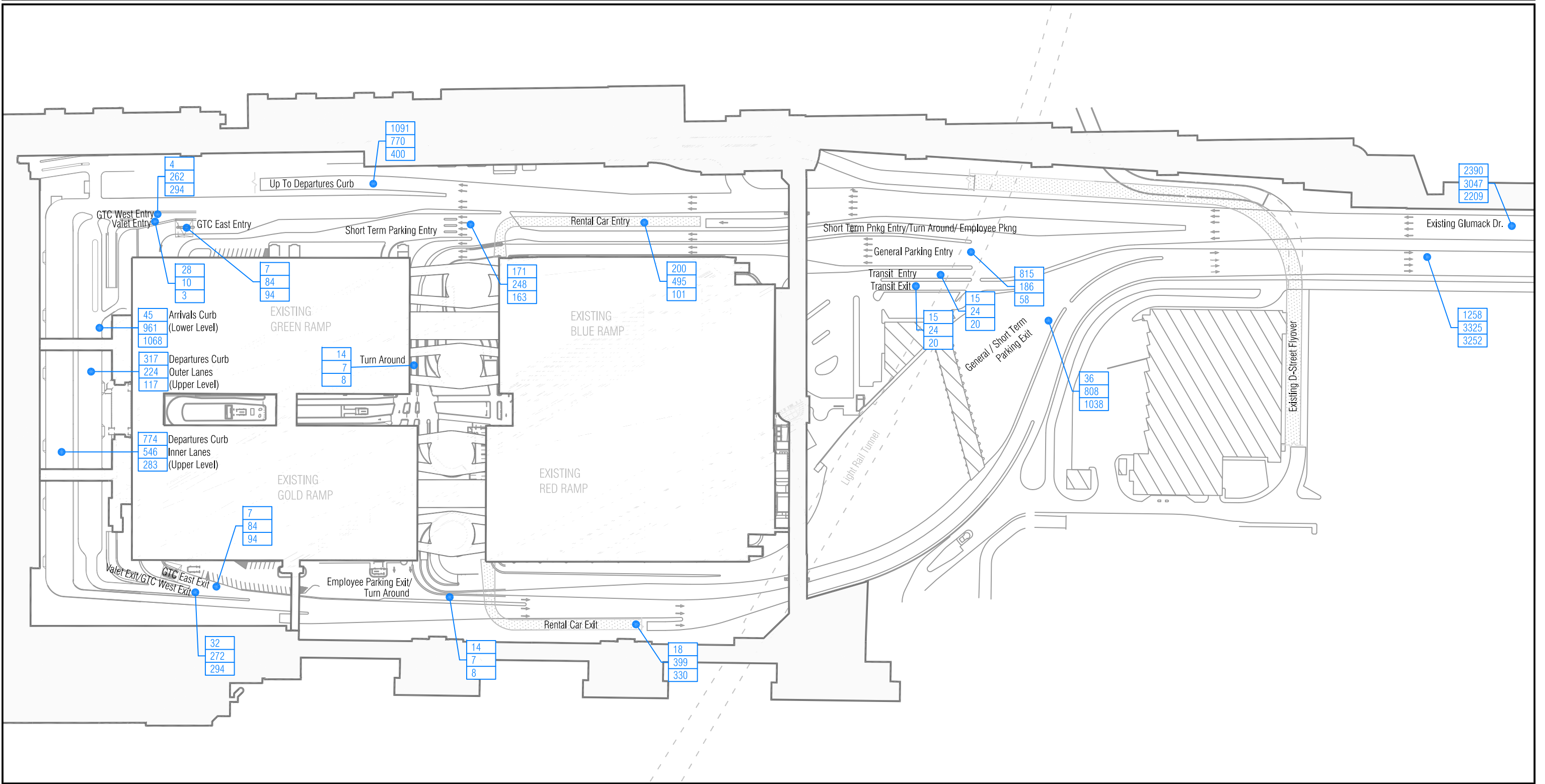
The Overall, Departures and Arrivals Peak Hour traffic volumes were further smoothed and balanced throughout the network at both terminals.

The peak hour traffic volumes for 2020 Airlines Remain Alternative are shown in **Figure H.3-5** and **Figure H.3-6**.

3.3.2 2025 Airlines Remain Alternative

The 2025 Airlines Remain Alternative diurnal volumes were developed based on the 2020 Airlines Remain Alternative volumes, with adjustment accounting for the hourly pattern change in the passenger O&D forecast schedule. Then the Overall, Departures, and Arrivals Peak Hour traffic volumes were further smoothed and balanced throughout the network at both terminals.

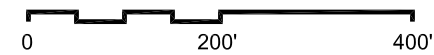
The peak hour traffic volumes for 2025 Airlines Remain Alternative are shown in **Figure H.3-7** and **Figure H.3-8**.



LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (4PM - 5PM)
Arrivals Peak Hour (8PM - 9PM)
Units: Vehicles/Hour

No Action - Terminal 1-Lindbergh: 2020 Peak Hour Volumes

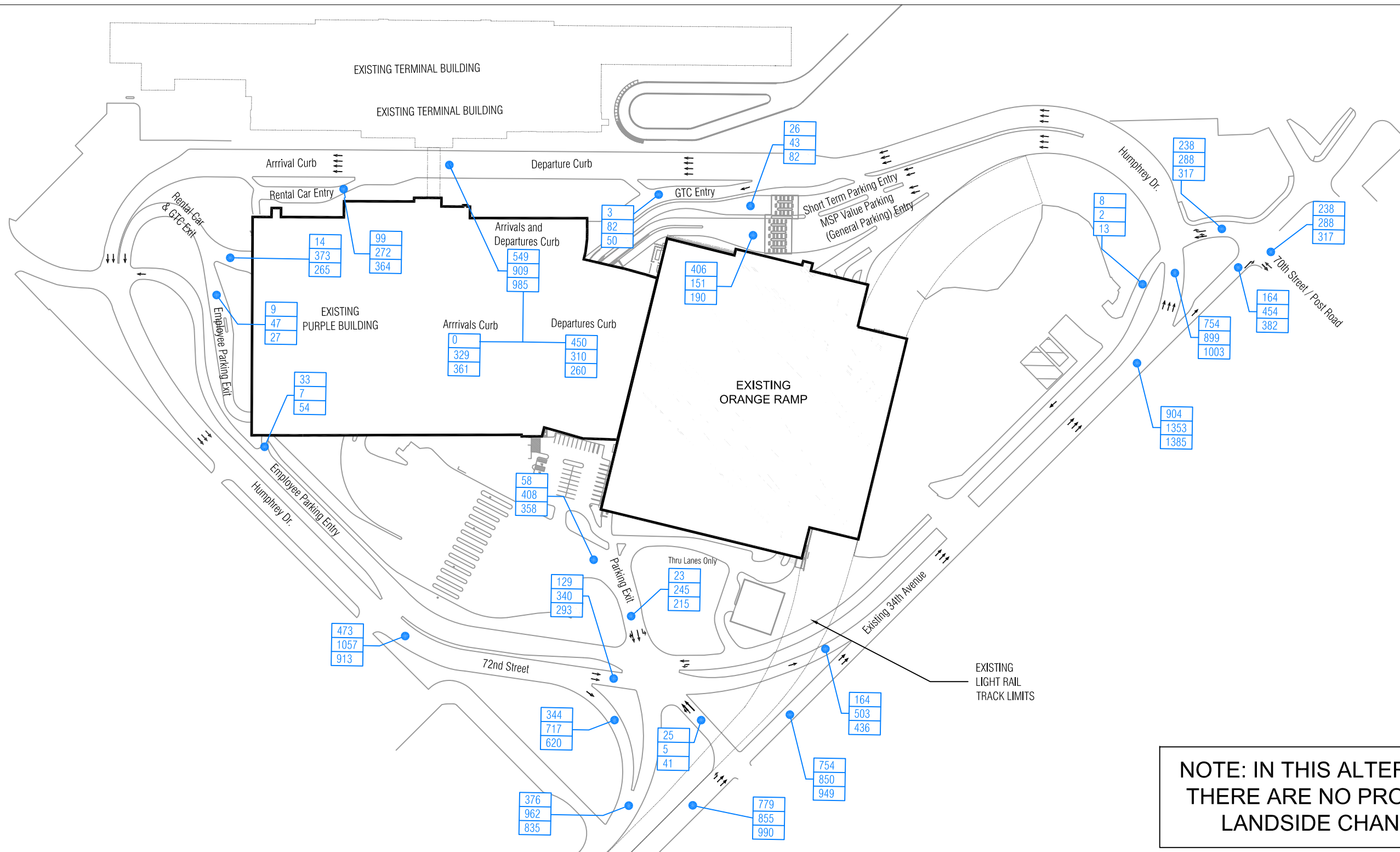


Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



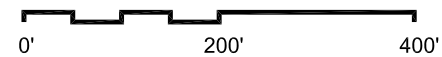
\\alkw001\pdocs\MSP EA - Landside_Transportation Assessment - 44692\Phase II - Complete EA\CAD, PDF, & Photos\Cad\Traffic_Volumes\All Concepts 060111 (Alt 1) - Standard\2_Volumes_Traffic\Concept_NoAction_2020.dwg
 12/19/2011 4:03:52 PM



LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (3PM - 4PM)
Arrivals Peak Hour (2PM - 3PM)
Units: Vehicles/Hour

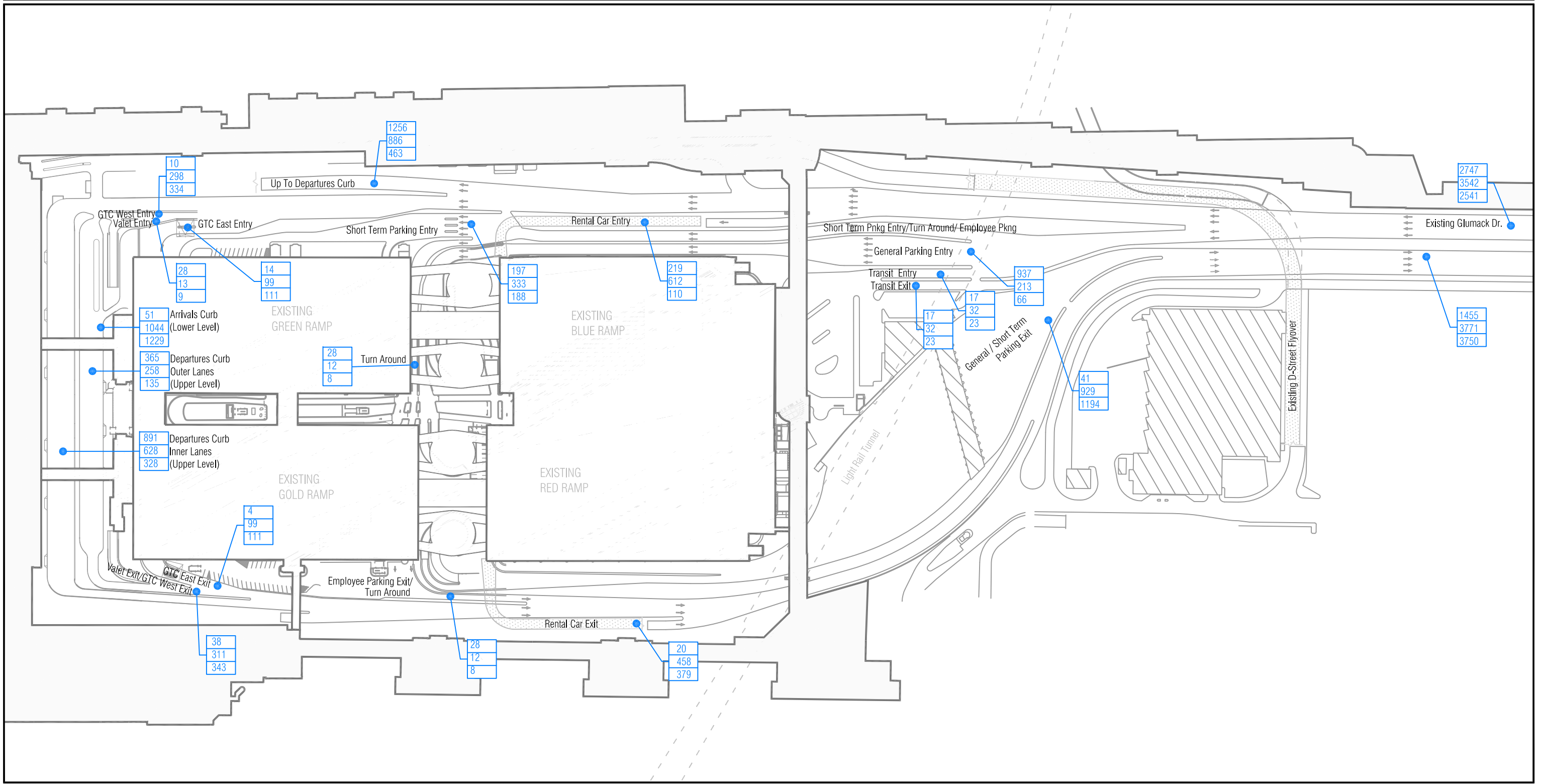
No Action- Terminal 2 - Humphrey: 2020 Peak Hour Volumes



Source: Data compiled and maintained by MAC, HNTB, TKDA
 Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



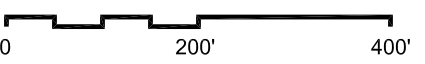
\\alkw001\pdoc\MSP EA - Landside_Transportation Assessment - 44692\Phase II - Complete EACAD, PDF, & Photos\Cad\Traffic_Volumes\Concepts 060111 (Alt 1) - Standard\9_Volumes_T2 Concept_NoAction_2020.dwg
 12/19/2011 4:08:26 PM



LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (4PM - 5PM)
Arrivals Peak Hour (8PM - 9PM)
Units: Vehicles/Hour

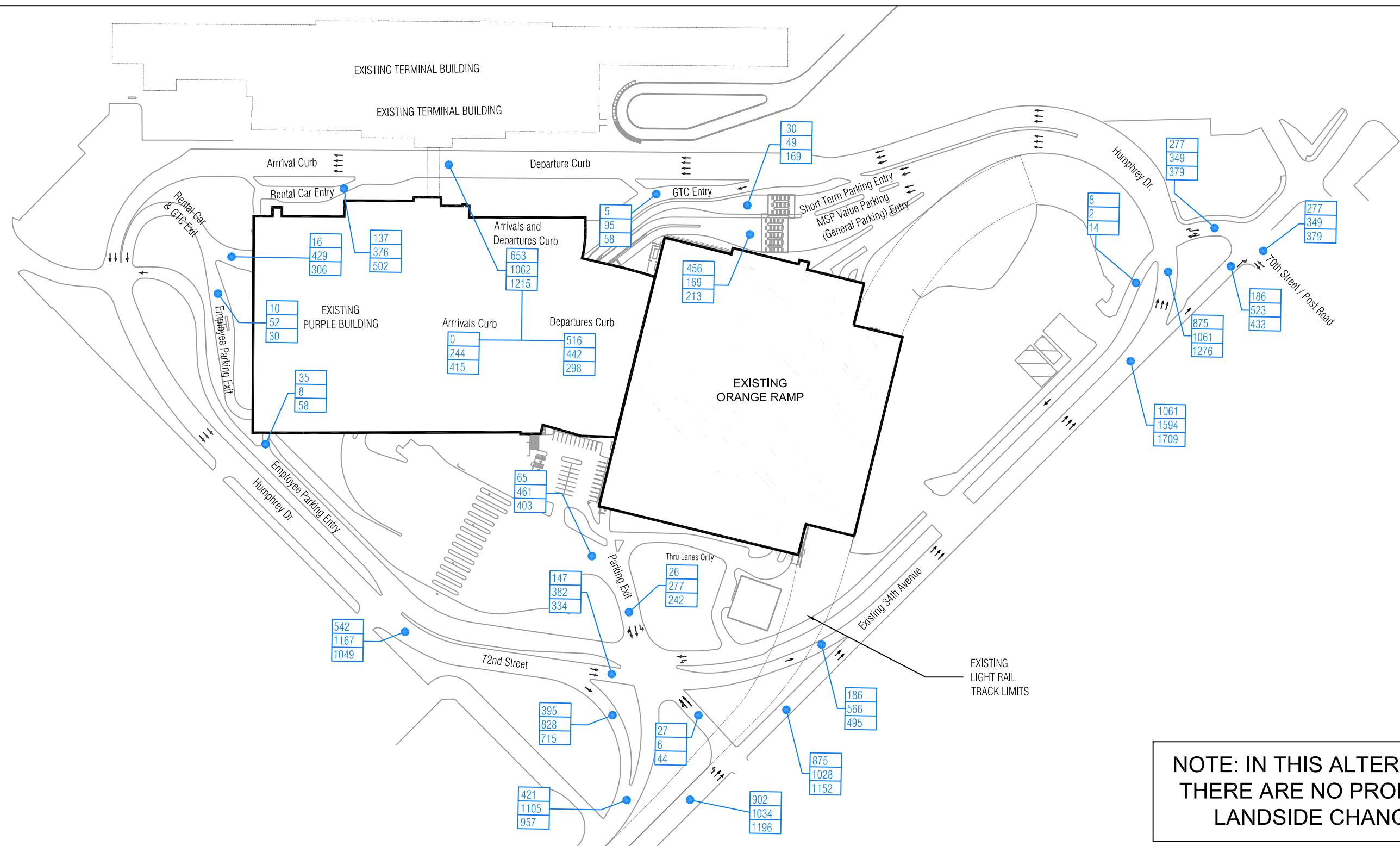
No Action - Terminal 1-Lindbergh: 2025 Peak Hour Volumes



Source: Data compiled and maintained by MAC, HNTB, TKDA
 Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



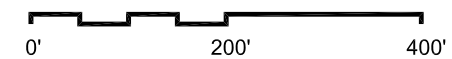
\\alkw001\pdoc\MSP EA - Landside_Transportation Assessment - 44692\Phase II - Complete EA\CAD, PDF, & Photos\Cad\Traffic_Volumes\All Concepts 060111 (Alt 1) - Standard\3_Volumes_T\Concept_NoAction_2025.dwg
 12/19/2011 4:04:31 PM



LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (3PM - 4PM)
Arrivals Peak Hour (2PM - 3PM)
Units: Vehicles/Hour

No Action- Terminal 2 - Humphrey: 2025 Peak Hour Volumes

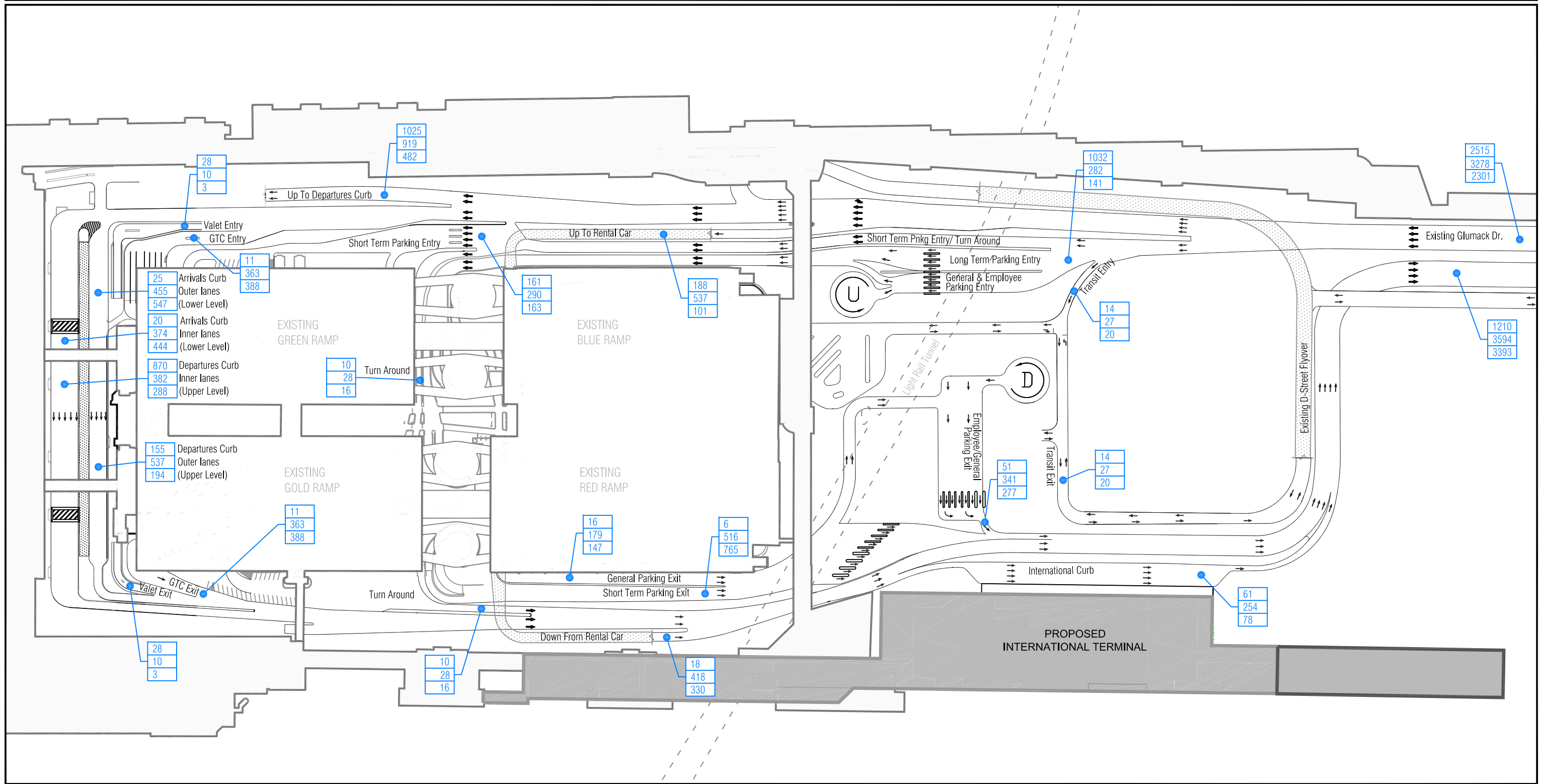


Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



\\alkw001\pdoc\MSP EA - Landside_Transportation Assessment - 44692\Phase II - Complete EACAD, PDF, & Photos\Cad\Traffic_Volumes\All Concepts 060111 (Alt 1) - Standard\VO_Volumes_T2 Concept_NoAction_2025.dwg 12/19/2011 4:09:17 PM

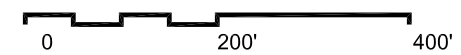


LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (3PM - 4PM)
Arrival Peak Hour (8PM - 9PM)

Units: Vehicles/Hour

Alternative 1 - Airlines Remain - Terminal 1-Lindbergh: 2020 Peak Hour Volumes

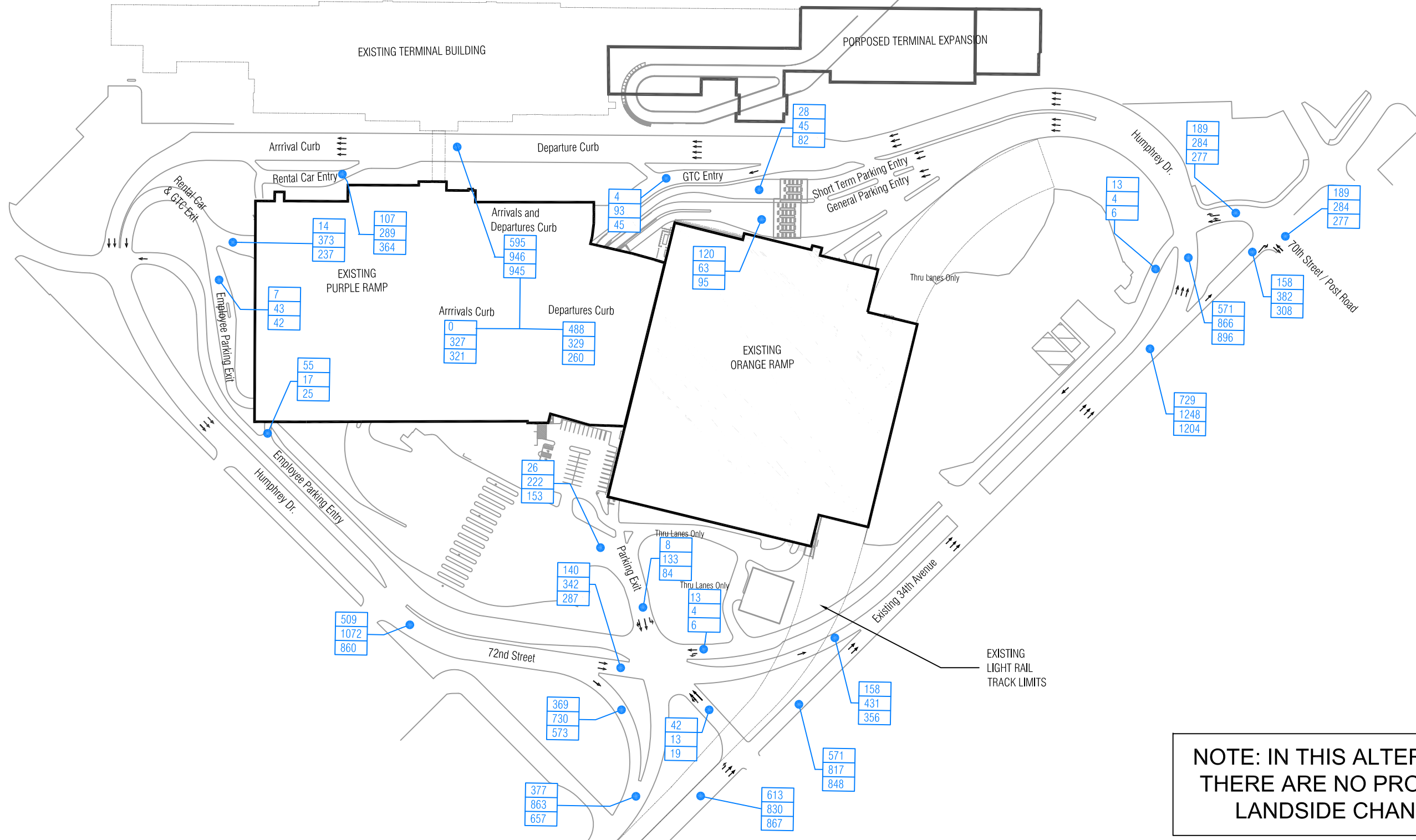


Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



I:\work\001\pdoc\WSP_EA - Landside_Transportation Assessment - 44692\Phase II - Complete EA\CAD, PDF, & Photos\Cad\Traffic_Volumes\Concepts 060111_Alt 1 - StandardV4_Volumes_11_Concept_2020AAT.dwg
 12/19/2011 4:05:07 PM

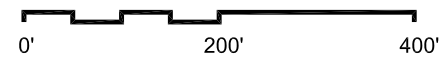


NOTE: IN THIS ALTERNATIVE THERE ARE NO PROPOSED LANDSIDE CHANGES

LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (3PM - 4PM)
Arrivals Peak Hour (2PM - 3PM)
Units: Vehicles/Hour

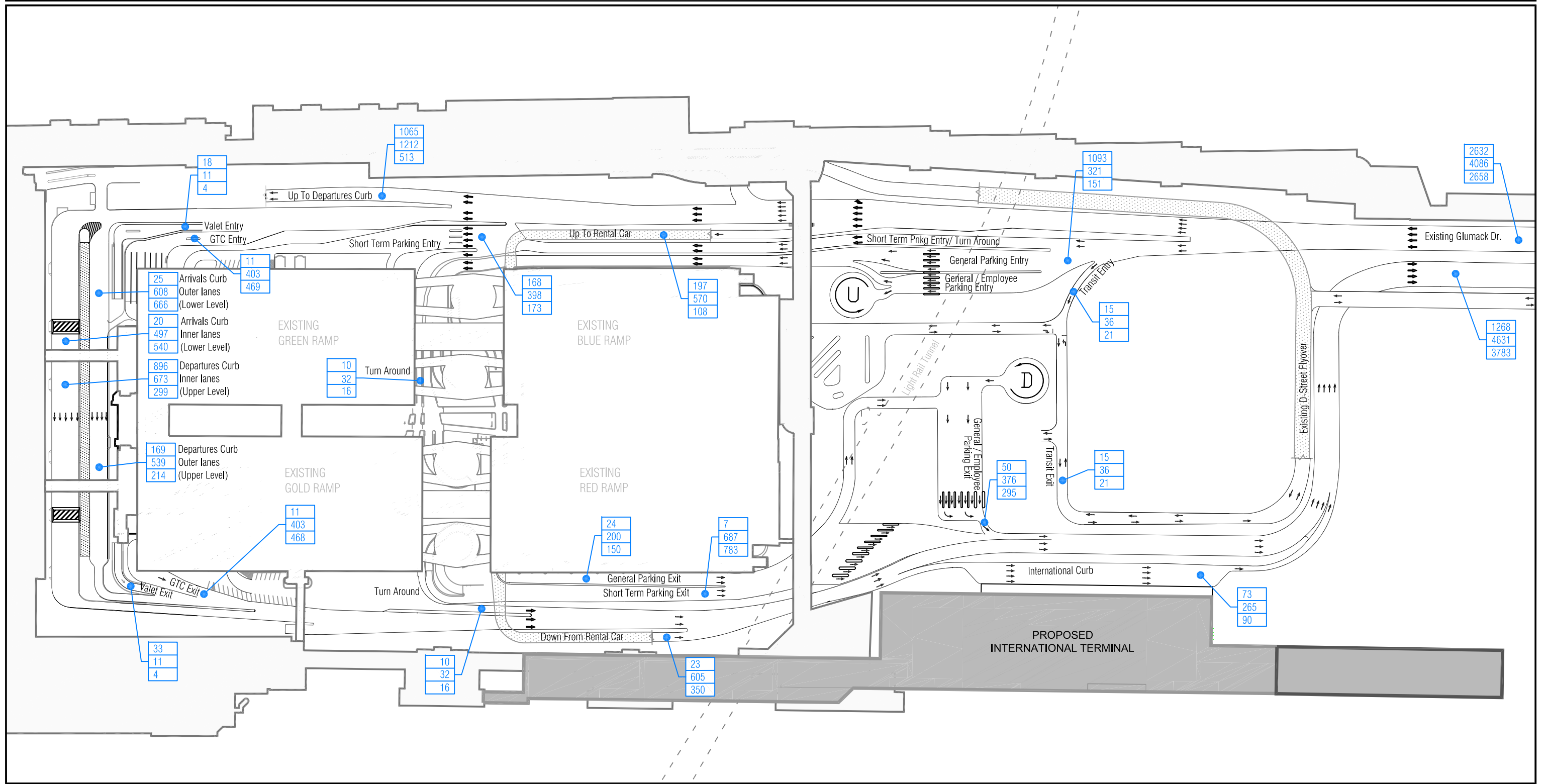
Alternative 1 - Airlines Remain - Terminal 2 - Humphrey: 2020 Peak Hour Volumest



Source: Data compiled and maintained by MAC, HNTB, TKDA
 Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



\\alkw001\pdoc\MSP EA - Landside_Transportation Assessment - 44692\Phase II - Complete EACAD, PDF, & Photos\Cad\Traffic_Volumes\All Concepts\060111_Alt 1 - Standard\11_Volumes_T2 Concept_2020Alt1.dwg
 12/19/2011 4:10:14 PM

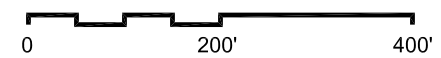


LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (4PM - 5PM)
Arrivals Peak Hour (8PM - 9PM)

Units: Vehicles/Hour

Alternative 1 - Airlines Remain - Terminal 1-Lindbergh: 2025 Peak Hour Volumes

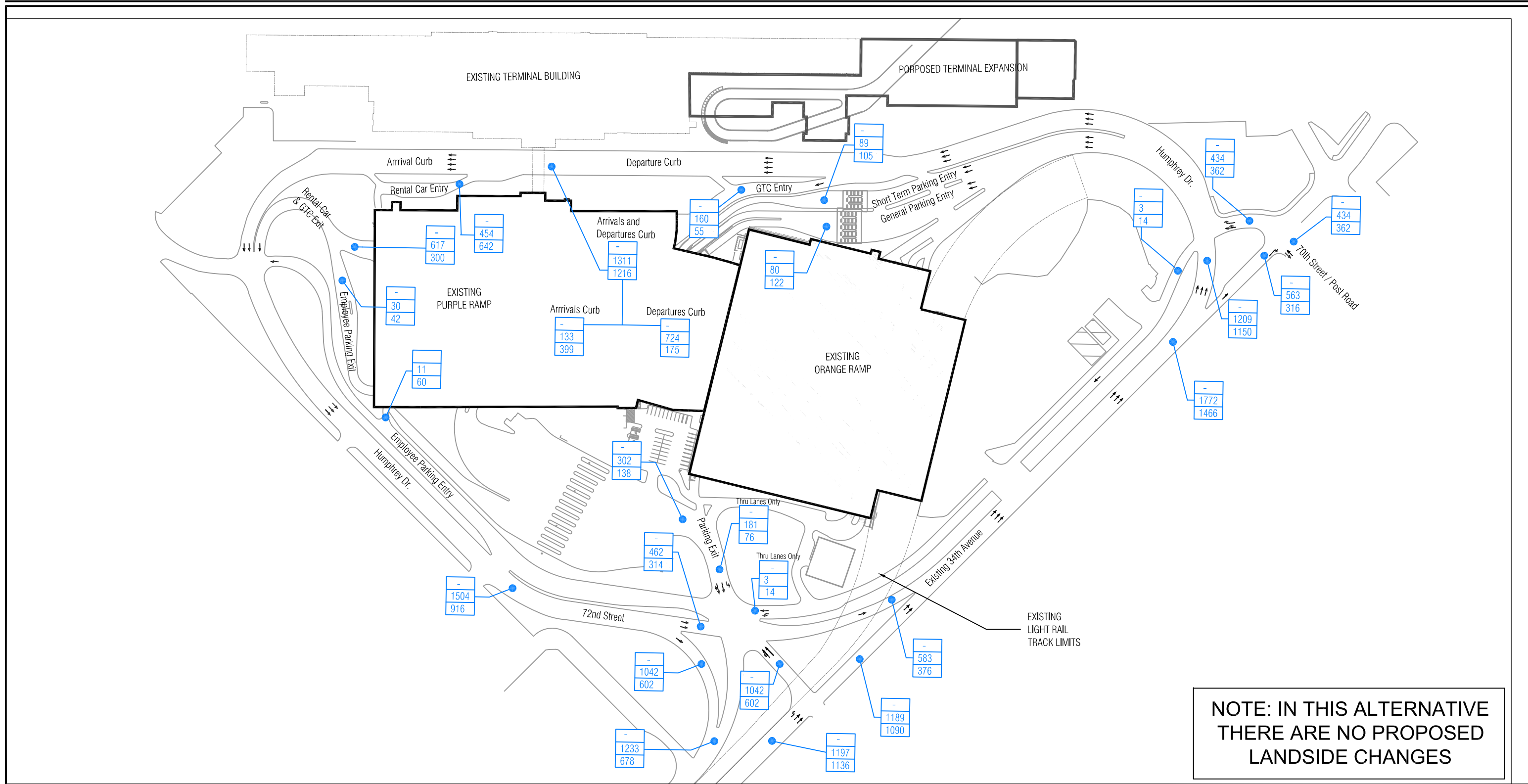


Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



\\alkw001\pdoc\WSP EA - Landside_Transportation Assessment - 44692\Phase II - Complete EA\CAD, PDF, & Photos\Cad\Traffic_Volumes\All Concepts 060111 (Alt 1) - Standard\6_Volumes_T1 Concept_2025\Alt1.dwg 12/19/2011 4:06:30 PM



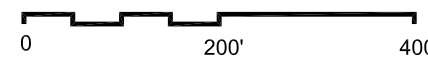
LEGEND

Peak Hour*
Overall Peak Hour (5PM - 6PM)**
Arrivals Peak Hour (4PM - 5PM)

Units: Vehicles/Hour

**Departures peak hour coincides with overall peak hour.
*Period was not analyzed because none of the facilities peaked during AM hours.

Alternative 1 Airlines Remain - Terminal 2 - Humphrey: 2025 Peak Hour Volumes



Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



\\slw001\pdoc\MSP EA - Landside_Transportation Assessment - 44692\Phase II - Complete EACAD, PDF, & Photos\Cad\Traffic_Volumes\All Concepts 060111 (Alt 1) - Standard\13_Volumes_T2 Concept_2025\Alt1.dwg 12/19/2011 4:12:00 PM

3.4 Airlines Relocate Alternative Traffic Volumes

3.4.1 2020 Airlines Relocate Alternative

In the Airlines Relocate Alternative, one of the major changes is to relocate all non-Sky Team airlines from Terminal 1-Lindbergh to Terminal 2-Humphrey. It was estimated that 65% of Sky Team passengers originating from the Airport are local residents who live in the metropolitan Minneapolis area; however only 50% of non-Sky Team originating passengers are local residents. Local and non-local residents behave differently when choosing the means to get to the airport. The most significant difference is that nearly none of the local residents will rent a car just to get to the airport; while nearly none of the non-local residents will use the long-term parking because they typically choose to be dropped-off or take other modes of transportation such as taxi, rental car or public transit.

Therefore, when relocating all non-Sky Team airlines from Terminal 1-Lindbergh to Terminal 2-Humphrey, adjustments based on this residency difference were added on top of the volumes grown and shifted based on passenger O&D schedules.

It shall be noted that Mode Share (percentage of passengers using different modes of transportation to arrive at the airport) was a critical base to calculate the adjustment. However, no recent, reliable Mode Share data for MSP were available for this study. Therefore, historical data for MSP as well as more recent data from other Delta hub U.S. airports that have similar characteristics were used to estimate the Mode Share at MSP. **Table H.3.4.1** shows the estimated and adjusted Mode Share.

Table H.3.4.1

Mode Share Change in Alternative 2 - Airlines Relocate			
Mode	All Originations*	Resident**	Non-Resident**
<i>Auto</i>			
<i>Direct ST Park</i>	11%	11%	11%
<i>Direct LT Park</i>	22%	39%	0%
<i>Curb drop</i>	22%	23%	21%
<i>Rental Car Return</i>	16%	0%	37%
<i>Taxi</i>	8%	7%	10%
<i>Other Commercial Vehicles</i>	18%	17%	19%
<i>Rail Transit</i>	3%	3%	3%
Total***	100%	100%	100%

Notes:

*: Average of other Delta hub U.S. airports with similar characteristics as the MSP airport.

** : Adjusted based on passenger residency characteristics.

***: Due to rounding numbers may not add to 100.

Source: HNTB data and analysis, 2011.

At Terminal 1-Lindbergh, employee parking traffic and commercial vehicle traffic were relocated based on the proposed changes in the concept design. At Terminal 2-Humphrey, curb, parking, rental car and commercial vehicle traffic were relocated using the proposed landside facility changes.

The Overall, Departures and Arrivals Peak Hour traffic volumes were further smoothed and balanced throughout the network at both terminals.

The peak hour traffic volumes for the 2020 Airlines Relocate Alternative are shown in **Figure H.3-9** and **Figure H.3-10**.

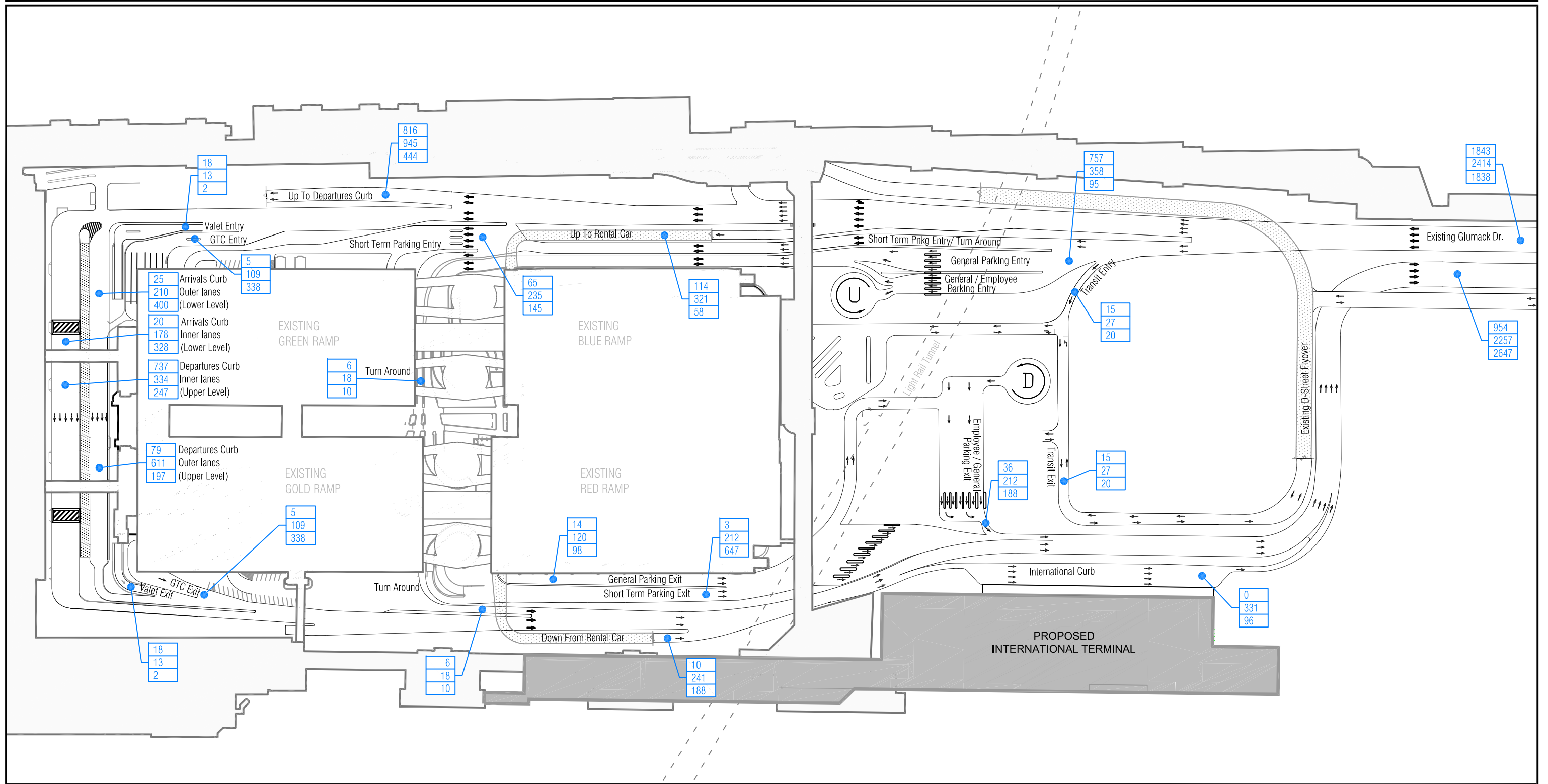
3.4.2 2025 Airlines Relocate Alternative

The 2025 Airlines Relocate Alternative diurnal volumes were developed based on the 2020 Airlines Relocate Alternative volumes, with adjustment accounting for the hourly pattern change in the passenger O&D forecast schedule. The Overall, Departures and Arrivals Peak Hour traffic volumes were further smoothed and balanced throughout the network at both terminals.

The peak hour traffic volumes for the 2025 Airlines Relocate Alternative are shown in **Figure H.3-11** and **Figure H.3-12**.

4 Landside Facility Requirements

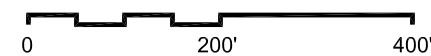
This section analyzes the individual landside components of MSP to determine the requirement for each forecast scenario through 2025. All of the landside facility requirements are based on the number of originating and terminating passengers as presented in the gated flight schedule forecasts. These forecasts were prepared for the average day of the peak month (ADPM) at the airport and varying metrics were used to determine each facility requirement as each facility typically has a different time of day during which it peaks. The seven facilities and their requirement drivers are listed in **Table H.4.1.1**.



LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (1PM - 2PM)
Arrivals Peak Hour (8PM - 9PM)
Units: Vehicles/Hour

Alternative 2 - Airlines Relocate - Terminal 1-Lindbergh: 2020 Peak Hour Volumes

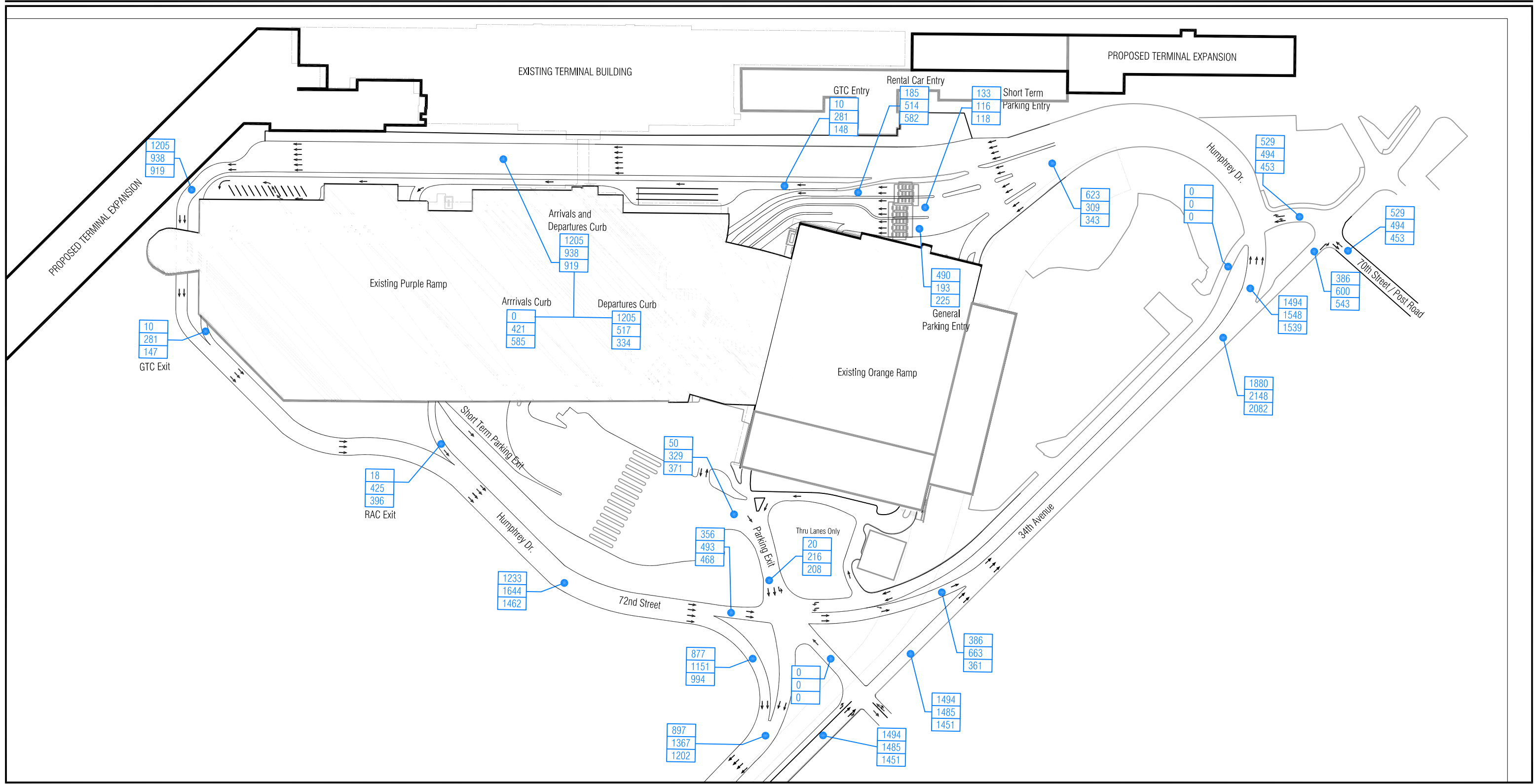


Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



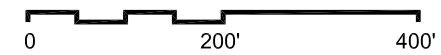
\\alkw001\pdoc\WSP EA - Landside_Transportation Assessment - 44692\Phase II - Complete EA\CAD, PDF, & Photos\Cad\Traffic_Volumes\All Concepts 060111 (Alt 1) - Standard\5_Volumes_T1 Concept_2020Alt2.dwg
 12/19/2011 4:05:39 PM



LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (3PM - 4PM)
Arrivals Peak Hour (2PM - 3PM)
Units: Vehicles/Hour

Alternative 2 - Airlines Relocate - Terminal 2 - Humphrey: 2020 Peak Hour Volumes

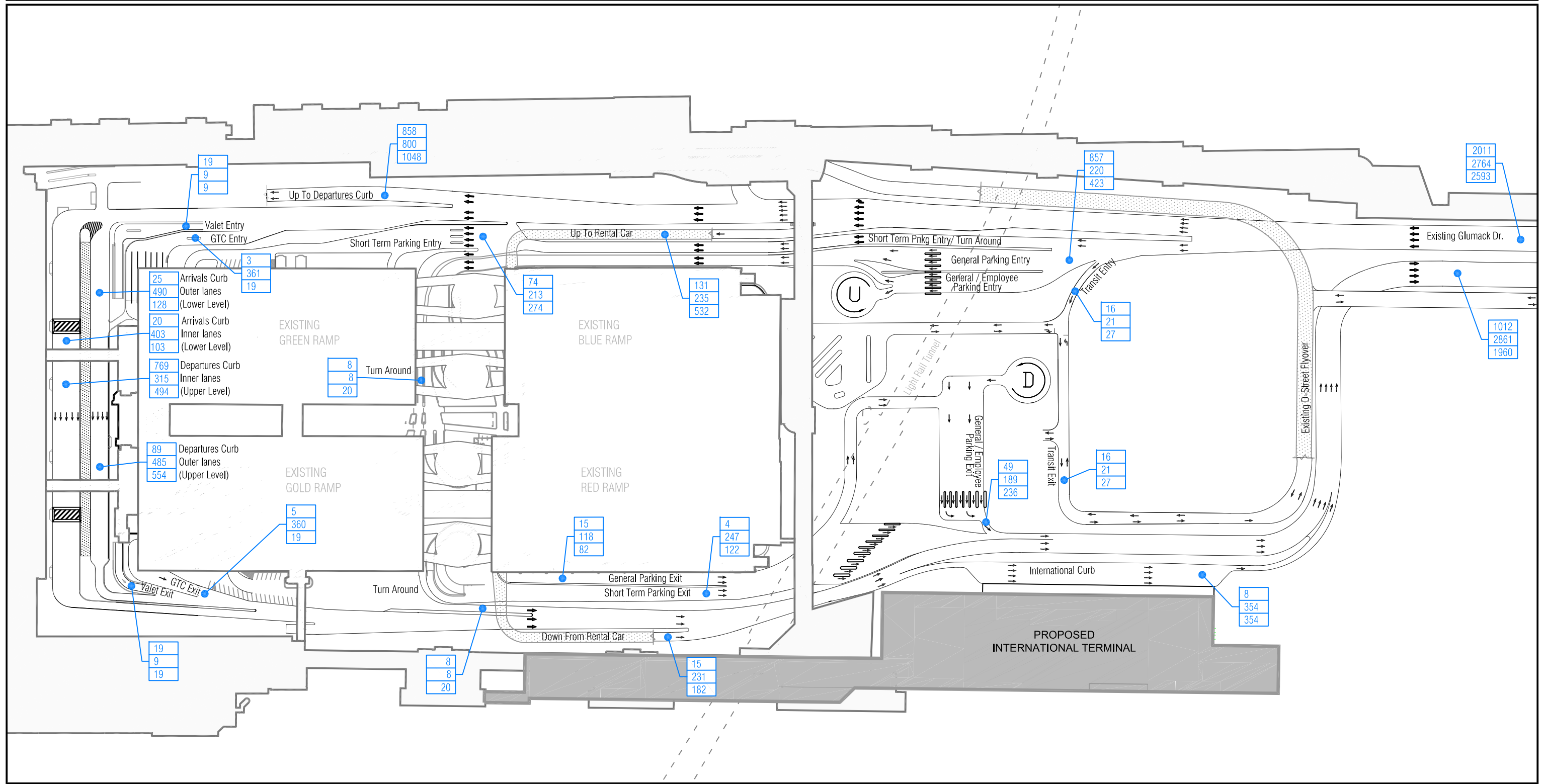


Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



\\alkw001\pdoc\MSP EA - Landside_Transportation Assessment - 44692\Phase II - Complete EACAD, PDF, & Photos\Cad\Traffic_Volumes\All Concepts\060111 (Alt 1) - Standard\12_Volumes_T2 Concept_2020Alt2.dwg
 12/19/2011 4:10:05 PM



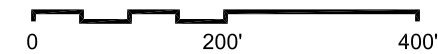
LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (5PM - 6PM)*
Peak Hour (3PM - 4PM)**
Units: Vehicles/Hour

*The arrivals peak hour coincides with the overall peak hour in this case.

** This is the peak hour for the upper level curb outer lane, caused by international curb traffic.

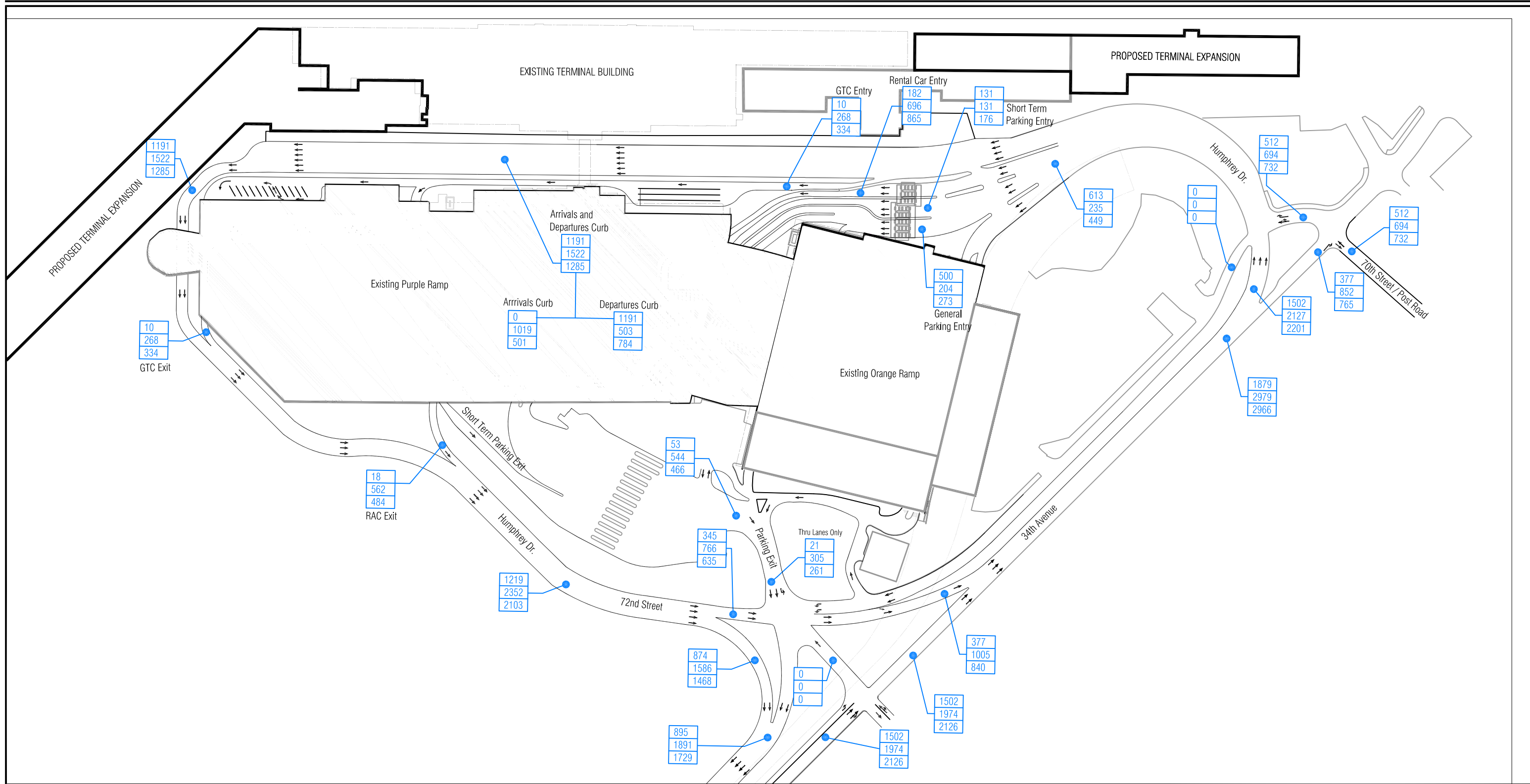
Alternative 2 - Airlines Relocate - Terminal 1-Lindbergh: 2025 Peak Hour Volumes



Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.





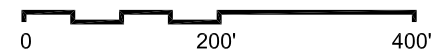
Alternative 2 - Airlines Relocate - Terminal 2 - Humphrey: 2025 Peak Hour Volumes

LEGEND

Departures Peak Hour (5AM - 6AM)
Overall Peak Hour (4PM - 5PM)*
Peak Hour (3PM - 4PM)**

Units: Vehicles/Hour

*The arrivals peak hour coincides with the overall peak hour in this case.
 ** This is the peak hour for the inbound roadways, GTC entrance, RAC entrance and STP entrance.



Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



\\slw001\pdoc\MSP EA - Landside_Transportation Assessment - 44692\Phase II - Complete EACAD, PDF, & Photos\Cad\Traffic_Volumes\All Concepts\060111_Alt 1 - Standard\14_Volumes_T2_Concept_2025\Alt2.dwg
 12/19/2011 4:13:43 PM

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.1.1

Landside Facility Requirement Drivers

Element	Requirement Driver	Other Key Parameters
<i>Terminal Access Roads</i>	<i>Sum of Inbound and Outbound Vehicle Volumes for Peak Hour of the ADPM</i>	
<i>Terminal Curb Roadways</i>	<i>Curb Traffic Volumes in Peak Hour ADPM of Originations (Departures Curb), and Terminations (Arrivals Curb)</i>	<i>Distribution of Vehicle Class, Average Dwell Times by Vehicle Class</i>
<i>Parking Stalls</i>	<i>Daily Volume of ADPM Originations (for general parking) & Peak Hour of Sum of Originations and Terminations for ADPM (for hourly parking)</i>	<i>Average Vehicular Parking Duration by Parking Product and Location</i>
<i>Parking Entrance Plazas</i>	<i>Inbound Parking Volume for 10th Highest Hour of the Year</i>	
<i>Parking Exit Plazas</i>	<i>Parking Exiting Volume for 10th Highest Hour of the Year</i>	
<i>RAC/QTA</i>	<i>Peak Daily Rental Car Transactions of the Year</i>	
<i>GTC</i>	<i>Sum of Inbound and Outbound Vehicle Volumes for Peak Hour of the ADPM</i>	<i>Distribution of Vehicle Class</i>

Source: HNTB analysis, 2011.

For each of these facilities, this section will list assumptions made in determining requirements and depict the future demand by forecast scenario.

4.1 Terminal Access Roads

On-airport roadways create a network for which requirements are not typically defined in the same manner as for spatial elements of the landside and terminal. To understand the basic requirements for a roadway network, the planner must first create an assumed network (typically using the network which already exists as the base), then analyze it with the forecast traffic volume, and adjust the network until the targeted LOS is achieved. The resulting network (roadway configuration and number of lanes) represents the requirement for the roadway system.

For both Terminal 1-Lindbergh and Terminal 2-Humphrey, there exists roadway networks which have evolved over time and which are not easily subject to large scale revisions without extensive impacts and costs. Thus, the initial definition of the required roadway network for each terminal was the existing network. Using the forecast traffic volumes from Section 3, the networks were tested to determine the quality of operation in 2010, 2020 and 2025. To reflect different aspects of the landside systems for the Airlines Remain Alternative and the Airlines

Relocate Alternative, modest adjustments were made to the network configuration in order to provide connectivity (access to and egress from) all functions within the terminal complex. If a function was removed, (e.g., the elimination of the USPS facility at Terminal 1-Lindbergh in the Airlines Remain Alternative), then its access and egress could be eliminated from the proposed roadway network.

Essential to the analysis of the roadway networks was the assignment of vehicle trips to/from their on-airport destinations/origins. A distinct characteristic of an airport roadway system is that many paths are well defined and many are used exclusively by one or just a few elements of the overall vehicle traffic stream, e.g., only commercial vehicles access and exit from the GTCs at both terminals. Once these paths were defined, the aggregate vehicle volumes in the analysis hours were disaggregated and assigned to the paths they would take, and the resulting volumes by network link were analyzed using the VISSIM software.

VISSIM is a flexible and reliable microsimulation tool, meaning that it analyzes the movement of each vehicle during each time element; typically each second. VISSIM reports back the demand for each link which was input to the model, the actual volume assigned, the average speed on the link, the traffic density (passenger cars/hour/lane), the presence, duration, and length of queues, and similar data which reflect the performance of the link and the overall roadway network. The results of these traffic operational microsimulations were then translated into a LOS with minor adjustments made as necessary, using professional judgment based on experience at other airports and knowledge of the MSP roadway operations, to account for the actual operation at MSP. Adjustments account for roadway merges, sight distances and other features that may not be fully captured by the model outputs but may be witnessed by observing the model simulation or real time roadway operations. The results of the VISSIM model for the No Action 2020 and 2025 are found in **Table H.4.1.2** and **Table H.4.1.3**.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.1.2

Summary of 2020 No Action Terminal Access Roadway Operations

2020 No Action	Operational Measures of Effectiveness					
Location	No. of Lanes	Demand (veh/hr)	Density (pc/ln/mi)	Speed (mph)	Delay* (sec/veh)	LOS**
Terminal 1-Lindbergh Overall Peak Hour (4-5PM)						
<i>Inbound Road (Glumack Drive)</i>						
<i>Return-to-Terminal Roadway To Parking Entrance</i>	4/5	3047	25.3	29.2	-	B
<i>Parking Entrance to Rental Car Entrance</i>	3	2582	30.8	28.5	-	C
<i>Rental Car Entrance to Curbside Entrance (diverge)</i>	3	2087	23.5	29.1	-	B
<i>Outbound Road (Glumack Drive)</i>						
<i>Curbside Exit (diverge) to Employee Exit/Turn Around</i>	2	2087	33.2	28.1	-	D
<i>Employee Exit/Turn Around to Rental Car Exit</i>	2	2094	43.1	27.6	-	D
<i>Rental Car Exit to Service Road</i>	2	2493	32.1	12.7	-	D
<i>Service Road to Parking Exit</i>	3	2493	20.7	21.5	-	D
<i>Parking Exit to Return-to-Terminal Roadway</i>	4	3325	21.9	18.5	-	D
Terminal 2 – Humphrey Overall Peak Hour (3-4PM)						
<i>Inbound Road (Humphrey Drive)</i>						
<i>34th Ave between 72nd St and 70th St (Weaving Segment)</i>	3	1353	20.4	23.6	-	A
<i>From 34th Ave to 70th St (prior to traffic signal)</i>	3	899	-	-	14.4	A
<i>From 70th St to Humphrey Dr (prior to traffic signal)</i>	2	288	-	-	7.1	A
<i>From 70th St to Parking Entrance</i>	3	194	2.9	24.6	-	A
<i>From 70th St/Humphrey Dr. to just before Curbs</i>	2/3	1048	12.2	26.6	-	A
<i>Outbound Road (Humphrey Drive)</i>						
<i>From Rental/Employee/GTC Exit to 34th Ave N/S diverge</i>	3	1057	10.4	31.8	-	A
<i>From Parking Exit to 34th Ave S (prior to traffic signal)</i>	2	245	-	-	22.7	B
<i>From Humphrey Dr to 34th Ave S</i>	1	717	23.9	29.4	-	B
<i>From Humphrey Dr to 34th Ave N (prior to traffic signal)</i>	2	340	-	-	49.2	C

Notes:

*: Applicable only for signalized intersections.

**: LOS for roadway segments based on ACRP Report 40 and HCM 2010 using Density; LOS for signalized intersections based on HCM 2010 using Delay.

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.1.3

Summary of 2025 No Action Terminal Access Roadway Operations

2025 No Action	Operational Measures of Effectiveness					LOS**
Location	No. of Lanes	Demand (veh/hr)	Density (pc/ln/mi)	Speed (mph)	Delay* (sec/veh)	
Terminal 1 – Lindbergh Overall Peak Hour (4-5PM)						
<i>Inbound Road (Glumack Drive)</i>						
<i>Return-to-Terminal Roadway To Parking Entrance</i>	4/5	3542	31.0	28.0	-	C
<i>Parking Entrance to Rental Car Entrance</i>	3	2952	40.0	25.0	-	D
<i>Rental Car Entrance to Curbside Entrance (diverge)</i>	3	2340	30.0	27.0	-	C
<i>Outbound Road (Glumack Drive)</i>						
<i>Curbside Exit (diverge) to Employee Exit/Turn Around</i>	2	2340	45.0	26.0	-	F
<i>Employee Exit/Turn Around to Rental Car Exit</i>	2	2352	49.0	22.0	-	F
<i>Rental Car Exit to Service Road</i>	2	2810	86.0	18.0	-	F
<i>Service Road to Parking Exit</i>	3	2810	75.0	17.0	-	F
<i>Parking Exit to Return-to-Terminal Roadway</i>	4	3771	111	10	-	F
Terminal 2 – Humphrey Overall Peak Hour (3-4PM)						
<i>Inbound Road (Humphrey Drive)</i>						
<i>34th Ave between 72nd St and 70th St (Weaving Segment)</i>	3	1594	122.0	5.0	-	D
<i>From 34th Ave to 70th St (prior to traffic signal)</i>	3	1061	-	-	45.0	C
<i>From 70th St to Humphrey Dr (prior to traffic signal)</i>	2	349	-	-	9.0	A
<i>From 70th St to Parking Entrance</i>	3	218	3.0	25.0	-	A
<i>From 70th St/Humphrey Dr. to just before Curbs</i>	2/3	1192	15.0	27.0	-	A
<i>Outbound Road (Humphrey Drive)</i>						
<i>From Rental/Employee/GTC Exit to 34th Ave N/S diverge</i>	3	1167	12.0	29.0	-	A
<i>From Parking Exit to 34th Ave S (prior to traffic signal)</i>	2	277	-	-	37	C
<i>From Humphrey Dr to 34th Ave S</i>	1	828	27.0	29.0	-	D
<i>From Humphrey Dr to 34th Ave N (prior to traffic signal)</i>	2	382	-	-	78	D

Notes:

*: Applicable only for signalized intersections

** : LOS for roadway segments based on ACRP Report 40 and HCM 2010 using Density; LOS for signalized intersections based on HCM 2010 using Delay.

Source: HNTB analysis, 2011.

From the highest perspective of the roadway networks, the requirements for the critical roadway links at each terminal include:

- The four existing inbound lanes of Glumack Drive serving Terminal 1-Lindbergh (from the merge point of the three inbound approaches to the first diverge to parking and Transit Center) will provide adequate operations for all years, for all alternatives.
- The four existing outbound lanes of Glumack Drive serving Terminal 1-Lindbergh (from the merge of the parking exit to the divide to the three exit paths) will provide adequate operations through 2020 but will operate at LOS F in 2025 under the No Action and the Airlines Remain Alternative. Only the Airlines Relocate Alternative will operate at an adequate level through 2025.
- The basic approaches to Terminal 2-Humphrey (70th Street approaching Humphrey Drive, 34th Avenue South from East 72nd Street to Humphrey Drive and Humphrey Drive) will provide adequate operations for all years, for all alternatives with some minor improvements.
- The basic elements of the Terminal 2-Humphrey outbound roadway network (Humphrey Drive, East 72nd Street, and 34th Avenue South in the immediate vicinity of Terminal 2-Humphrey) will provide adequate operations for all years, for all alternatives with some minor improvements.

4.2 Terminal Curb Roadways

Curb roadway requirements, much like other airport roadway requirements, are not independently derived from planning factors. Rather, curb requirements are derived from the analysis of an assumed curb physical plant (length and number of lanes), the configuration within the network (which influences the presence of vehicles merely driving through a curb roadway versus actually stopping to service passengers) and operational practices, including the allocation of space to different vehicle classes and the level of enforcement. These data plus the vehicular demand by class are analyzed using an enhanced time-space technique which calculates the capacity for the curb under the assumed conditions, and compares it to the vehicle volume on the curb.

A volume to capacity (v/c) ratio of 0.70 was utilized in the terminal curb roadway analysis as the limit of adequate LOS. For v/c ratios of greater than 0.70, congestion and delay rapidly builds and the ability to maneuver to or from a location to serve passengers becomes restricted. As v/c approaches 1.0, queues form, blocking access to or egress from the curb. A 0.70 v/c ratio provides sufficient length for vehicles to stop on the curb to pick-up/drop-off, and adequate numbers of lanes to provide for access, egress and the ability to maneuver around and bypass other vehicles stopped along the curb.

The vehicle dwell time is a factor in determining how much curb length is required. Data from field observations were reviewed and the average observed dwell time, shown in **Table H.4.2.1**, was used in analysis.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.2.1

Vehicular Dwell Times Used in Terminal Curb Roadway Analysis

Vehicle Class	Departures Dwell Time	Arrivals Dwell Time
<i>POVs</i>	2 minutes	3.5 minutes
<i>Taxis & Limos (1)</i>	2 minutes	n.a.
<i>Commercial Vehicles (1)</i>	3 minutes	n.a.

Notes:

n.a. = not applicable

POV = privately operated vehicle

(1) All taxis, limos, and commercial vehicles pick-up passengers at the GTC.

Source: HNTB analysis, 2011.

Vehicle volumes by vehicle class used in the analysis can be found in **Table H.4.2.2** to **Table H.4.2.7**. These volumes, the dwell times, the curb lengths and lane configurations, and effective vehicle length were used to estimate the capacity of the curbs and the v/c ratios. The summary of the existing terminal curb roadway requirements can be found in **Table H.4.2.8**. Requirements for terminal curb roadways in the forecast scenarios can be found in **Table H.4.2.9** to **Table H.4.2.11**.

Table H.4.2.2

Peak Hour Vehicle Class Curb Volumes (2020 No Action)

Peak Hour:	Terminal 1-Lindbergh Departures Curb			Terminal 1-Lindbergh Arrivals Curb		Terminal 2-Humphrey Combined Curb		
	5:00 AM			8:00 PM		3:00 PM		
	Inner	Outer	Total	Inner	Total	Dep	Arr	Total
<i>POVs</i>	800	10	810	1,050	1,050	340	200	540
<i>Taxis & Limos</i>	200	-	200	-	-	30	-	30
<i>Commercial Vehicles</i>	-	90	90	-	-	80	-	80
Total	1000	100	1,100	1,050	1,050	450	200	650

Notes:

POV = privately operated vehicle

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.2.3

Peak Hour Vehicle Class Curb Volumes (2020 Alternative 1 - Airlines Remain)

Peak Hour:	Terminal 1-Lindbergh Departures Curb			Terminal 1-Lindbergh Arrivals Curb			Terminal 1-Lindbergh International Curb			Terminal 2-Humphrey Combined Curb		
	5:00 AM			8:00 PM			11:00 AM			3:00 PM		
	Inner	Outer	Total	Inner	Outer	Total	Dep	Arr	Total	Dep	Arr	Total
<i>POVs</i>	650	160	810	750	300	1,050	270	5	275	380	200	580
<i>Taxis & Limos</i>	200	-	200	-	-	-	20	-	20	20	-	20
<i>Commercial Vehicles</i>	-	90	90	-	-	-	55	-	55	50	-	50
Total	850	250	1,100	750	300	1,050	345	5	350	450	200	650

Notes:

POV = privately operated vehicle

Source: HNTB analysis, 2011.

Table H.4.2.4

Peak Hour Vehicle Class Curb Volumes (2020 Alternative 2 - Airlines Relocate)

Peak Hour:	Terminal 1-Lindbergh Departures Curb			Terminal 1-Lindbergh Arrivals Curb			Terminal 1-Lindbergh International Curb			Terminal 2-Humphrey Combined Curb		
	8:00 AM			8:00 PM			3:00 PM			5:00 AM		
	Inner	Outer	Total	Inner	Outer	Total	Dep	Arr	Total	Dep	Arr	Total
<i>POVs</i>	580	5	585	750	100	850	250	4	254	800	400	1,200
<i>Taxis & Limos</i>	140	-	140	-	-	-	10	1	11	50	-	50
<i>Commercial Vehicles</i>	-	75	75	-	-	-	35	-	35	150	-	150
Total	720	80	800	750	100	850	295	5	300	1,000	400	1,400

Notes:

POV = privately operated vehicle

Source: HNTB analysis, 2011.

Table H.4.2.5

Peak Hour Vehicle Class Curb Volumes (2025 No Action)

Peak Hour:	Terminal 1-Lindbergh Departures Curb			Terminal 1-Lindbergh Arrivals Curb		Terminal 2-Humphrey Combined Curb		
	5:00 AM			8:00 PM		2:00 PM		
	Inner	Outer	Total	Inner	Total	Dep	Arr	Total
<i>POVs</i>	640	292	932	1,229	1,229	333	244	577
<i>Taxis & Limos</i>	228	-	228	-	-	29	-	29
<i>Commercial Vehicles</i>	-	96	96	-	-	80	-	80
Total	868	388	1,256	1,229	1,229	442	244	686

Notes:

POV = privately operated vehicle

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.2.6

Peak Hour Vehicle Class Curb Volumes (2025 Alternative 1 - Airlines Remain)

Peak Hour:	Terminal 1- Lindbergh Departures Curb			Terminal 1- Lindbergh Arrivals Curb			Terminal 1- Lindbergh International Curb			Terminal 2- Humphrey Combined Curb		
	5:00 AM			8:00 PM			4:00 PM			5:00 PM		
	Inner	Outer	Total	Inner	Outer	Total	Dep	Arr	Total	Dep	Arr	Total
<i>POVs</i>	685	73	758	540	666	1,206	203	6	209	612	133	745
<i>Taxis & Limos</i>	211	-	211	-	-	-	16	-	16	32	-	32
<i>Commercial Vehicles</i>	-	96	96	-	-	-	40	-	40	80	-	80
Total	896	96	1,065	540	666	1,206	259	6	265	724	133	857

Notes:

POV = privately operated vehicle

Source: HNTB analysis, 2011.

Table H.4.2.7

Peak Hour Vehicle Class Curb Volumes (2025 Alternative 2 - Airlines Relocate)

Peak Hour:	Terminal 1- Lindbergh Departures Curb			Terminal 1- Lindbergh Arrivals Curb			Terminal 1- Lindbergh International Curb			Terminal 2- Humphrey Combined Curb		
	5:00 AM			8:00 PM			3:00 PM			4:00 PM		
	Inner	Outer	Total	Inner	Outer	Total	Dep	Arr	Total	Dep	Arr	Total
<i>POVs</i>	620	14	634	403	490	893	295	5	300	380	1019	1399
<i>Taxis & Limos</i>	149	-	149	-	-	-	12	2	14	23	-	23
<i>Commercial Vehicles</i>	-	75	75	-	-	-	40	-	40	100	-	100
Total	769	89	858	403	490	893	347	7	354	503	1,019	1,522

Notes:

POV = privately operated vehicle

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.2.8

Existing Terminal Curb Roadway Requirement

Terminal Curb	Existing Length	Existing Number of Lanes	2010 Base Case	
			Existing v/c ratio	Requirement ⁽¹⁾
Terminal 1-Lindbergh Departures				
Inner	830'	4	0.70	4 lanes @ 830'
Outer	630'	3	0.15	3 lanes @ 240'
Terminal 1-Lindbergh Arrivals				
Inner ⁽²⁾	700'	5	0.80	5 lanes @ 800'
Terminal 2-Humphrey Single-Level				
Departures	350'	4	0.60	4 lanes @ 155'
Arrivals	350'	4	0.60	4 lanes @ 210'

Notes:

(1) To achieve a v/c ratio of 0.70 or below which provides an acceptable level of service.

(2) Terminal 1-Lindbergh outer arrivals curb is currently utilized as part of the GTC and does not function as a curb roadway.

Source: MAC As-built CAD files and HNTB analysis, 2011.

Table H.4.2.9

No Action Terminal Curb Roadway Requirement

Terminal Curb	Existing Length	Existing Number of Lanes	2020 No Action	2025 No Action
			Requirement ⁽¹⁾	Requirement ⁽¹⁾
Terminal 1-Lindbergh Departures				
Inner	830'	4	4 lanes @ 830'	4 lanes @ 830'
Outer	630'	3	3 lanes @ 330'	3 lanes @ 630'
Terminal 1-Lindbergh Arrivals				
Inner ⁽²⁾	700'	5	5 lanes @ 1,100'	5 lanes @ 1,430'
Terminal 2-Humphrey Single-Level				
Departures	350'	4	4 lanes @ 350'	5 lanes @ 350'
Arrivals	350'	4	4 lanes @ 290'	5 lanes @ 350'

Notes:

(1) To achieve a v/c ratio of 0.70 or below which provides an acceptable level of service.

(2) Terminal 1-Lindbergh outer arrivals curb is currently utilized as part of the GTC and does not function as a curb roadway.

Source: MAC As-built CAD files and HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.2.10

Alternative 1 - Airlines Remain Terminal Curb Roadway Requirement				
Terminal Curb	Existing Length	Existing Number of Lanes	2020	2025
			Alternative 1 - Airlines Remain Requirement⁽¹⁾	Alternative 1 - Airlines Remain Requirement⁽¹⁾
Terminal 1-Lindbergh Departures				
Inner	830'	4	4 lanes @ 850'	4 lanes @ 830'
Outer	630'	3	3 lanes @ 260'	3 lanes @ 430'
Terminal 1-Lindbergh Arrivals				
Inner ⁽²⁾	700'	5	5 lanes @ 1100'	5 lanes @ 1,420'
Terminal 1-Lindbergh International Single-Level ⁽³⁾				
Departures	n.a	n.a	3 lanes @ 210'	3 lanes @ 315'
Arrivals	n.a	n.a	3 lanes @ 120'	3 lanes @ 200'
Terminal 2-Humphrey Single-Level				
Departures	350'	4	4 lanes @ 350'	5 lanes @ 390'
Arrivals	350'	4	4 lanes @ 290'	5 lanes @ 300'

Notes:

n.a. = not applicable

(1) To achieve a v/c ratio of 0.70 or below which provides an acceptable level of service.

(2) Terminal 1-Lindbergh outer arrivals curb is currently utilized as part of the GTC.

(3) The Terminal 1-Lindbergh international curb is a proposed single level curb supporting the proposed International Terminal and FIS facility.

Source: MAC As-built CAD files and HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.2.11

Alternative 2 - Airlines Relocate Terminal Curb Roadway Requirement				
	Existing Length	Existing Number of Lanes	2020	2025
			Alternative 2 - Airlines Relocate Requirement ⁽¹⁾	Alternative 2 - Airlines Relocate Requirement ⁽¹⁾
Terminal 1-Lindbergh Departures				
Inner	830'	4	4 lanes @ 600'	4 lanes @ 650'
Outer	630'	3	3 lanes @ 125'	3 lanes @ 185'
Terminal 1-Lindbergh Arrivals				
Inner ⁽²⁾	700'	5	5 lanes @ 800'	5 lanes @ 870'
Terminal 1-Lindbergh International Single-Level ⁽³⁾				
Departures	n.a	n.a	4 lanes @ 180'	4 lanes @ 205'
Arrivals	n.a	n.a	3 lanes @ 200'	4 lanes @ 250'
Terminal 2-Humphrey Single-Level				
Departures	350'	4	6 lanes @ 900'	6 lanes @ 350'
Arrivals	350'	4	6 lanes @ 470'	6 lanes @ 900'

Notes:

n.a. = not applicable

(1) To achieve a v/c ratio of 0.70 or below which provides an acceptable level of service.

(2) Terminal 1-Lindbergh outer arrivals curb is currently utilized as part of the GTC.

(3) The Terminal 1-Lindbergh international curb is a proposed single level curb supporting the proposed International Terminal and FIS facility.

Source: MAC As-built CAD files and HNTB analysis, 2011.

4.3 Parking Facilities

Parking requirements were calculated based on providing an adequate level of customer ease in finding an available parking space and a reasonable wait time when entering or leaving the facility. The parking facility requirements were developed for general, short-term and employee parking spaces along with entry and exit plaza lane requirements. The calculation of each of these elements is described below.

4.3.1 Parking Stalls

Parking requirements stem from the number of vehicles wishing to park and the duration they park. Requirements are calculated to reflect the provision of an adequate level of customer ease in finding an available parking space. To calculate the required number of spaces, the total passenger demand for each type of parking is divided by an efficiency or search factor, which represents the point at which the lot is deemed essentially full and a new entrant would have difficulty finding an available space. As is common practice in the industry, this factor is assumed to be 0.90 for general parking and 0.85 for short-term parking. This equates to a 90% and 85% maximum occupancy, respectively, which allows vehicles a reasonable search time for an open space during the time the facility is most full.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Although July is the peak month for O&D passenger activity, existing parking data show that the MSP General Parking facility demand peaks in March. March activity reflects Spring Break recreational travel, which may include an increase in international travel. Leisure and international passengers travel for longer periods of time, thus resulting in a lower than normal turnover of parking stalls. This trend has not only been observed by MAC staff, but parking revenue data shows that the number of diversions (patrons who are sent from the Terminal 1-Lindbergh ramps to the Terminal 2-Humphrey ramps to park) in March is dramatically higher than in any other month.

Short-Term Parking at both terminals peaks in coordination with the July O&D passenger peak. Both well-wishers accompanying originating passengers and meeter/greeters picking up terminating passengers contribute to the demand for short-term parking. Meeter/greeters tend to park for longer durations, as they are uncertain about when a flight will arrive.

Vehicular parking duration for General Parking varies between both terminals. Short-Term parking durations are very similar between Terminal 1-Lindbergh and Terminal 2-Humphrey. It was noted that patrons did not always park in the facility priced for the time they spent parked. For purposes of the parking requirements estimation, parking duration data were split between Short-Term and General Parking based on duration. Short-term parking was defined as less than 6 hours and is intended to serve meeter/greeters and well-wishers. Six hours is estimated as the shortest time period that would allow someone to fly to a destination, conduct business and fly back. Anything over six hours was defined as general parking and intended to serve passengers traveling for a day (defined as a minimum of six hours) or longer. Parking duration assumptions are shown in **Table H.4.3.1**.

Table H.4.3.1

Parking Durations Used in Analysis		
<i>Assumed Range of Use</i>	Parking Duration	
	Short-Term Parking	General Parking
	< 6 Hours	≥ 6 Hours
Terminal 1-Lindbergh Average	1.4 Hours	69.9 Hours (2.9 Days)
Terminal 2-Humphrey Average	1.3 Hours	100.5 Hours (4.2 Days)

Source: 2010 MAC Parking Revenue Data and HNTB analysis, 2011.

Parking stall demand values are broken down by three categories: Public General, Public Short-Term, and Employee. These three categories were analyzed individually by alternative. **Table H.4.3.2** shows the existing capacity of MSP's parking facilities as well as current demand values. Terminal 1-Lindbergh currently uses nearly all of its current capacity to park passengers who desire walkable parking. This leaves no room for Terminal 1-Lindbergh employees, who have to park at Terminal 2-Humphrey and take the LRT shuttle to/from their worksite. Even with employees parking at Terminal 2-Humphrey, the terminal's ramps are just over half full.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.3.2

Existing Parking Stall Requirement

Parking Stall	Existing Capacity	2010 Base Case	
		Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Parking Stalls			
<i>Public Short-Term</i>	967	620	347
<i>Public General</i>	11,903	11,420	483
<i>Employee⁽¹⁾</i>	<u>0</u>	<u>0</u>	<u>0</u>
Total Terminal 1-Lindbergh	12,870	12,040	830
Terminal 2-Humphrey Parking Stalls			
<i>Public Short-Term</i>	505	75	430
<i>Public General</i>	8,195	3,450	4,745
<i>Employee⁽²⁾</i>	<u>410</u>	<u>2,100</u>	<u>(1,690)</u>
Total Terminal 2-Humphrey	9,110	5,625	3,485
Total Terminal 1-Lindbergh & Terminal 2-Humphrey	21,980	17,665	4,315

Notes:

- (1) Terminal 1-Lindbergh employees assigned to Terminal 2-Humphrey ramps as Terminal 1-Lindbergh ramps fully utilized by public parking.
- (2) In addition to the 410 employee spaces provided on the mezzanine level of the Purple ramp at Terminal 2-Humphrey, Terminal 1-Lindbergh airport employees currently utilize Terminal 2-Humphrey General Parking stalls.

Source: 2010 MAC Parking Revenue Data and HNTB analysis, 2011.

Table H.4.3.3 to **Table H.4.3.5** show the requirements for the three forecast scenarios out to 2020 and 2025. All three scenarios have parking deficiencies by the planning year 2020. These deficiencies continue to grow into 2025. Analysis of existing conditions at Terminal 1-Lindbergh shows a slight surplus of 483 general parking stalls during the average day of the peak month. However, MAC parking revenue data show that from January through May of 2010, passengers were directed to overflow parking at Terminal 2-Humphrey on eight Wednesdays and one Tuesday. It is acknowledged that as passenger levels increase in 2011, the diversion is becoming more frequent and the projected parking requirement shows a significant deficit at Terminal 1-Lindbergh by 2020.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.3.3

No Action Parking Stall Requirement

Parking Stall	Existing Capacity	2020 No Action		2025 No Action	
		Requirement	Surplus (Deficit)	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Parking Stalls					
Public Short-Term	967	785	182	895	72
<i>Public General</i>	11,903	20,630	(8,727)	23,070	(11,167)
<i>Employee⁽¹⁾</i>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total Terminal 1-Lindbergh	12,870	21,415	(8,545)	23,965	(11,095)
Terminal 2-Humphrey Parking Stalls					
Public Short-Term	505	120	385	165	340
<i>Public General</i>	8,195	5,980	2,215	7,750	445
<i>Employee⁽²⁾</i>	<u>410</u>	<u>2,700</u>	<u>(2,290)</u>	<u>3,020</u>	<u>(2,610)</u>
Total Terminal 2-Humphrey	9,110	8,800	310	10,935	(1,825)
Total Terminal 1-Lindbergh & Terminal 2-Humphrey	21,980	30,215	(8,235)	34,900	(12,920)

Notes:

(1) Terminal 1-Lindbergh employees assigned to Terminal 2-Humphrey ramps as Terminal 1-Lindbergh ramps fully utilized by public parking.

(2) In addition to the 410 employee spaces provided on the mezzanine level of the Purple ramp at Terminal 2-Humphrey, Terminal 1-Lindbergh airport employees currently utilize Terminal 2-Humphrey General Parking stalls.

Source: 2010 MAC Parking Revenue Data and HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.3.4

Alternative 1 - Airlines Remain Parking Stall Requirement

Parking Stall	Existing Capacity	2020 Alternative 1 - Airlines Remain		2025 Alternative 1 - Airlines Remain	
		Requirement	Surplus (Deficit)	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Parking Stalls					
<i>Public Short-Term</i>	967	780	187	885	82
<i>Public General</i>	11,903	20,400	(8,497)	22,805	(10,902)
<i>Employee⁽¹⁾</i>	<u>0</u>	<u>2,300</u>	<u>(2,300)</u>	<u>2,770</u>	<u>(2,770)</u>
Total Terminal 1-Lindbergh	12,870	23,480	(10,610)	26,460	(13,590)
Terminal 2-Humphrey Parking Stalls					
<i>Public Short-Term</i>	505	120	385	160	345
<i>Public General</i>	8,195	6,240	1,955	8,090	105
<i>Employee⁽¹⁾</i>	<u>410</u>	<u>400</u>	<u>10</u>	<u>490</u>	<u>(80)</u>
Total Terminal 2-Humphrey	9,110	6,760	2,350	8,740	370
Total Terminal 1-Lindbergh & Terminal 2-Humphrey	21,980	30,240	(8,260)	35,200	(13,220)

Notes:

(1) Based on direction from MAC, the employee parking requirement was distributed between Terminal 1-Lindbergh and Terminal 2-Humphrey. The number of employees working at each terminal was estimated based on the number of passengers at each terminal.

Source: 2010 MAC Parking Revenue Data and HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.3.5

Alternative 2 - Airlines Relocate Parking Stall Requirement

Parking Stall	Existing Capacity	2020 Alternative 2 - Airlines Relocate		2025 Alternative 2 - Airlines Relocate	
		Requirement	Surplus (Deficit)	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Parking Stalls					
<i>Public Short-Term</i>	967	590	377	660	307
<i>Public General</i>	11,903	14,690	(2,787)	16,460	(4,557)
<i>Employee⁽¹⁾</i>	<u>0</u>	<u>1,500</u>	<u>(1,500)</u>	<u>1,680</u>	<u>(1,680)</u>
Total Terminal 1-Lindbergh	12,870	16,780	(3,910)	18,800	(5,930)
Terminal 2-Humphrey Parking Stalls					
<i>Public Short-Term</i>	505	275	230	335	170
<i>Public General</i>	8,195	11,920	(3,725)	15,670	(7,475)
<i>Employee⁽¹⁾</i>	<u>410</u>	<u>1,200</u>	<u>(790)</u>	<u>1,580</u>	<u>(1,170)</u>
Total Terminal 2-Humphrey	9,110	13,395	(4,285)	17,585	(8,475)
Total Terminal 1-Lindbergh & Terminal 2-Humphrey	21,980	30,175	(8,195)	36,385	(14,405)

Notes:

(1) Based on direction from MAC, the employee parking requirement was distributed between Terminal 1-Lindbergh and Terminal 2-Humphrey. The number of employees working at each terminal was estimated based on the number of passengers at each terminal.

Source: 2010 MAC Parking Revenue Data and HNTB analysis, 2011.

4.3.2 Parking Entrance & Exit Plazas

Parking plaza requirements were established assuming that adequate LOS correlates to a maximum queue of two vehicles in each lane. Processing times (for issuing tickets or reading cards for inbound parkers, and for payment for outbound parkers) used for analysis were identical across all plazas and terminals. These vehicle processing times do vary from parker to parker based on method of payment and type of transaction. Entrance plaza transaction times are similar between the two payment methods (paper ticket and ePark). Exit plaza transaction times vary between the two types of exit lanes. At MSP, eParkers utilize their own lanes, and cashier lanes process all paper tickets and lost tickets. **Table H.4.3.6** depicts the average transaction times assumed during analysis.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.3.6

Entrance and Exit Plaza Processing Times		
Plaza	Processing Time	
	Average Transaction Time Per Vehicle (sec/veh)	Capacity of Lane Per Hour (veh/hr)
<i>Entrance Plaza</i>		
<i>Ticket</i>	15	240
<i>ePark</i>	15	240
<i>Exit Plaza</i>		
<i>Cashier⁽¹⁾</i>	52	70
<i>ePark</i>	26	140

Notes:

(1) Cashier lanes process all tickets and lost tickets. Methods of payment include cash, credit card, check, and IOU.

Source: MAC Inventory Data and HNTB analysis, 2011.

MSP has an adequate number of parking plazas at both terminals for the 2010 vehicle demand. **Table H.4.3.7** shows the existing capacity and requirements of plazas at MSP. Terminal 1-Lindbergh plazas have deficiencies by 2020 for all three forecast scenarios; Terminal 2-Humphrey only has deficiencies in the 2020 Airlines Relocate Alternative forecast scenario. New deficiencies develop between the 2020 and 2025 forecast periods at both terminals. Terminal 1-Lindbergh operates close to or over capacity in all of the future scenarios, whereas Terminal 2-Humphrey operates with excess capacity in both the No Action and the Airlines Remain Alternative forecast scenarios. **Table H.4.3.8** to **Table H.4.3.10** show the facility requirements for plazas in the three forecast scenarios.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.3.7

Existing Parking Plaza Requirement			
Plaza	Existing Capacity	2010 Base Case	
		Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Parking Plazas			
Public Short-Term Entrance Lanes	4	3	1
General/Employee Entrance Lanes	5	5	0
Exit Lanes	18	12	6
Terminal 2-Humphrey Parking Plazas			
Public Short-Term Entrance Lanes	3	2	1
General/Employee Entrance Lanes	6	3	3
Exit Lanes	17	4	13

Source: 2010 MAC Parking Revenue Data and HNTB analysis, 2011.

Table H.4.3.8

No Action Parking Plaza Requirement					
Plaza	Existing Capacity	2020 No Action		2025 No Action	
		Requirement	Surplus (Deficit)	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Parking Plazas					
Public Short-Term Entrance Lanes	4	4	0	5	(1)
General/Employee Entrance Lanes	5	8	(3)	9	(4)
Exit Lanes	18	15	3	17	1
Terminal 2-Humphrey Parking Plazas					
Public Short-Term Entrance Lanes	3	2	1	3	0
General/Employee Entrance Lanes	6	4	2	5	1
Exit Lanes	17	7	10	10	7

Source: 2010 MAC Parking Revenue Data and HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.3.9

Alternative 1 - Airlines Remain Parking Plaza Requirement

Plaza	Existing Capacity	2020 Alternative 1 - Airlines Remain		2025 Alternative 1 - Airlines Remain	
		Requirement	Surplus (Deficit)	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Parking Plazas					
Public Short-Term Entrance Lanes	4	4	0	5	(1)
General/Employee Entrance Lanes	5	8	(3)	9	(4)
Exit Lanes	18	15	3	17	1
Terminal 2-Humphrey Parking Plazas					
Public Short-Term Entrance Lanes	3	2	1	3	0
General/Employee Entrance Lanes	6	3	3	5	1
Exit Lanes	17	8	9	11	6

Source: 2010 MAC Parking Revenue Data and HNTB analysis, 2011.

Table H.4.3.10

Alternative 2 - Airlines Relocate Parking Plaza Requirement

Plaza	Existing Capacity	2020 Alternative 2 - Airlines Relocate		2025 Alternative 2 - Airlines Relocate	
		Requirement	Surplus (Deficit)	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Parking Plazas					
Public Short-Term Entrance Lanes	4	4	0	5	(1)
General/Employee Entrance Lanes	5	6	(1)	7	(2)
Exit Lanes	18	12	6	13	5
Terminal 2-Humphrey Parking Plazas					
Public Short-Term Entrance Lanes	3	3	0	4	(1)
General/Employee Entrance Lanes	6	3	3	5	1
Exit Lanes	17	9	8	12	5

Source: 2010 MAC Parking Revenue Data and HNTB analysis, 2011.

4.4 Rent-a-Car (RAC) Ready/Return Spaces and Quick Turn Around (QTA) Area

RAC facility requirements were established utilizing a targeted ready/return stall turnover rate of three vehicles per day. Rental car companies prefer to turn over their spaces fewer times per day, saving operating costs. Turnover rates vary widely in the industry depending on the number of available ready/return spaces and the diurnal and weekly demand profile for that market and company. Three turns/day is in the middle of the pack, reflecting a balance between overbuilding facilities (turns per day in the 1 – 2 range) and requiring too many turns with their high operating costs (with 4 – 5 turns/day). This analysis also assumed the distribution of space between RAC companies is proportional to the demand, and that reallocation would proceed from time to time according to MAC's agreements with the companies, and thus the analysis was done on the aggregate demand, not by company.

Rental car facilities were determined to peak similar to O&D passenger traffic; thus July transactions were utilized in analysis. Future needs assumed constant Mode Share for rental cars, and were determined based on transaction data gathered and provided by MAC. The average daily transactions for the peak month were doubled to establish a peak daily transaction for the year. Ready/return demand was calculated using the peak daily transaction for each forecast scenario. QTA square footage areas were calculated proportional to ready/return stalls required, based on anecdotal evidence from the MAC and the companies that the QTA was currently right-sized for the total market (Terminal 1-Lindbergh plus Terminal 2-Humphrey).

Terminal 2-Humphrey returned cars are serviced at the QTA unless they require more extensive service than vacuum, fuel and wash. The 2020 No Action scenario assumed that all of the Terminal 2-Humphrey rental car companies either go off-site or to the Terminal 1-Lindbergh QTA for cleaning and fueling, as is done today.

MSP's rental car facilities are right at capacity under existing conditions. **Table H.4.4.1** shows the existing rental car facility capacity. **Table H.4.4.2** to **Table H.4.4.4** show the demand requirements of the three forecast scenarios. Under all future scenarios rental car facilities are deficient by 2020 and continue to deteriorate by 2025.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.4.1

Existing Rental Car Facility Requirement

Facility	Existing Capacity	2010 Base Case	
		Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Ready Return Stalls	1,725	1,691	34
Terminal 1-Lindbergh QTA (sq. ft.)	302,050	302,050 ⁽¹⁾	-
Terminal 2-Humphrey Ready Return Stalls	145	142	3

Notes:

(1) Current QTA assessed as being right-sized based on anecdotal information from MAC and rental car companies. Terminal 1-Lindbergh QTA currently serves both Terminal 1-Lindbergh and Terminal 2-Humphrey rental car vehicles.

Source: 2010 MAC Rental Car Transaction Data and HNTB analysis, 2011.

Table H.4.4.2

No Action Rental Car Facility Requirement

Facility	Existing Capacity	2020 No Action		2025 No Action	
		Requirement	Surplus (Deficit)	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Ready Return Stalls	1,725	1,880	(155)	2,200	(475)
Terminal 1-Lindbergh QTA (sq. ft.)	302,050	383,900	(81,850)	470,000	(167,950)
Terminal 2-Humphrey Ready Return Stalls	145	495	(350)	710	(565)

Source: 2010 MAC Rental Car Transaction Data and HNTB analysis, 2011.

Table H.4.4.3

Alternative 1 - Airlines Remain Rental Car Facility Requirement

Facility	Existing Capacity	2020 Alternative 1 - Airlines Remain		2025 Alternative 1 - Airlines Remain	
		Requirement	Surplus (Deficit)	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Ready Return Stalls	1,725	1,860	(135)	2,175	(450)
Terminal 1-Lindbergh QTA (sq. ft.)	302,050	300,600	(1,450)	350,800	(48,750)
Terminal 2-Humphrey Ready Return Stalls	145	515	(370)	740	(595)
Terminal 2-Humphrey QTA (sq. ft.)	0	83,300	(83,300)	119,200	(119,200)

Source: 2010 MAC Rental Car Transaction Data and HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.4.4

Alternative 2 - Airlines Relocate Rental Car Facility Requirement

Facility	Existing Capacity	2020 Alternative 2 - Airlines Relocate		2025 Alternative 2 - Airlines Relocate	
		Requirement	Surplus (Deficit)	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Ready Return Stalls	1,725	1,355	370	1,560	165
Terminal 1-Lindbergh QTA (sq. ft.)	302,050	219,200	82,850	256,000	46,050
Terminal 2-Humphrey Ready Return Stalls	145	1,020	(875)	1,300	(1,155)
Terminal 2-Humphrey QTA (sq. ft.)	0	164,700	(164,700)	214,000	(214,000)

Source: 2010 MAC Rental Car Transaction Data and HNTB analysis, 2011.

4.5 Ground Transportation

The ground transportation facilities were analyzed as a compilation of requirements by the different vehicle classes which used the area. **Table H.4.5.1** shows dwell time and vehicle classifications by location.

Table H.4.5.1

	Dwell Time Duration (minutes)	
	Terminal 1-Lindbergh	Terminal 2-Humphrey
GTC		
<i>Taxis</i>	4.5	7
<i>Limos</i>	15	15
<i>Hotel Vans/Shuttles</i>	3	4.5
<i>Shared Ride Vans</i>	5	5
<i>Off-Airport Parking Shuttles</i>	5	2
Ground Transit Center		
<i>Transit Bus</i>	1	-
<i>Chartered Shuttle Bus</i>	4.5	4.5
<i>Employee Shuttle Bus</i>	4.5	4.5

Source: HNTB analysis, 2011.

Also accessed through the Ground Transit Center is the light rail transit (LRT) station. No analysis of the LRT schedule, capacity or demand was included in this analysis.

4.5.1 Ground Transportation Center (GTC)

The GTCs chiefly serve as loading locations for commercial vehicles, in lieu of an assigned curb location. MSP pioneered the GTC concept, which provides for an enclosed passenger waiting area and pull-through stalls for the vehicles. The stall can also serve as a brief holding area for the CVs, though that is not their primary purpose.

The requirements are estimated similar to a parking facility. Peak hour demand for the collective fleet of CVs was estimated and factored by the duration of their stay or dwell time (see Table H.4.5.1) to estimate the number of stalls required in the peak hour of the average day peak month. MSP's GTC is right at capacity with a slight surplus of 1 and 3 spaces, at Terminal 1-Lindbergh and Terminal 2-Humphrey, respectively, under existing conditions (see **Table H.4.5.2**). As shown in **Table H.4.5.3** through **Table H.4.5.5**, in all future scenarios, the requirement would exceed supply in 2020, and continue to deteriorate by 2025.

Table H.4.5.2

Existing GTC Requirement			
GTC	Existing Capacity	2010 Base Case	
		Requirement	Surplus (Deficit)
Terminal 1-Lindbergh GTC	48	47	1
Terminal 2-Humphrey GTC	15	12	3

Source: MAC As-built CAD files and HNTB analysis, 2011.

Table H.4.5.3

No Action GTC Requirement					
GTC	Existing Capacity	2020 No Action		2025 No Action	
		Requirement	Surplus (Deficit)	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh GTC	48	61	(13)	70	(22)
Terminal 2-Humphrey GTC	15	16	(1)	19	(4)

Source: MAC As-built CAD files and HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.4.5.4

Alternative 1 - Airlines Remain GTC Requirement

GTC	Existing Capacity	2020 Alternative 1 - Airlines Remain		2025 Alternative 1 - Airlines Remain	
		Requirement	Surplus (Deficit)	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh GTC	48	61	(13)	68	(20)
Terminal 2-Humphrey GTC	15	18	(3)	22	(7)

Source: MAC As-built CAD files and HNTB analysis, 2011.

Table H.4.5.5

Alternative 2 - Airlines Relocate GTC Requirement

GTC	Existing Capacity	2020 Alternative 2 - Airlines Relocate		2025 Alternative 2 - Airlines Relocate	
		Requirement	Surplus (Deficit)	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh GTC	48	54	(6)	59	(11)
Terminal 2-Humphrey GTC	15	25	(10)	31	(16)

Source: MAC As-built CAD files and HNTB analysis, 2011.

4.5.2 Transit Center

The Transit Centers at both terminals did not show significant growth through the three forecast scenarios. Because no growth is expected and the facilities are both operating below capacity, no modifications are warranted through the planning period.

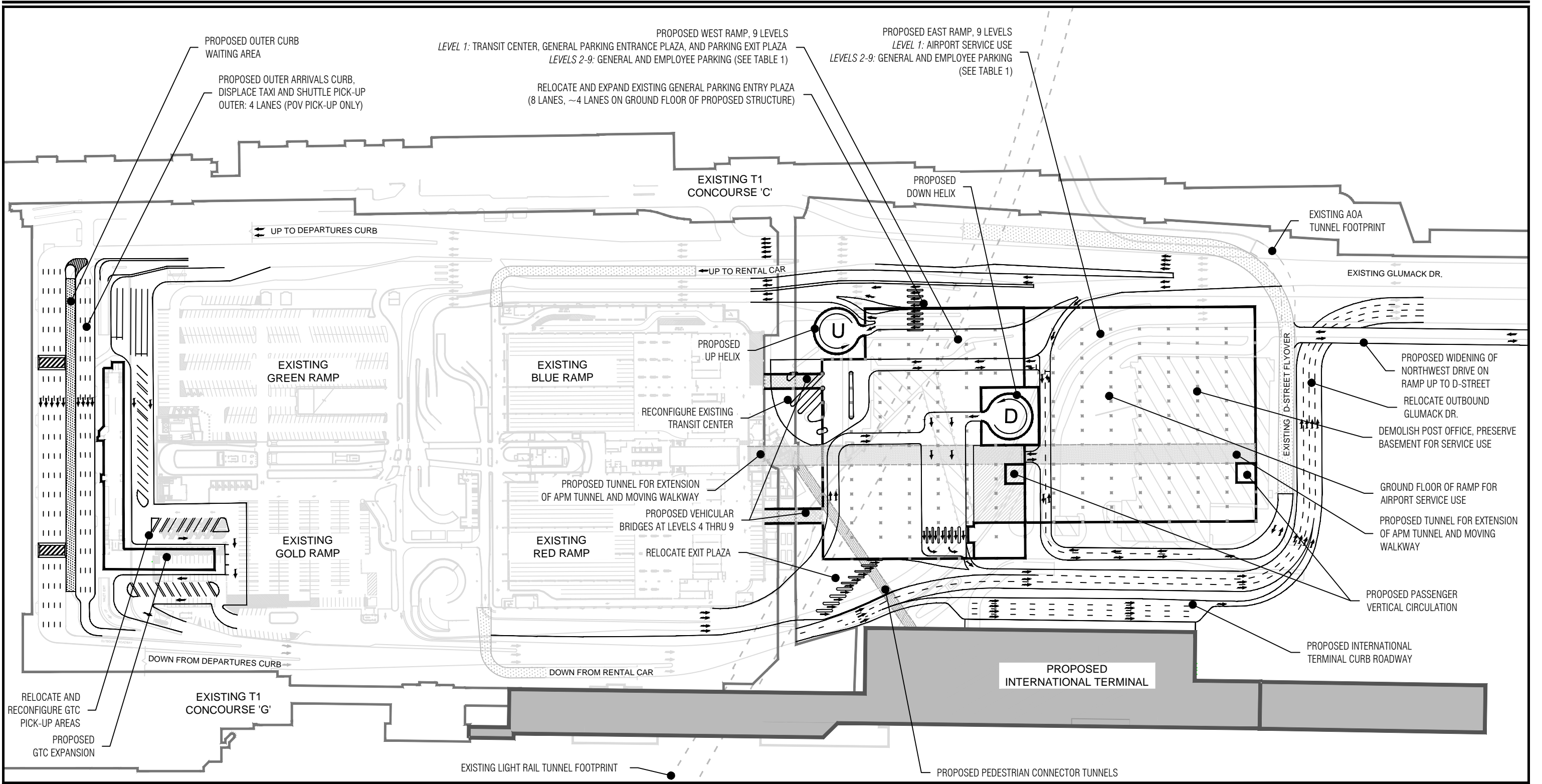
5 Future Alternative Concepts

The landside facility requirements presented in Section 4 served as a basis for development of the 2020 landside concepts. The concepts were prepared to accommodate passenger growth through 2020 and meet requirements associated with the passenger forecast and terminal alternative. The facility operation through 2025 is shown for informational purposes to assess how the facilities will continue to function beyond 2020, as these facilities have a useful life far exceeding the year 2020. Landside concepts for both Terminal 1-Lindbergh and Terminal 2-Humphrey were developed to match the terminal concepts under each Alternative as described in the sections below.

5.1 Airlines Remain Alternative

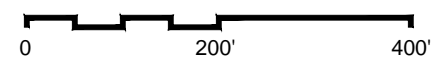
Under the Airlines Remain Alternative, the majority of airport passenger activity remains at Terminal 1-Lindbergh and demand for most landside facilities exceeds capacity by 2020. As shown on **Figure H.5-1**, to accommodate the forecast demand through 2020, two new interconnected, nine-level parking ramps with approximately 10,000 new stalls are proposed east of the existing ramps. The ramps will be connected to the Red and Blue ramps on levels four through nine and a new helix will be provided between the new ramps. The ground floor of the proposed western ramp will also include a relocated parking operations center.

As shown in **Table H.5.1.1**, these ramps would meet passenger parking requirements and 80% of the Terminal 1-Lindbergh employee parking requirements through 2020 with the Terminal 2-Humphrey ramps accommodating the remaining 20% of Terminal 1-Lindbergh employee demand. After 2020, employees would need to find parking at an alternative location to ensure passenger demand for walkable parking could be met at Terminal 1-Lindbergh.



LEGEND

Alternative 1 - Airlines Remain Terminal 1-Lindbergh: 2020 Overall Landside Concept



Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



J:\Jobs\44692 MAC Planning Consultant\PL_034 - MSP 2020 Improvements EA\TechProd\Work\CADD\Side\Landside Concepts\Final Concepts_111411\T1 Concept 121911_Alt 1.dwg 12/20/2011 7:11:33 PM

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.5.1.1

Alternative 1 - Airlines Remain Parking Capacity

	Existing Capacity	2020 Alternative 1 – Airlines Remain			2025 Alternative 1 – Airlines Remain		
		Proposed Capacity	Requirement	Surplus (Deficit)	Proposed Capacity	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Parking Stalls							
<i>Public Short-Term</i>	967	780	780	0	885	885	0
<i>Public General</i>	11,903	20,400	20,400	0	21,975	22,805	(830)
<i>Employee⁽¹⁾</i>	0	<u>1,680</u>	<u>1,680⁽²⁾</u>	0	0	<u>1,880⁽²⁾</u>	<u>(1,880)</u>
Total Terminal 1-Lindbergh	12,870	22,860	22,860	0	22,860	25,570	(2,710)
Terminal 2-Humphrey Parking Stalls							
<i>Public Short-Term</i>	505	505	120	385	505	160	345
<i>Public General</i>	8,195	8,195	6,240	1,955	8,195	8,090	105
<i>Employee⁽¹⁾</i>	<u>410</u>	<u>410</u>	<u>1,020⁽³⁾</u>	<u>(610)</u>	<u>410</u>	<u>1,380⁽³⁾</u>	<u>(970)</u>
Total Terminal 2-Humphrey	9,110	9,110	7,380	1,730	9,110	9,630	(520)
Total Terminal 1-Lindbergh & Terminal 2 Humphrey	21,980	31,970	30,240	1,730	31,970	35,200	(3,230)

Notes:

- (1) Based on direction from MAC, employee parking was distributed between Terminal 1-Lindbergh and Terminal 2-Humphrey based on passenger levels; however under Alternative 1 due to capacity issues at Terminal 1-Lindbergh an additional 27% of employees were assumed to remain at Terminal 2-Humphrey utilizing excess capacity at Terminal 2-Humphrey.
- (2) It is assumed that Terminal 1-Lindbergh employees will be accommodated within the Terminal 1-Lindbergh parking ramps until public parking requirements meet or exceed the available supply at which point it is assumed that employees would be relocated to another location.
- (3) It is assumed that in addition to the 410 employee spaces provided on the mezzanine level of the Purple ramp, airport employees will continue to utilize excess capacity within the Terminal 2-Humphrey General Parking area. Once public parking requirements meet or exceed the available supply it is assumed that employees would be relocated to another location.

Source: HNTB analysis and concepts, 2011.

In order to construct the parking ramps, outbound Glumack Drive will be relocated around the parking structure and the main structure of the US Postal Service (USPS) facility will be demolished. However, the below-grade sorting level of the USPS facility with access to the Airport Operations Area (AOA) tunnel will be maintained and/or reconstructed. Access to this facility will be down from the ground floor of the proposed east ramp. Northwest Drive would be widened to two-way traffic and tied into the D-Street flyover by ramping over the relocated Glumack Drive. No additional lanes would be required on outbound Glumack Drive.

In the Airlines Remain Alternative, inbound Glumack Drive remains on its existing alignment and no new lanes would be required. The General Parking entrance plaza would be relocated east of its existing location and expanded by three lanes to provide a total of 8 lanes. The parking

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

exit plaza would be relocated to accommodate the proposed parking ramps. See **Table H.5.1.2** for a summary of the proposed parking entry and exit capacities. In addition, the transit center located east of the existing garages would be reconfigured to make room for the proposed parking structure. The Automatic People Mover (APM) tunnel would be extended under both of the proposed ramps, and vertical circulation would provide additional mobility. The ePark Elite parking lot would be relocated within the Gold and Green ramps.

Table H.5.1.2

Alternative 1 - Airlines Remain Parking Plaza Capacity

	Existing Capacity	2020 Alternative 1 – Airlines Remain			2025 Alternative 1 – Airlines Remain		
		Proposed Capacity	Requirement	Surplus (Deficit)	Proposed Capacity	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Parking Plazas							
Total Public Short-Term Entrance Lanes	4	4	4	0	4	5	(1)
Total General/Employee Entrance Lanes	5	8	8	0	8	9	(1)
Total Exit Lanes	18	16	15	1	16	17	(1)
Terminal 2-Humphrey Parking Plazas							
Total Public Short-Term Entrance Lanes	3	3	2	1	3	3	0
Total General/Employee Entrance Lanes	6	6	3	3	6	4	2
Total Exit Lanes	17	17	8	9	17	11	6

Source: 2010 MAC Parking Revenue Data and HNTB analysis, 2011.

With active curbside management maintaining dwell times no higher than current levels and directing peak-hour traffic between the inner and outer curbs, the departures curb roadway would operate adequately through 2020. In order to accommodate future demand on the arrivals curb roadway, the taxi and hotel shuttle pick-up area for the GTC would be converted to an outer curb for POV use with a new island between the inner and outer roadways to allow passenger loading on the right side of the vehicles. The curbside capacity is summarized in **Table H.5.1.3**. The taxis and commercial vehicles which currently pick up in that area would be relocated within an expanded GTC. As shown in **Table H.5.1.4**. The GTC would provide 13 additional spaces for a total of 61 spaces, meeting requirements through 2020.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.5.1.3

Alternative 1 - Airlines Remain Terminal Curb Roadway Capacity

	2020 Alternative 1 - Airlines Remain			2025 Alternative 1 - Airlines Remain		
	Length	Lanes	v/c ratio ⁽¹⁾	Length	Lanes	v/c ratio ⁽¹⁾
<i>Terminal 1-Lindbergh Departures</i>						
<i>Inner</i>	830	4	0.70	830	4	0.70
<i>Outer</i>	630	3	0.25	630	3	0.30
<i>Terminal 1-Lindbergh Arrivals</i>						
<i>Inner</i>	700	5	0.69	700	5	0.69
<i>Outer⁽²⁾</i>	700	4	0.29	700	4	0.44
<i>Terminal 1-Lindbergh International Single-Level⁽³⁾</i>						
<i>Departures</i>	300	4	0.70	300	4	0.73
<i>Arrivals</i>	200	4	0.67	200	4	0.70
Total	500	4	n.a.	500	4	n.a.
<i>Terminal 2-Humphrey Combined</i>						
<i>Departures</i>	350	5	0.70	350	5	0.76
<i>Arrivals</i>	350	5	0.50	350	5	0.61
Total	700	5	n.a.	700	5	n.a.

Notes:

n.a. = not applicable

(1) A v/c ratio of 0.70 or below is considered an acceptable level of service.

(2) Terminal 1-Lindbergh outer arrivals curb is currently utilized as part of the GTC, but is proposed to be converted to use by privately operated vehicles.

(3) The Terminal 1-Lindbergh international curb is a proposed single level curb supporting the proposed International Terminal and FIS facility.

Source: MAC As-built CAD files and HNTB analysis, 2011.

Table H.5.1.4

Alternative 1 - Airlines Remain GTC Capacity

	Existing Capacity	2020 Alternative 1 – Airlines Remain			2025 Alternative 1 – Airlines Remain		
		Proposed Capacity	Requirement	Surplus (Deficit)	Proposed Capacity	Requirement	Surplus (Deficit)
Total Terminal 1- Lindbergh GTC Spaces	48	61	61	0	61	68	(7)
Total Terminal 2- Humphrey GTC Spaces	15	15	18	(3)	15	22	(7)

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

The proposed international terminal would be supported by a 500-foot, four-lane, single-level departures and arrivals curb roadway. This curb roadway would be accessed from Glumack Drive immediately after the Concourse C and G pedestrian connector. The single-level terminal curb roadway merges back with Glumack Drive on the east side of the proposed parking structures.

The roadways at both Terminal 1-Lindbergh and Terminal 2-Humphrey are sized to provide an adequate LOS D or better through 2020. However as shown in **Table H.5.1.5** and **Table H.5.1.6**, by 2025 the outbound roadway at Terminal 1-Lindbergh would provide an inadequate LOS F similar to the No Action Alternative. All other roadways would continue to provide an adequate LOS through 2025 at both terminals.

At Terminal 2-Humphrey, the landside facilities are sufficient to meet requirements through 2020. Capacities are summarized in Table H.5.1.1 through **Table H.5.1.7**. However, the intersection of East 70th Street/34th Avenue South/Humphrey Drive would be reconfigured to accommodate traffic demand. This modification is needed due to an increase in traffic expected to utilize the reconfigured Post Road and TH 5 Interchange. The limited RAC activity at Terminal 2-Humphrey in this Alternative would not justify a QTA facility at Terminal 2-Humphrey, and all RAC vehicles returned at Terminal 2-Humphrey would be cleaned and refueled at the Terminal 1-Lindbergh QTA. Proposed rental car capacities for Terminal 1-Lindbergh and Terminal 2-Humphrey under the Airlines Remain Alternative are summarized in Table H.5.1.6. The configuration is shown in **Figure H.5-2**.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.5.1.5

Summary of 2020 Alternative 1 - Airlines Remain Terminal Access Roadway Operations

2020 Alternative 1 - Airlines Remain	Operational Measures of Effectiveness					
Location	No. of Lanes	Demand (veh/hr)	Density (pc/l/mi)	Speed (mph)	Delay* (sec/veh)	LOS**
Terminal 1-Lindbergh Overall Peak Hour (3-4PM)						
<i>Inbound Road (Glumack Drive)</i>						
<i>Return-to-Terminal Roadway To Parking Entrance</i>	4/5	3278	27.0	28.8	-	B
<i>Parking Entrance to Rental Car Entrance</i>	4/5	2651	20.4	31.3	-	B
<i>Rental Car Entrance to Curbside Entrance (diverge)</i>	3/4	2114	21.9	27.3	-	B
<i>Outbound Road (Glumack Drive)</i>						
<i>Curbside Exit (diverge) to Employee Exit/Turn Around</i>	2/3	2114	29.8	28.0	-	D
<i>Turn Around to Rental Car Exit</i>	2/3	2142	30.2	26.6	-	D
<i>Rental Car Exit to International Terminal (diverge)</i>	2	2560	44.4	27.9	-	D
<i>Service Road to Parking Exit</i>	2	2331	35.7	29.9	-	D
<i>Parking/Employee Exit to International Terminal (merge)</i>	3	3367	46.9	22.5	-	D
<i>International Terminal (merge) to Return-to-Terminal Roadway</i>	4	3594	35.1	25.6	-	D
Terminal 2- Humphrey Overall Peak Hour (3-4PM)						
<i>Inbound Road (Humphrey Drive)</i>						
<i>34th Ave between 72nd St and 70th St (Weaving Segment)</i>	3	1248	12.9	32.3	-	A
<i>From 34th Ave to 70th St (prior to traffic signal)</i>	3	866	-	-	6.2	A
<i>From 70th St to Humphrey Dr (prior to traffic signal)</i>	2	284	-	-	20.2	A
<i>From 70th St to Parking Entrance</i>	3	108	1.6	23.8	-	A
<i>From 70th St/Humphrey Dr. to just before Curbs</i>	2/3	1042	12.8	26.5	-	A
<i>Outbound Road (Humphrey Drive)</i>						
<i>From Rental/Employee/GTC Exit to 34th Ave N/S diverge</i>	3	1072	10.4	32.3	-	A
<i>From Parking Exit to 34th Ave S (prior to traffic signal)</i>	2	133	-	-	25.5	B
<i>From Humphrey Dr to 34th Ave S</i>	1	730	24.4	29.4	-	B
<i>From Humphrey Dr to 34th Ave N (prior to traffic signal)</i>	2	287	-	-	16.3	A

Notes:

*: Applicable only for signalized intersections.

** : LOS for roadway segments based on ACRP Report 40 and HCM 2010 using Density; LOS for signalized intersections based on HCM 2010 using Delay.

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.5.1.6

Summary of 2025 Alternative 1 - Airlines Remain Terminal Access Roadway Operations

2025 Alternative 1 - Airlines Remain	Operational Measures of Effectiveness					
Location	No. of Lanes	Demand (veh/hr)	Density (pc/ln/mi)	Speed (mph)	Delay* (sec/veh)	LOS**
Terminal 1- Lindbergh Overall Peak Hour (4-5PM)						
<i>Inbound Road (Glumack Drive)</i>						
<i>Return-to-Terminal Roadway To Parking Entrance</i>	4/5	4086	35.7	27.7	-	D
<i>Parking Entrance to Rental Car Entrance</i>	4/5	3299	26.1	30.5	-	D
<i>Rental Car Entrance to Curbside Entrance (diverge)</i>	3/4	2729	30.5	25.0	-	D
<i>Outbound Road (Glumack Drive)</i>						
<i>Curbside Exit (diverge) to Employee Exit/Turn Around</i>	2/3	2729	43.4	24.0	-	F
<i>Turn Around to Rental Car Exit</i>	2/3	2761	44.9	22.1	-	F
<i>Rental Car Exit to International Terminal (diverge)</i>	2	3366	56.0	25.7	-	F
<i>Int'l Terminal Entrance to Parking Exit (diverge)</i>	2	3103	53.5	25.6	-	F
<i>Parking/Employee Exit to International Terminal (merge)</i>	3	4364	67.1	20.1	-	F
<i>International Terminal (merge) to Return-to-Terminal Roadway</i>	4	4631	51.2	21.4	-	F
Terminal 2- Humphrey Overall Peak Hour (5-6PM)						
<i>Inbound Road (Humphrey Drive)</i>						
<i>34th Ave between 72nd St and 70th St (Weaving Segment)</i>	3	1772	23.2	27.4	-	B
<i>From 34th Ave to 70th St (prior to traffic signal)</i>	3	1209	-	-	41.0	C
<i>From 70th St to Humphrey Dr (prior to traffic signal)</i>	2	434	-	-	23.3	B
<i>From 70th St to Parking Entrance</i>	3	143	2.5	26.2	-	A
<i>From 70th St/Humphrey Dr. to just before Curbs</i>	2/3	1474	20.0	24.9	-	B
<i>Outbound Road (Humphrey Drive)</i>						
<i>From Rental/Employee/GTC Exit to 34th Ave N/S diverge</i>	3	1504	14.8	30.9	-	A
<i>From Parking Exit to 34th Ave S (prior to traffic signal)</i>	2	182	-	-	32	B
<i>From Humphrey Dr to 34th Ave S</i>	1	1042	35.5	28.6	-	D
<i>From Humphrey Dr to 34th Ave N (prior to traffic signal)</i>	2	462	-	-	23.4	A

Notes:

*: Applicable only for signalized intersections.

** : LOS for roadway segments based on ACRP Report 40 and HCM 2010 using Density; LOS for signalized intersections based on HCM 2010 using Delay.

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.5.1.7

Alternative 1 - Airlines Remain Rental Car Facility Capacity

	Existing Capacity	2020 Alternative 1 – Airlines Remain			2025 Alternative 1 – Airlines Remain		
		Proposed Capacity	Requirement	Surplus (Deficit)	Proposed Capacity	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Ready Return Stalls ⁽¹⁾	1,725	1,860	1,860	0	1,860	2,175	(315)
Terminal 1-Lindbergh QTA (sq. ft.) ⁽²⁾	302,050	302,050	383,900	(81,850)	302,050	470,000	(167,950)
Terminal 2-Humphrey Ready Return Stalls	145	145	515	(370)	145	740	(595)

Notes:

- (1) It is assumed that the rental car area at Terminal 1-Lindbergh will be reconfigured to accommodate the increased rental car demand in 2020 without requiring the construction of additional spaces.
- (2) In Alternative 1-Airlines Remain the Terminal 1-Lindbergh QTA would serve both Terminal 1-Lindbergh and Terminal 2-Humphrey rental car vehicles, as the demand at Terminal 2-Humphrey is not great enough to support an independent QTA facility.

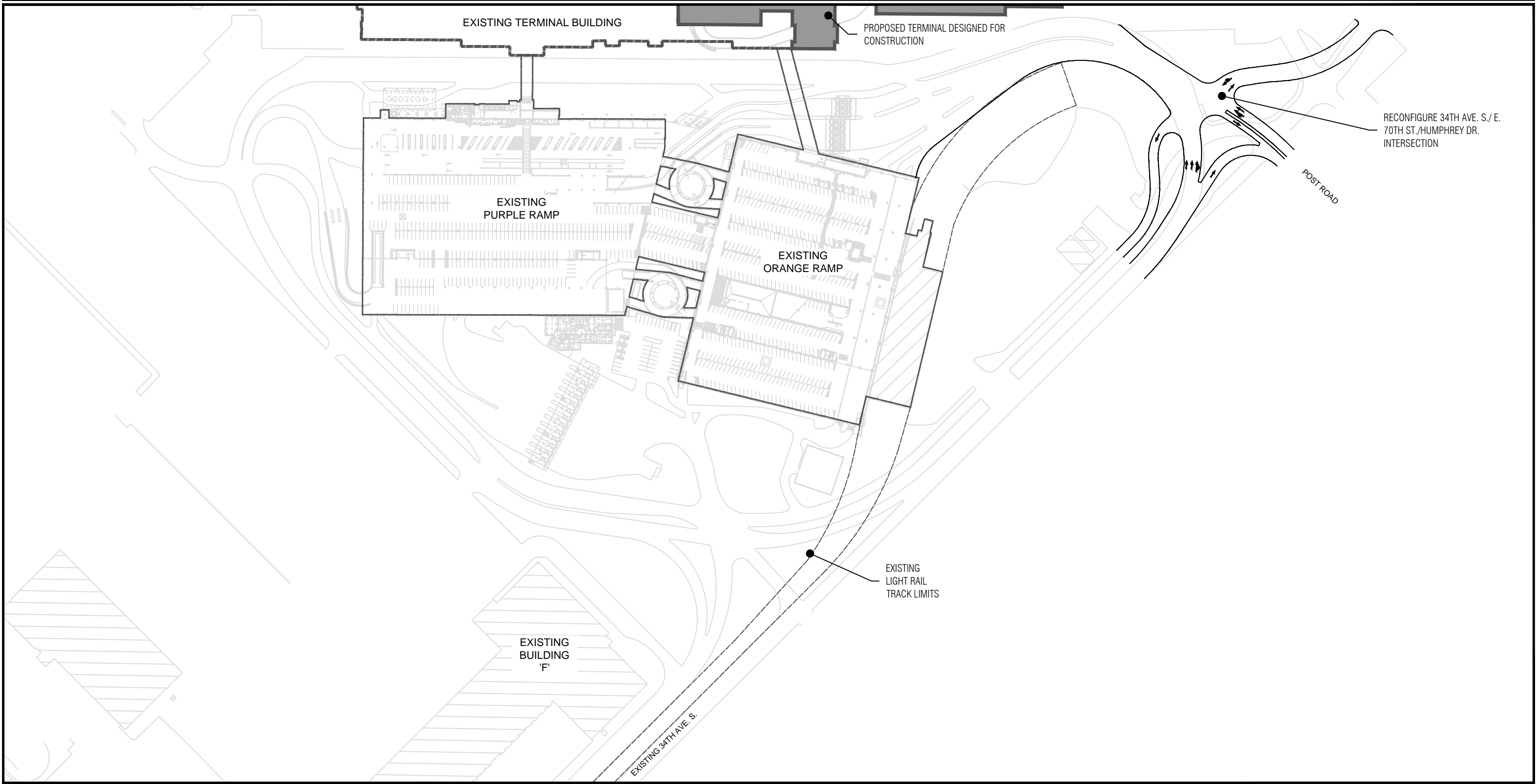
Source: 2010 MAC Rental Car Transaction Data and HNTB analysis, 2011.

5.2 Airlines Relocate Alternative

Under the Airlines Relocate Alternative, Delta Airlines and its Sky Team partners would remain at Terminal 1-Lindbergh and all other airlines relocate to Terminal 2-Humphrey, more nearly balancing passenger demand between the two terminals. This alternative requires more extensive facility development at Terminal 2-Humphrey, but nonetheless still requires additional landside facilities at Terminal 1-Lindbergh to meet requirements.

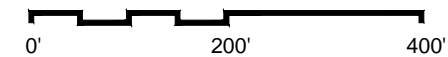
To meet requirements at Terminal 1-Lindbergh, as shown on **Figure H.5-3**, a new nine-level parking ramp with approximately 5,000 new stalls is proposed east of the existing ramps. The new ramp will be connected to the Red and Blue ramps on levels four through nine and a new helix will be provided. The ground floor of the new ramp will also include a relocated parking operations center.

As shown in **Table H.5.2.1**, this ramp would meet parking requirements for passengers using and employees working at Terminal 1-Lindbergh through 2020. By 2025 only approximately 25 percent of the Terminal 1-Lindbergh employee parking demand could be accommodated in the Terminal 1-Lindbergh ramps. The remainder would need to be provided at an alternative location to ensure passenger demand for walkable parking could be met within the ramps.



LEGEND

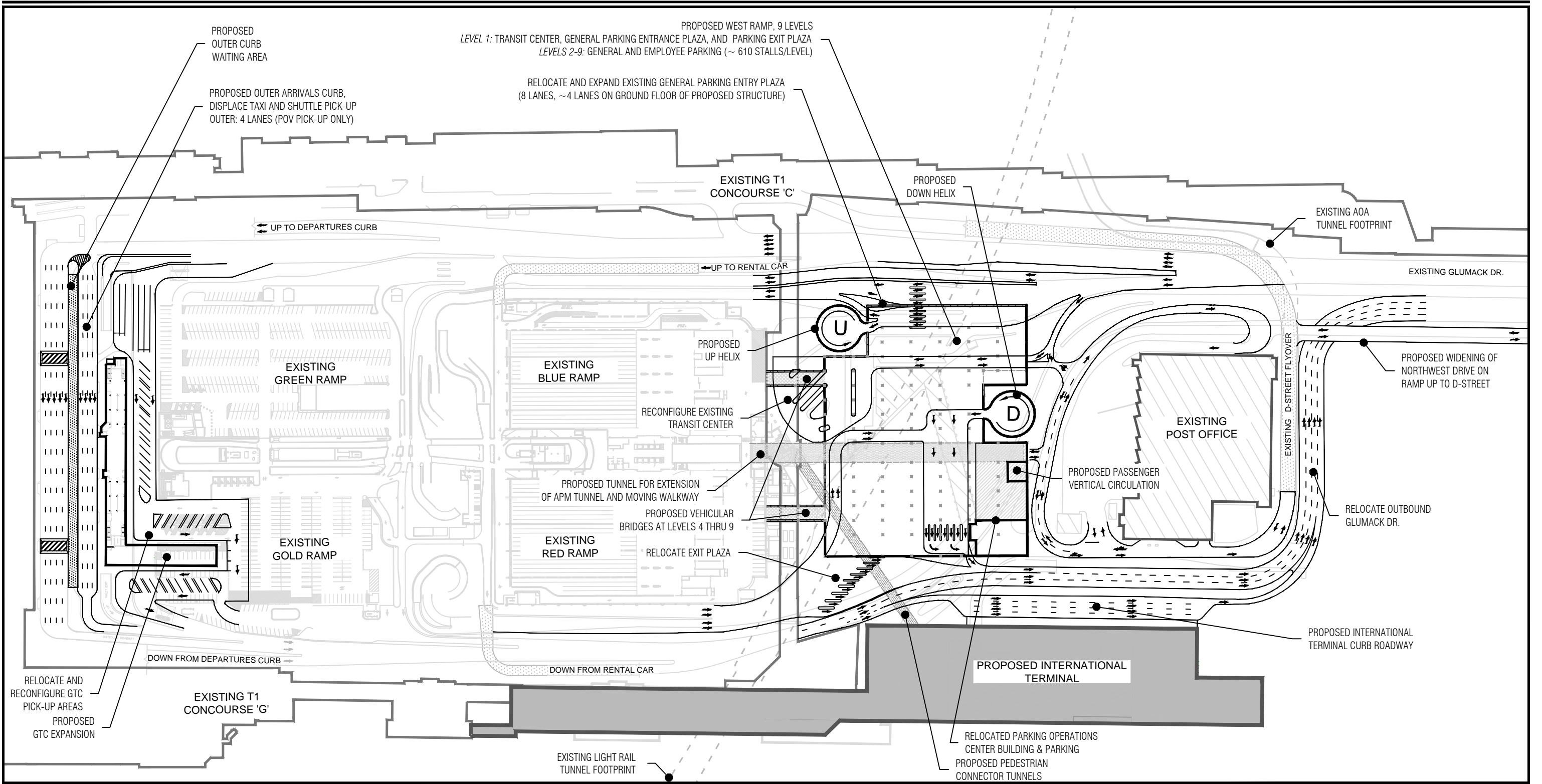
Alternative 1 - Airlines Remain Terminal 2-Humphrey: 2020 Overall Landside Concept



Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.





LEGEND

Alternative 2 - Airlines Relocate Terminal 1-Lindbergh: 2020 Overall Landside Concept



Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



J:\Jobs\44692 MAC Planning Consultant\PL_034 - MSP 2020 Improvements EA\TechProd\Work\CADD\Side\Landside Concepts\Final Concepts_111411\T1 Concept 121911_(Alt 2).dwg
 12/20/2011 7:10:53 PM

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.5.2.1

Alternative 2 - Airlines Relocate Parking Capacity

Parking Stall	Existing Capacity	2020			2025		
		Alternative 2 - Airlines Relocate			Alternative 2 - Airlines Relocate		
		Proposed Capacity	Requirement	Surplus (Deficit)	Proposed Capacity	Requirement	Surplus (Deficit)
Terminal 1- Lindbergh Parking Stalls							
<i>Public Short-Term</i>	967	756	590	166	756	660	96
<i>Public General</i>	11,903	15,304	14,690	614	16,460	16,460	0
<i>Employee⁽¹⁾</i>	<u>0</u>	<u>1,500</u>	<u>1,500⁽²⁾</u>	<u>0</u>	<u>344</u>	<u>1,680⁽²⁾</u>	<u>(1,336)</u>
Total Terminal 1- Lindbergh	12,870	17,560	16,780	780	17,560	18,800	(1,240)
Terminal 2- Humphrey Parking Stalls							
<i>Public Short-Term</i>	505	505	275	230	505	335	170
<i>Public General</i>	8,195	13,430	11,920	1,510	14,630	15,670	(1,040)
<i>Employee⁽¹⁾</i>	<u>410</u>	<u>1,200</u>	<u>1,200⁽³⁾</u>	<u>0</u>	<u>0</u>	<u>1,580⁽³⁾</u>	<u>(1,580)</u>
Total Terminal 2- Humphrey	9,110	15,135	13,395	1,740	15,135	17,585	(2,450)
Total Terminal 1- Lindbergh & Terminal 2- Humphrey	21,980	32,695	30,175	2,520	32,695	36,385	(3,690)

Notes:

- (1) Based on direction from MAC employee parking was distributed between Terminal 1-Lindbergh and Terminal 2-Humphrey based on passenger levels.
- (2) It is assumed that Terminal 1-Lindbergh employees will be accommodated within the Terminal 1-Lindbergh parking ramps until public parking requirements meet or exceed the available supply at which point it is assumed that employees would be relocated to another location.
- (3) It is assumed that Terminal 2-Humphrey employees will continue to be accommodated within the Terminal 2-Humphrey parking ramps until public parking requirements meet or exceed the available supply at which point it is assumed that employees would be relocated to another location.

Source: Other tables and HNTB analysis and concepts, 2011.

In order to construct the new ramp, outbound Glumack Drive would be relocated around the parking structure and USPS facility. The USPS facility would be maintained in its existing location. Northwest Drive would be widened to two-way traffic and tied into the D-Street flyover by ramping over the relocated Glumack Drive. No additional lanes would be required on outbound Glumack Drive. The operations of the terminal access roadways are shown in **Table H.5.2.2** and **Table H.5.2.3**. As shown, all roadways are forecast to operate at an acceptable LOS D or better through 2025.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.5.2.2

Summary of 2020 Alternative 2 - Airlines Relocate Terminal Access Roadway Operations

2020 Alternative 2 - Airlines Relocate	Operational Measures of Effectiveness					LOS**
Location	No. of Lanes	Demand (veh/hr)	Density (pc/ln/mi)	Speed (mph)	Delay* (sec/veh)	
Terminal 1-Lindbergh Overall Peak Hour (1-2PM)						
<i>Inbound Road (Glumack Drive)</i>						
<i>Return-to-Terminal Roadway To Parking Entrance</i>	4/5	2414	18.8	30.4	-	A
<i>Parking Entrance to Rental Car Entrance</i>	4/5	1776	13.4	32.0	-	A
<i>Rental Car Entrance to Curbside Entrance (diverge)</i>	3/4	1455	14.3	28.9	-	A
<i>Outbound Road (Glumack Drive)</i>						
<i>Curbside Exit (diverge) to Employee Exit/Turn Around</i>	2/3	1455	19.8	29.8	-	B
<i>Turn Around to Rental Car Exit</i>	2/3	1473	19.9	28.6	-	B
<i>Rental Car Exit to International Terminal (diverge)</i>	2	1714	29.3	28.6	-	B
<i>Service Road to Parking Exit</i>	2	1383	19.9	30.8	-	B
<i>Parking/Employee Exit to International Terminal (merge)</i>	3	1927	25.3	23.2	-	B
<i>International Terminal (merge) to Return-to-Terminal Roadway</i>	4	2257	20.6	27.1	-	B
Terminal 2-Humphrey Overall Peak Hour (3-4PM)						
<i>Inbound Road (Humphrey Drive)</i>						
<i>34th Ave between 72nd St and 70th St (Weaving Segment)</i>	3	2148	26.2	27.1	-	A
<i>From 34th Ave to 70th St (prior to traffic signal)</i>	3	1548	-	-	4.3	A
<i>From 70th St to Humphrey Dr (prior to traffic signal)</i>	2	494	-	-	7.4	A
<i>From 70th St to Parking Entrance</i>	3	825	16.2	24.8	-	A
<i>From 70th St/Humphrey Dr. to just before Curbs</i>	2/3	1219	11.7	29.1	-	A
<i>Outbound Road (Humphrey Drive)</i>						
<i>Curbside Exit to GTC Exit</i>	2	938	21.7	21.3	-	B
<i>GTC exit to Rental Car exit</i>	3	1219	11.6	34.3	-	A
<i>Rental Exit to 34th Ave N/S diverge</i>	4	1644	14.3	27.4	-	A
<i>Parking Exit to 34th Ave S (prior to traffic signal)</i>	1/2	216	-	-	24.4	B
<i>Humphrey Dr to 34th Ave S</i>	2	1152	21.4	26.6	-	B
<i>Humphrey Dr to 34th Ave N (prior to traffic signal)</i>	2	494	-	-	11.6	A

Notes:

*: Applicable only for signalized intersections.

** : LOS for roadway segments based on *ACRP Report 40* and *HCM 2010* using Density; LOS for signalized intersections based on *HCM 2010* using Delay.

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.5.2.3

Summary of 2025 Alternative 2 - Airlines Relocate Terminal Access Roadway Operations

2025 Alternative 2 - Airlines Relocate		Operational Measures of Effectiveness				
Location	No. of Lanes	Demand (veh/hr)	Density (pc/ln/mi)	Speed (mph)	Delay* (sec/veh)	LOS**
Terminal 1-Lindbergh Overall Peak Hour (5-6PM)						
<i>Inbound Road (Glumack Drive)</i>						
<i>Return-to-Terminal Roadway To Parking Entrance</i>	4/5	2764	21.8	30.0	-	A
<i>Parking Entrance to Rental Car Entrance</i>	4/5	2302	17.4	31.8	-	A
<i>Rental Car Entrance to Curbside Entrance (diverge)</i>	3/4	2067	21.7	26.8	-	B
<i>Outbound Road (Glumack Drive)</i>						
<i>Curbside Exit (diverge) to Employee Exit/Turn Around</i>	2/3	2067	29.1	28.1	-	D
<i>Turn Around to Rental Car Exit</i>	2/3	2075	28.5	27.1	-	D
<i>Rental Car Exit to International Terminal (diverge)</i>	2	2306	39.2	28.4	-	D
<i>Service Road to Parking Exit</i>	2	1952	32.1	29.9	-	D
<i>Parking/Employee Exit to International Terminal (merge)</i>	3	2506	35.9	22.8	-	D
<i>International Terminal (merge) to Return-to-Terminal Roadway</i>	4	2861	26.4	26.6	-	D
Terminal 2-Humphrey Overall Peak Hour (4-5PM)						
<i>Inbound Road (Humphrey Drive)</i>						
<i>34th Ave between 72nd St and 70th St (Weaving Segment)</i>	3	2979	48.7	20.4	-	C
<i>From 34th Ave to 70th St (prior to traffic signal)</i>	3	2127	-	-	6.0	A
<i>From 70th St to Humphrey Dr (prior to traffic signal)</i>	2	694	-	-	23.5	C
<i>From 70th St to Parking Entrance</i>	3	1029	18.8	24.6	-	B
<i>From 70th St/Humphrey Dr. to just before Curbs</i>	2/3	1790	17.8	28.9	-	A
<i>Outbound Road (Humphrey Drive)</i>						
<i>Curbside Exit to GTC Exit</i>	2	1522	32.9	20.9	-	D
<i>GTC exit to Rental Car exit</i>	3	1790	16.1	34.2	-	A
<i>Rental Exit to 34th Ave N/S diverge</i>	4	2352	21.1	25.5	-	B
<i>Parking Exit to 34th Ave S (prior to traffic signal)</i>	1/2	306	-	-	29.8	B
<i>Humphrey Dr to 34th Ave S</i>	2	1586	29.9	26.0	-	D
<i>Humphrey Dr to 34th Ave N (prior to traffic signal)</i>	2	766	-	-	16.4	A

Notes:

*: Applicable only for signalized intersections.

** : LOS for roadway segments based on ACRP Report 40 and HCM 2010 using Density; LOS for signalized intersections based on HCM 2010 using Delay.

Source: HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

In the Airlines Relocate Alternative, inbound Glumack Drive remains in its existing alignment and no new lanes would be required. The General Parking entrance plaza would be relocated east of its existing location and expanded by three lanes to provide a total of 8 lanes, meeting requirements through 2025. The exit plaza would be relocated to accommodate the proposed parking ramps. See **Table H.5.2.4** for a summary of the proposed parking entry and exit plaza capacities. In addition, the transit center located east of the existing garages would be reconfigured to make room for the proposed parking structure. The APM (tram) tunnel would be extended under the proposed ramp, and vertical circulation would provide additional mobility. The ePark Elite parking lot would be relocated within the Gold and Green ramps.

Table H.5.2.4

Alternative 2 - Airlines Relocate Parking Plaza Capacity

Parking Plaza	Existing Capacity	2020			2025		
		Alternative 2 - Airlines Relocate			Alternative 2 - Airlines Relocate		
		Proposed Capacity	Requirement	Surplus (Deficit)	Proposed Capacity	Requirement	Surplus (Deficit)
Terminal 1-Lindbergh Parking Plazas							
Public Short-Term Entrance Lanes	4	4	4	0	4	5	(1)
General/Employee Entrance Lanes	5	8	6	2	8	7	1
Exit Lanes	18	16	12	4	16	13	3
Terminal 2-Humphrey Parking Plazas							
Public Short-Term Entrance Lanes	3	3	3	0	3	4	(1)
General/Employee Entrance Lanes	6	3	3	0	3	5	(2)
Exit Lanes	17	14	9	5	14	12	2

Source: 2010 MAC Parking Revenue Data and HNTB analysis, 2011.

With active curbside management maintaining dwell times no higher than current levels and directing peak-hour traffic between the inner and outer curbs, the departures curb roadway would operate adequately through 2020. In order to accommodate future demand on the arrivals curb roadway, the taxi and hotel shuttle pick-up area for the GTC would be converted to an outer curb for POV use with a new island between the inner and outer roadways to allow passenger loading on the right side of the vehicles. The curbside capacity is summarized in **Table H.5.2.5**. The taxis which currently pick up in this area would be relocated to an expanded GTC. As shown in **Table H.5.2.6**, the GTC will provide 13 additional spaces for a total of 61 spaces accommodating demand through 2020.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Table H.5.2.5

Alternative 2 - Airlines Relocate Terminal Curb Roadway Capacity

	2020 Alternative 2- Airlines Relocate			2025 Alternative 2- Airlines Relocate		
	Length	Lanes	v/c ratio ⁽¹⁾	Length	Lanes	v/c ratio ⁽¹⁾
<i>Terminal 1-Lindbergh Departures</i>						
<i>Inner</i>	830	4	0.60	830	4	0.62
<i>Outer</i>	630	3	0.20	630	3	0.22
<i>Terminal 1-Lindbergh Arrivals</i>						
<i>Inner</i>	700	5	0.68	700	5	0.69
<i>Outer⁽²⁾</i>	700	4	0.10	700	4	0.14
<i>Terminal 1-Lindbergh International Single Level⁽³⁾</i>						
<i>Departures</i>	250	4	0.60	250	4	0.61
<i>Arrivals</i>	250	4	0.05	250	4	0.10
Total	500	4	n.a	500	4	n.a.
<i>Terminal 2-Humphrey Combined</i>						
<i>Departures</i>	850	6	0.58	850	6	0.68
<i>Arrivals</i>	690	6	0.48	690	6	0.84
Total	1,540	6	n.a	1,540	6	n.a

Notes:

n.a. = not applicable

(1) A v/c ratio of 0.70 or below is considered an acceptable level of service.

(2) Terminal 1-Lindbergh outer arrivals curb is currently utilized as part of the GTC, but is proposed to be converted to use by privately operated vehicles.

(3) Terminal 1-Lindbergh international curb is a proposed single level curb supporting the proposed International Terminal and FIS facility.

Source: MAC As-built CAD files and HNTB analysis, 2011.

Table H.5.2.6

Alternative 2 - Airlines Relocate GTC Capacity

	Existing Capacity	2020 Alternative 2 - Airlines Relocate			2025 Alternative 2 - Airlines Relocate		
		Proposed Capacity	Requirement	Surplus (Deficit)	Proposed Capacity	Requirement	Surplus (Deficit)
Total Terminal 1- Lindbergh GTC Spaces	48	61	54	7	61	59	(11)
Total Terminal 2- Humphrey GTC Spaces	15	25	25	0	25	31	(6)

Source: MAC As-built CAD files and HNTB analysis, 2011.

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

Under the Airlines Relocate Alternative, RAC QTA facilities would be accommodated at each terminal to serve vehicles rented and returned at their respective terminals. Rental car facility capacities are summarized in **Table H.5.2.7**.

Table H.5.2.7

Alternative 2 - Airlines Relocate Rental Car Facility Capacity

Facility	Existing Capacity	2020			2025		
		Alternative 2 - Airlines Relocate			Alternative 2 - Airlines Relocate		
		Proposed Capacity	Requirement	Surplus (Deficit)	Proposed Capacity	Requirement	Surplus (Deficit)
Terminal 1- Lindbergh Ready Return Stalls	1,725	1,860	1,355	505	1,860	1,560	300
Terminal 1- Lindbergh QTA (sq. ft.) ⁽²⁾	302,050	302,050	219,200	82,850	302,050	256,000	46,050
Terminal 2- Humphrey Ready Return Stalls	145	1,020	1,020	-	1,020	1,300	(280)
Terminal 2- Humphrey QTA (sq. ft.) ⁽¹⁾	-	164,700	164,700	-	164,700	214,000	(49,300)

Notes:

(1) In Alternative 2-Airlines Relocate a separate QTA is provided at each terminal to service rental car vehicles for each respective terminal.

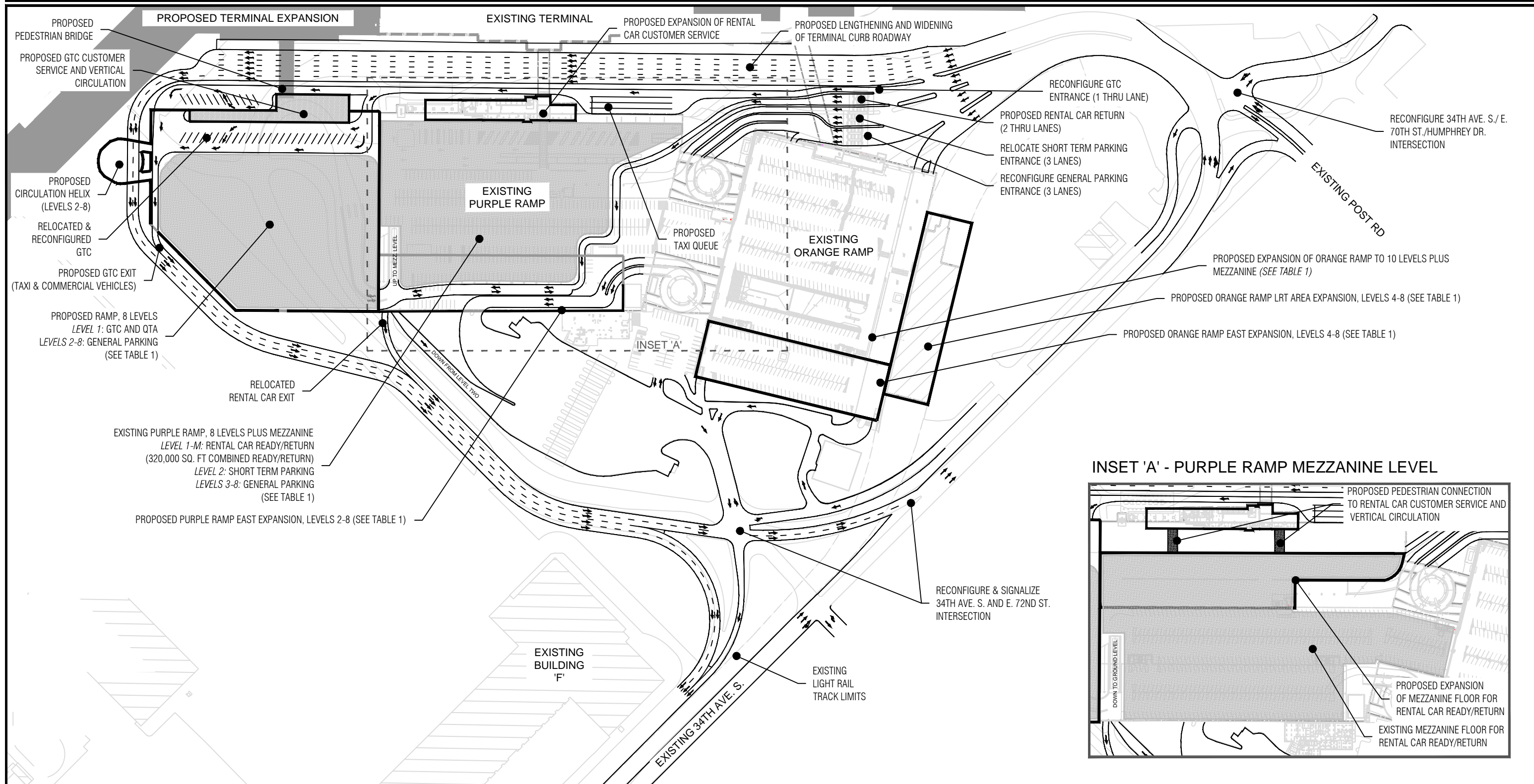
Source: 2010 MAC Rental Car Transaction Data and HNTB analysis, 2011.

The proposed international terminal would be supported by a 500-foot, four-lane, single-level departures and arrivals curb roadway. This curb roadway would be accessed from Glumack Drive immediately after the Concourse C and G pedestrian connector. The single-level terminal curb roadway would merge back with Glumack Drive on the east side of the proposed parking structures.

Under the Airlines Relocate Alternative, demand for Terminal 2-Humphrey landside facilities increases substantially, requiring additional and reconfigured landside facilities to support demand as depicted in **Figure H.5-4**. To minimize development costs, existing facilities including the inbound and outbound roadway networks and parking ramps were maintained to the extent feasible.

The concept assumes airport traffic is approaching from both the Post Road/TH 5 Interchange and the 34th Avenue South/I-494 Interchange, with nearly a three to one split favoring the 34th/I-494 Interchange. Traffic and roadway facilities on these supporting local and regional roads were analyzed in a separate analysis as a part of this EA, see *Appendix C*.

Inbound traffic on Humphrey Drive diverges between curb and parking at the entrance to the terminal area just beyond the intersection of 34th Avenue/70th Street. In the proposed



LEGEND

Alternative 2 - Airlines Relocate Terminal 2-Humphrey: 2020 Overall Landside Concept



Source: Data compiled and maintained by MAC, HNTB, TKDA

Disclaimer: This map was generated by HNTB Corporation based off of CAD files supplied by other parties. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of map are approximate.



J:\Jobs\44692-MAC Planning Consultant\PL 034 - MSP 2020 Improvements EA\TechProd\Work\CADD\I.side\Landside Concepts\Final Concepts_111411\T2 Concept 121911_Alt 2.dwg
 12/20/2011 7:09:39 PM

reconfiguration, rental car return and GTC entrance traffic would follow the same path as the parking entrance, staying to the right at the entrance plaza. This configuration would allow traffic at the Post Road signal to be balanced as it approaches the terminal. GTC and RAC return traffic would utilize the westernmost lanes of the plaza (closest to the terminal curb road) and the RAC return lane would follow the old GTC entrance road onto the ground floor of the existing Purple ramp. The existing ground floor of this ramp would be expanded to provide additional rental car ready/return spaces. These facilities would also occupy an expanded mezzanine level to be accessed from the existing ramp on the southeast corner of the facility. The GTC access lane would run parallel to the terminal curb roadway and proceed to the relocated GTC facility which would be constructed on the ground floor of the proposed parking ramp.

A new parking ramp south of the existing Purple ramp and vertical expansion of the Orange and Purple ramps are proposed to collectively provide approximately 6,000 additional parking spaces. The expanded parking would meet Terminal 2-Humphrey public and employee parking requirements through 2020, as shown in Table H.5.2.1. After 2020, some employees working at Terminal 2-Humphrey would need to park at an alternate site as these facilities would not meet employee parking requirements.

The new ramp would be ten floors and connected to the Purple ramp on levels one through eight. A new helix would provide vertical circulation on the south edge of the ramp. The ground floor of the proposed ramp will include a relocated GTC with 10 additional commercial vehicle spaces, as shown in Table H.5.2.5. There would also be a new RAC QTA facility to serve Terminal 2-Humphrey rental cars on the ground floor of the new ramp. The QTA would eliminate the need to shuttle vehicles to Terminal 1-Lindbergh's QTA for refueling and cleaning. Rental car facilities are summarized in Table H.5.2.6.

The existing pedestrian bridges would provide access from the upper level of the Terminal 2-Humphrey terminal building to both the expanded RAC customer service building (in the existing Purple ramp) and the newly constructed GTC customer service building (in the proposed ramp).

As they are today, the entrances to Short-Term and General Parking are proposed to be adjacent to each other, located near the same location as entrances for the GTC and RAC return. Short-term parkers would utilize the same dedicated ramp to access the second level of the existing Purple ramp as they do today. Egress from Short-Term Parking would be via the current dedicated ramp on the southeastern edge of the existing facility. General Parking traffic would feed directly into the existing double helix. This helix would allow for access to both the Orange and Purple ramps. The Orange ramp and Purple ramp outriggers are proposed to be expanded upward to match the height of the adjacent ramp structure. The Orange ramp would also be expanded vertically two levels. All General Parking egress would be maintained through the existing down double helix. The existing parking exit plaza would process all parked vehicles and feed them into a reconfigured signalized intersection of East 72nd Street/34th Avenue South.

Under the Airlines Relocate Alternative, additional curb space is required to accommodate demand through 2020. The terminal curb roadway is proposed to be widened to six lanes from the four existing lanes, shown in Figure H.5-4. Departure traffic would still utilize the first half of

**Minneapolis-St. Paul International Airport
2020 Improvements EA/EAW**

the curb, and arrivals the second half. Terminal curb roadway traffic would merge back to two lanes at the end of the terminal curb, pass under the newly constructed vertical circulation helix, and tie back into the East 72nd Street alignment prior to its intersection with 34th Avenue South.

ENDNOTES

¹ Transportation Research Board (TRB), *Highway Capacity Manual 2010*.

² Airport Cooperative Research Program (ACRP), *Airport Curbside and Terminal Area Roadway Operations, Report 40*, 2010.