ATTACHMENT C-1

MODELED FLIGHT TRACK EXHIBITS

This section provides supplemental information on the projected flight tracks used in preparing the noise exposure contours for the Existing Fly Quiet, Proposed Interim Fly Quiet, Revised Interim Fly Quiet 1, and Revised Interim Fly Quiet 2. All four alternatives use the same model tracks. The exhibits depict delineation of the compatible and noncompatible land use areas overlaid with the projected flight paths that aircraft would follow when arriving or departing from O'Hare under each alternative. Exhibits of projected flight paths are provided for two flow conditions (east flow and west flow) separately for arrivals and departures.

The exhibits are numbered as follows:
Exhibit C1-1 – All Model Tracks
Exhibit C1-2 – East Flow Arrival Model Tracks
Exhibit C1-3 – West Flow Arrival Model Tracks
Exhibit C1-4 – East Flow Departure Model Tracks
Exhibit C1-5 – West Flow Departure Model Tracks

For additional information on how the projected flight tracks were developed, refer to **Section C.2.6.**

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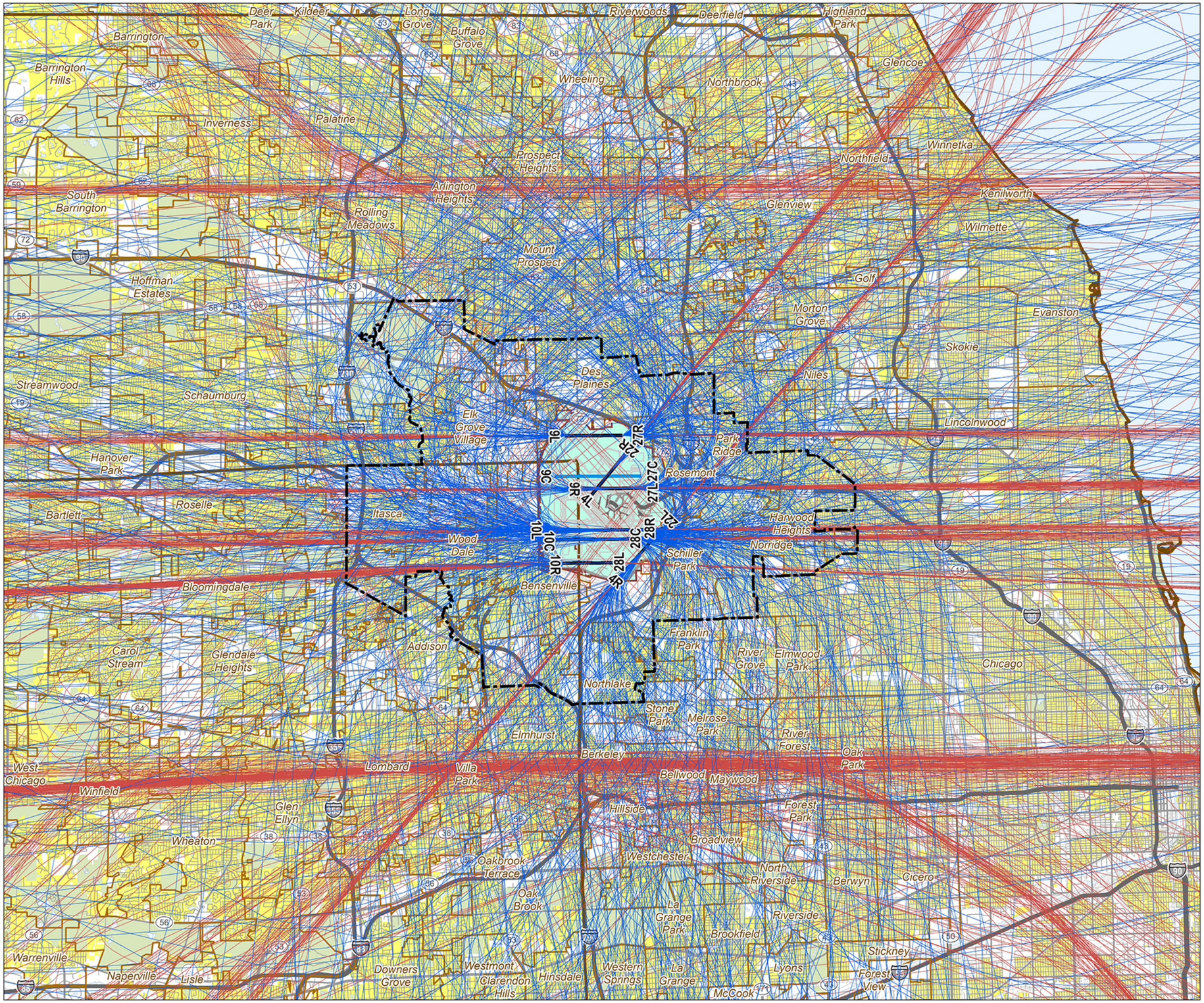

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

- Departure Flight Tracks
- Arrival Flight Tracks
- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noise Sensitive Land Use
- Open Space, Recreation
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Local Roads
- Railroad Lines

Note: Model tracks represent November 2019 to May 2020 and September 2020 to January 2021

0 3 6
Miles

All Model Tracks

▶ Exhibit C1-1

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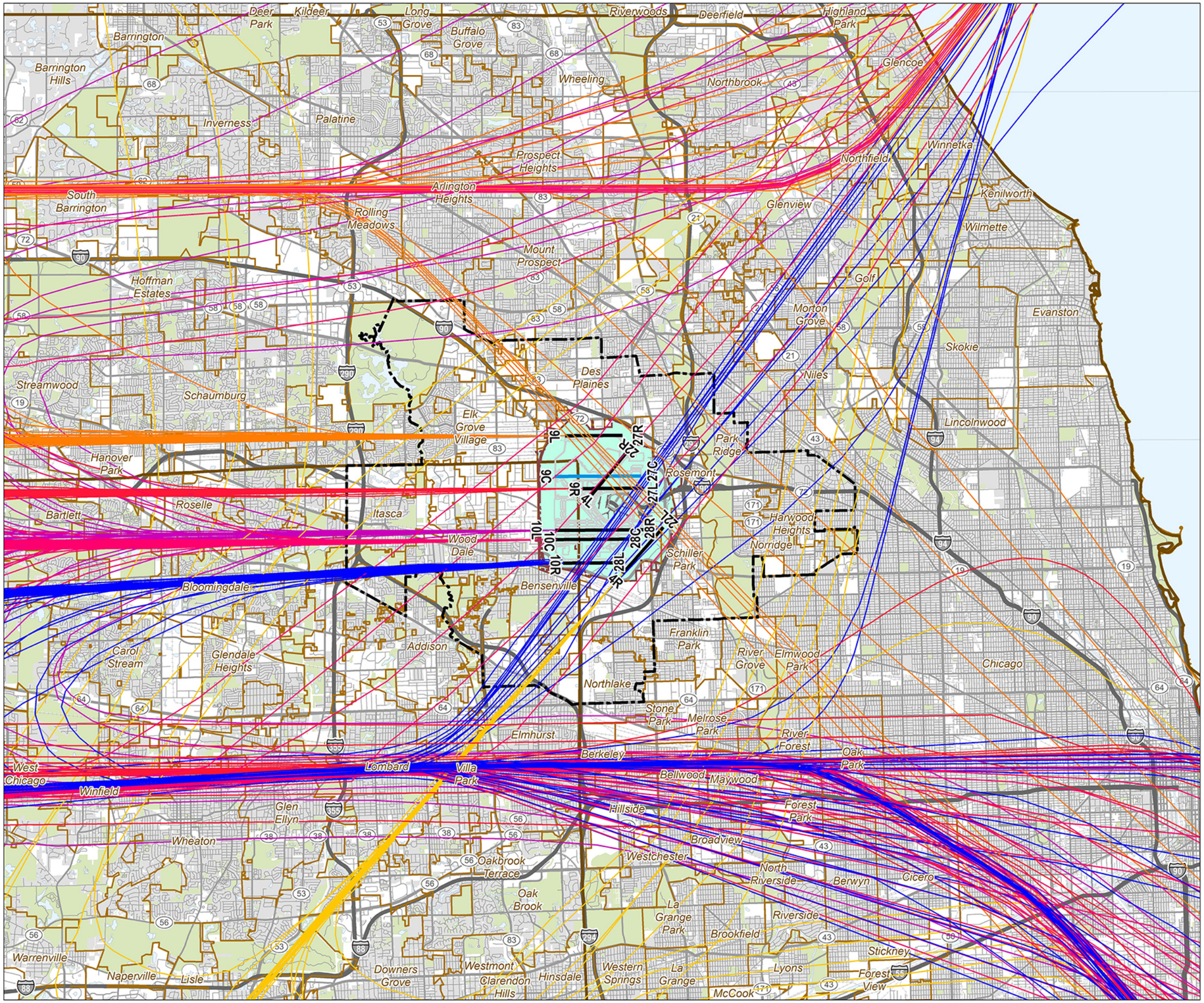

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

- Arrival, Runway 4R
- Arrival, Runway 9L
- Arrival, Runway 9R
- Arrival, Runway 10C
- Arrival, Runway 10L
- Arrival, Runway 10R

- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noise Sensitive Land Use
- Open Space, Recreation
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Local Roads
- Railroad Lines

Note: Model tracks represent November 2019 to May 2020 and September 2020 to January 2021

0 3 6
Miles

East Flow Arrival Model Tracks

▶ Exhibit C1-2

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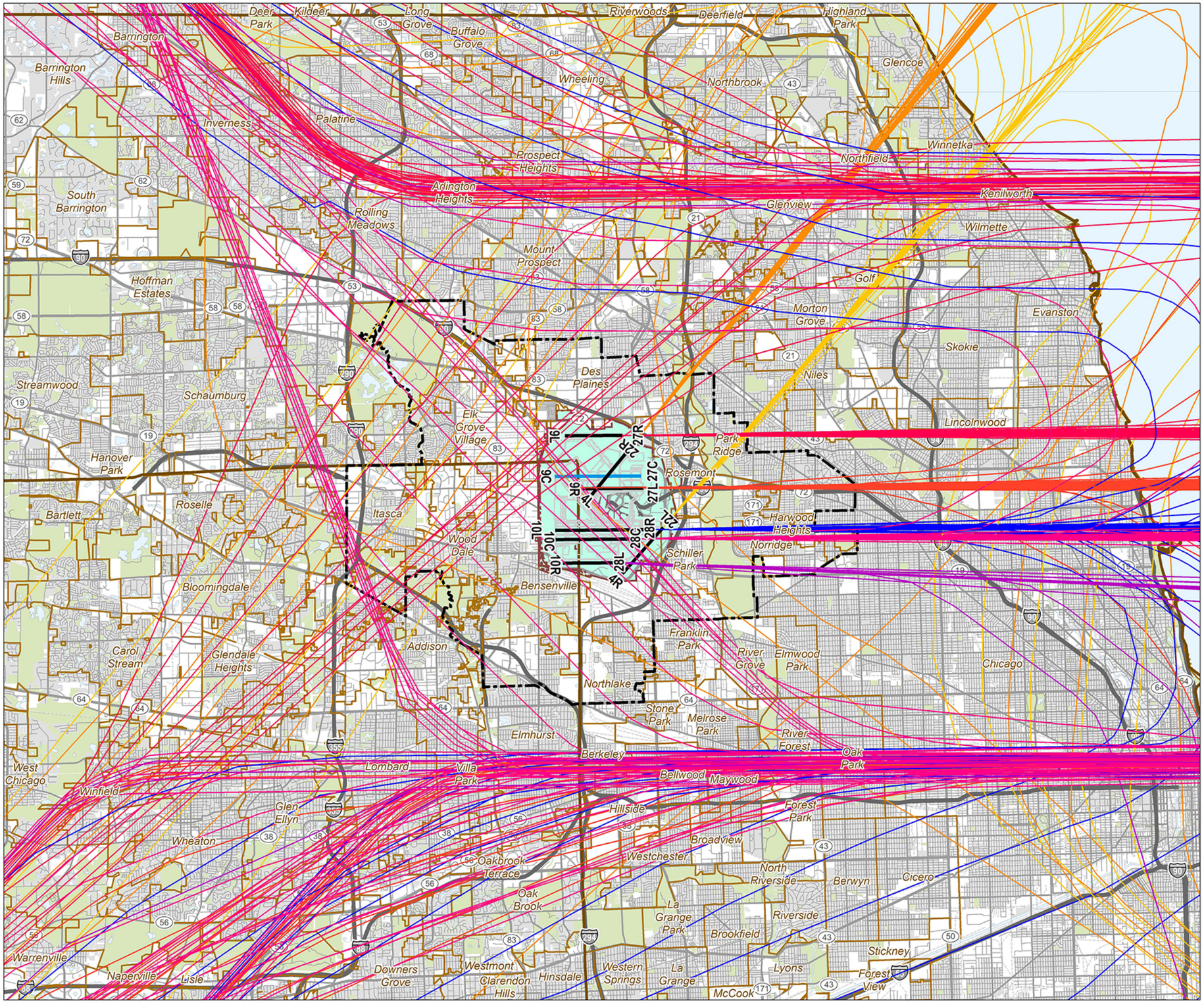

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

- Arrival, Runway 22L
- Arrival, Runway 22R
- Arrival, Runway 27L
- Arrival, Runway 27R
- Arrival, Runway 28C
- Arrival, Runway 28L
- Arrival, Runway 28R

- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noise Sensitive Land Use
- Open Space, Recreation
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Local Roads
- Railroad Lines

Note: Model tracks represent November 2019 to May 2020 and September 2020 to January 2021

0 3 6
Miles

West Flow Arrival Model Tracks

▶ Exhibit C1-3

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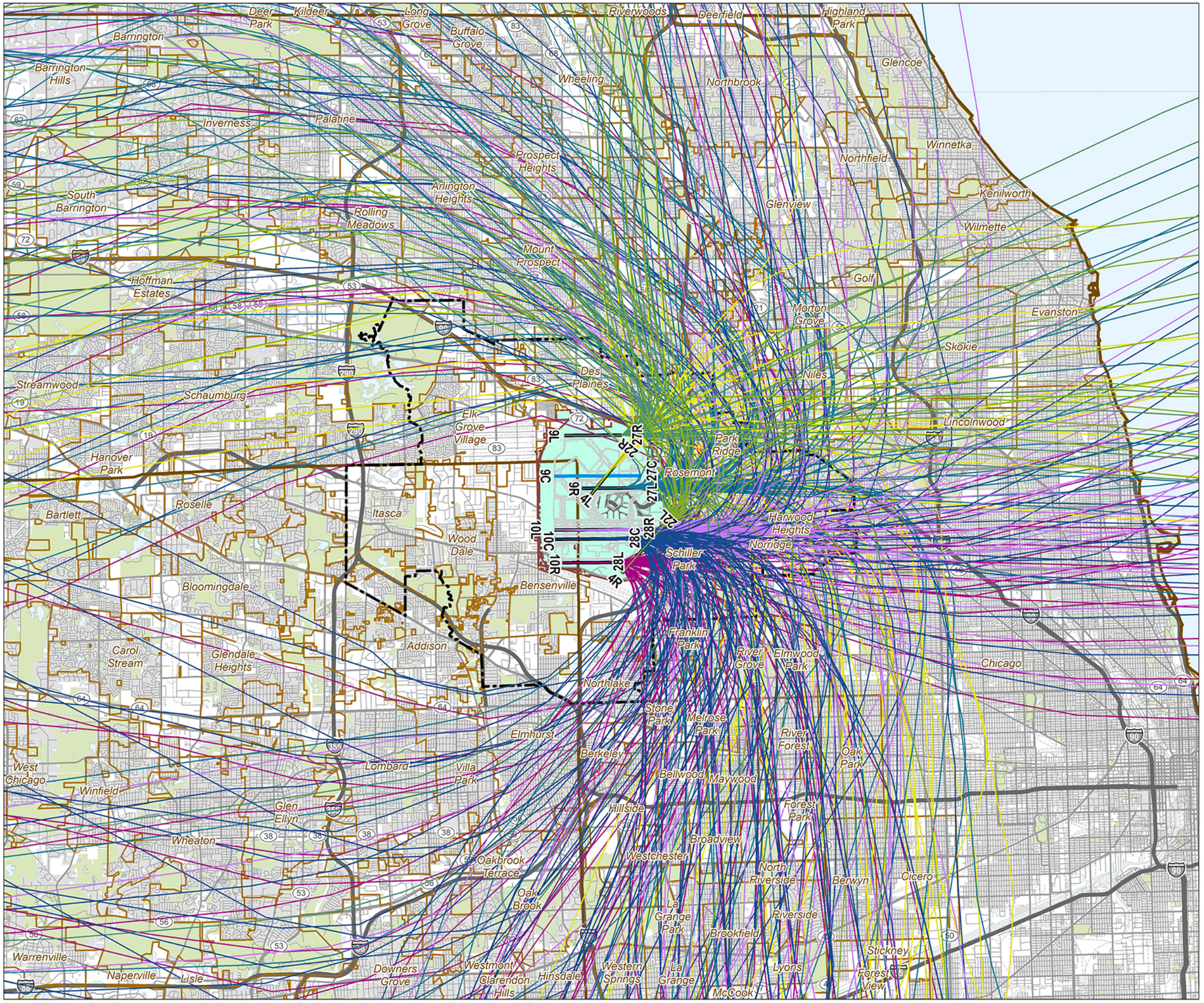

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

- Departure, Runway 4L
- Departure, Runway 4R
- Departure, Runway 9L
- Departure, Runway 9R
- Departure, Runway 10C
- Departure, Runway 10L
- Departure, Runway 10R

- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noise Sensitive Land Use
- Open Space, Recreation
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Local Roads
- Railroad Lines

Note: Model tracks represent November 2019 to May 2020 and September 2020 to January 2021

0 3 6
Miles

East Flow Departure Model Tracks

▶ Exhibit C1-4

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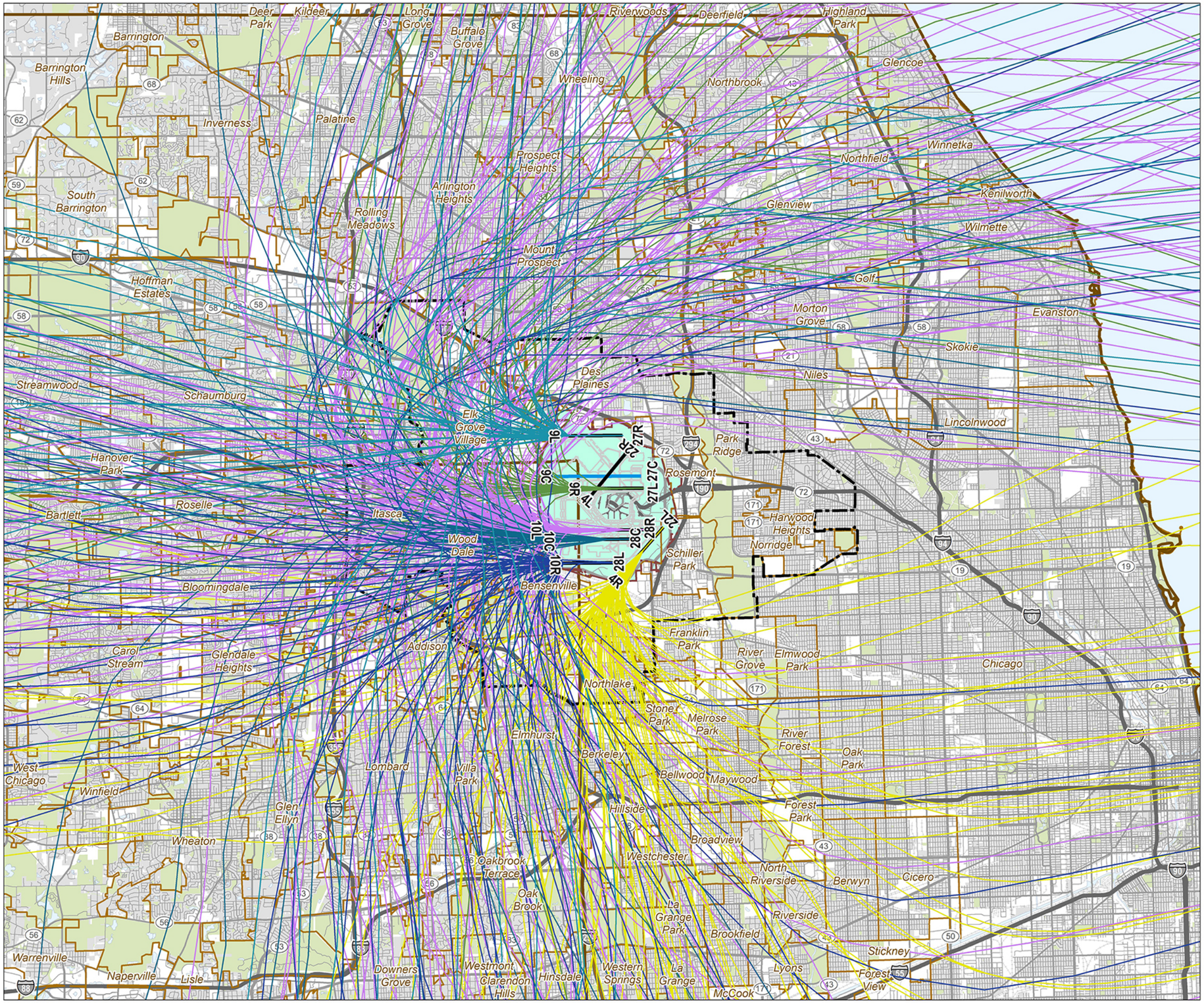

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

- Departure, Runway 22L
- Departure, Runway 27L
- Departure, Runway 27R
- Departure, Runway 28C
- Departure, Runway 28L
- Departure, Runway 28R

- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noise Sensitive Land Use
- Open Space, Recreation
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Local Roads
- Railroad Lines

Note: Model tracks represent November 2019 to May 2020 and September 2020 to January 2021

0 3 6
Miles

West Flow Departure Model Tracks

▶ Exhibit C1-5

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ATTACHMENT C-2

AEDT INPUT DATA

This attachment provides two tables and one memo that support the development of the AEDT noise modeling of the Existing Fly Quiet, Proposed Interim Fly Quiet, Revised Interim Fly Quiet 1, and Revised Interim Fly Quiet 2.

1. The AEDT Aircraft Assignment Table
2. The AEDT Stage Length Lookup Table
3. The Zero Runway Use Memo

TABLE C.2-1
AEDT AIRCRAFT ASSIGNMENT TABLE

Airline Code		Aircraft Type (per PMAD Schedule)		AEDT Type		Airline Code		Aircraft Type (per PMAD Schedule)		AEDT Type
AAL		A319		A319-131		FFT		A320		A320-211
AAL		A320		A320-211		FFT		A321		A321-232
AAL		A321		A321-232		FIN		A333		A330-301
AAL		B738		737800		FWK		C680		CNA680
AAL		B752		757RR		GEC		B772		777300
AAL		B763		767300		GEC		MD11		MD11GE
AAL		B772		777200		GTI		B763		767300
AAL		B788		7878R		IBE		A346		A340-642
AAL		B789		7878R		ICE		B752		757RR
AAL		CRJ2		CL600		JAL		B773		7773ER
AAL		CRJ7		CRJ9-ER		JBU		A320		A320-232
AAL		E145		EMB145		JBU		A321		A321-232
AAL		E170		EMB170		JBU		E190		EMB190
AAL		MD82		MD82		JCM		H25B		LEAR35
AAR		A359		A330-343		KAL		B748		7478
AAR		B744		747400		KAL		B773		7773ER
ABW		B748		7478		KFS		LJ35		LEAR35
ACA		A319		A319-131		KLM		B744		747400
ACA		E170		EMB170		LOT		B789		7878R
ACA		E190		EMB190		LXJ		CL30		CL600
AFR		A332		A330-301		N18		C185		CNA182

Airline Code		Aircraft Type (per PMAD Schedule)		AEDT Type		Airline Code		Aircraft Type (per PMAD Schedule)		AEDT Type
AIC		B744		747400		N24		GALX		CNA750
AIJ		A320		A320-211		N83		B350		DHC6
AMX		B738		737800		NCA		B748		7478
ANA		B773		7773ER		NKS		A320		A320-232
ASA		B738		737800		NKS		A321		737800
ASA		B739		737800		QTR		B773		7773ER
AUA		B772		777200		RJA		B788		7878R
AZA		A330		A330-301		SAS		A359		A330-343
BAW		A388		A380-841		SWR		B773		7773ER
BAW		B744		747400		THY		B772		777200
BER		A332		A330-343		UAE		A388		A380-861
CAL		B744		747400		UAE		B772		777300
CAO		B772		777300		UAL		A319		A319-131
CES		B773		7773ER		UAL		A320		A320-232
CKK		B744		747400		UAL		B737		737700
CLX		B744		747400		UAL		B738		737800
CMP		B738		737800		UAL		B739		737800
CPA		B748		7478		UAL		B752		757RR
CPA		B773		7773ER		UAL		B763		767300
CSN		B772		777300		UAL		B772		777200
DAL		A319		A319-131		UAL		B788		7878R
DAL		A320		A320-211		UAL		CRJ2		CL600
DAL		B712		717200		UAL		CRJ7		CRJ9-ER
DAL		CRJ2		CL600		UAL		E145		EMB145
DAL		CRJ7		CRJ9-ER		UAL		E170		EMB170
DAL		CRJ9		CRJ9-ER		UNS		BE40		MU3001
DAL		E170		EMB170		UNS		C56X		CNA55B
DAL		MD88		MD83		UNS		C750		CNA750
DAL		MD90		MD9025		UNS		F900		COMJET
DCM		C525		CNA500		UNS		GALX		CNA750
DCM		C650		CIT3		UNS		GLF1		IA1125
DLH		B748		7478		UNS		GLF5		GV
DLH		MD11		MD11GE		UNS		H25B		LEAR35
EIN		A330		A330-301		UNS		PAY2		CNA441
EJA		C560		CNA560U		UPS		A306		A300-622R
EJA		C56X		CNA55B		UPS		B752		757RR
EJA		C750		CNA750		UPS		B763		767300
EJA		E55P		CNA560E		VOI		A319		A319-131

Airline Code		Aircraft Type (per PMAD Schedule)		AEDT Type		Airline Code		Aircraft Type (per PMAD Schedule)		AEDT Type
EJA		H25B		LEAR35		VOI		A320		A320-232
ETD		B773		7773ER		VOI		A321		A321-232
EVA		B744		747400		VRD		A321		A320-211
EVA		B772		777300		WBR		CNA208		CNA208
FDX		B752		757RR		WJA		B737		737700
FDX		B762		767JT9						
FDX		B772		777300						
FDX		DC10		DC1010						

Source: HMMH, 2018.

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TABLE C.2-2
AEDT STAGE LENGTH LOOKUP TABLE

		Percentage of Flights at Stage Length											Percentage of Flights at Stage Length								
AEDT_ID	**Destination**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**AEDT_ID**	**Destination**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
717200	KATL	-	100	-	-	-	-	-	-	-	CL600	CYOW (2)	100	-	-	-	-	-	-	-	-
	KDTW	100	-	-	-	-	-	-	-	-		CYUL (2)	100	-	-	-	-	-	-	-	-
	KMSP	100	-	-	-	-	-	-	-	-		CYWG (2)	100	-	-	-	-	-	-	-	-
	Overall	70.0	30.0	-	-	-	-	-	-	-		KAMW	100	-	-	-	-	-	-	-	-
737700	CYYC	-	-	100	-	-	-	-	-	-		KBMI	100	-	-	-	-	-	-	-	-
	KCLE	100	-	-	-	-	-	-	-	-		KCAK	100	-	-	-	-	-	-	-	-
	KCMH	100	-	-	-	-	-	-	-	-		KCHA	100	-	-	-	-	-	-	-	-
	KJAC	-	-	100	-	-	-	-	-	-		KCID	100	-	-	-	-	-	-	-	-
	KLAX	-	-	-	100	-	-	-	-	-		KCLE	100	-	-	-	-	-	-	-	-
	KSNA	-	-	100	-	-	-	-	-	-		KCMI	100	-	-	-	-	-	-	-	-
	Overall	25.0	-	50.0	25.0	-	-	-	-	-		KCRW	100	-	-	-	-	-	-	-	-
737800	CYYZ	100	-	-	-	-	-	-	-	-		KCVG	100	-	-	-	-	-	-	-	-
	KALB	-	100	-	-	-	-	-	-	-		KDLH	100	-	-	-	-	-	-	-	-
	KATL	-	100	-	-	-	-	-	-	-		KFSD	100	-	-	-	-	-	-	-	-
	KAUS	-	100	-	-	-	-	-	-	-		KGRB	100	-	-	-	-	-	-	-	-
	KBOS	-	100	-	-	-	-	-	-	-		KHPN (2)	100	-	-	-	-	-	-	-	-
	KBWI	-	100	-	-	-	-	-	-	-		KHSV	100	-	-	-	-	-	-	-	-
	KBZN	-	-	100	-	-	-	-	-	-		KLEX	100	-	-	-	-	-	-	-	-
	KCLE	100	-	-	-	-	-	-	-	-		KMHT (2)	100	-	-	-	-	-	-	-	-
	KCLT	-	100	-	-	-	-	-	-	-		KMKE	100	-	-	-	-	-	-	-	-
	KDCA	-	100	-	-	-	-	-	-	-		KMKG	100	-	-	-	-	-	-	-	-
	KDEN	-	100	-	-	-	-	-	-	-		KMLI	100	-	-	-	-	-	-	-	-
	KDFW	-	100	-	-	-	-	-	-	-		KPIA	100	-	-	-	-	-	-	-	-
	KDTW	100	-	-	-	-	-	-	-	-		KPWM (2)	100	-	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length											Percentage of Flights at Stage Length								
AEDT_ID	**Destination**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**AEDT_ID**	**Destination**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	KEWR	-	100	-	-	-	-	-	-	-		KRIC (2)	100	-	-	-	-	-	-	-	-
	KFLL	-	-	100	-	-	-	-	-	-		KROC	100	-	-	-	-	-	-	-	-
	KIAD	-	100	-	-	-	-	-	-	-		KSBN	100	-	-	-	-	-	-	-	-
	KIAH	-	100	-	-	-	-	-	-	-		KSDF	100	-	-	-	-	-	-	-	-
	KJFK	-	100	-	-	-	-	-	-	-		KSTL	100	-	-	-	-	-	-	-	-
	KLAS	-	-	100	-	-	-	-	-	-		KTUL (2)	100	-	-	-	-	-	-	-	-
	KLAX	-	-	-	100	-	-	-	-	-		KTVC	100	-	-	-	-	-	-	-	-
	KLGA	-	100	-	-	-	-	-	-	-		KTYS	100	-	-	-	-	-	-	-	-
	KMCO	-	100	-	-	-	-	-	-	-		KUNV	100	-	-	-	-	-	-	-	-
	KMIA	-	-	100	-	-	-	-	-	-	CNA208	KBRL	100	-	-	-	-	-	-	-	-
	KMSP	100	-	-	-	-	-	-	-	-		KDEC	100	-	-	-	-	-	-	-	-
	KMSY	-	100	-	-	-	-	-	-	-		KIWD	100	-	-	-	-	-	-	-	-
	KMYR	-	100	-	-	-	-	-	-	-		KMCW	100	-	-	-	-	-	-	-	-
	KPBI	-	100	-	-	-	-	-	-	-	CNA441	KDBQ	100	-	-	-	-	-	-	-	-
	KPDX	-	-	-	100	-	-	-	-	-	CNA500	KPTK	100	-	-	-	-	-	-	-	-
	KPHL	-	100	-	-	-	-	-	-	-	CNA55B	KMCN (2)	100	-	-	-	-	-	-	-	-
	KPHX	-	-	100	-	-	-	-	-	-	CNA560E	KBTL	100	-	-	-	-	-	-	-	-
	KPIT	100	-	-	-	-	-	-	-	-		KPLN	100	-	-	-	-	-	-	-	-
	KRDU	-	100	-	-	-	-	-	-	-	CNA560U	KRAC	100	-	-	-	-	-	-	-	-
	KRNO	-	-	100	-	-	-	-	-	-	CNA680	KMTV (2)	100	-	-	-	-	-	-	-	-
	KRSW	-	100	-	-	-	-	-	-	-	CNA750	KEVV	100	-	-	-	-	-	-	-	-
	KSAN	-	-	100	-	-	-	-	-	-		KMIA (3)	100	-	-	-	-	-	-	-	-
	KSAT	-	100	-	-	-	-	-	-	-		KTEB (2)	100	-	-	-	-	-	-	-	-
	KSEA	-	-	100	-	-	-	-	-	-	CRJ9-ER	CYQB	-	100	-	-	-	-	-	-	-
	KSFO	-	-	-	100	-	-	-	-	-		CYYC	-	-	100	-	-	-	-	-	-
	KSJC	-	-	-	100	-	-	-	-	-		CYYZ	100	-	-	-	-	-	-	-	-
	KSLC	-	-	100	-	-	-	-	-	-		KABE	-	100	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	KSMF	-	-	-	100	-	-	-	-	-
	KSNA	-	-	100	-	-	-	-	-	-
	KSTL	100	-	-	-	-	-	-	-	-
	KTPA	-	100	-	-	-	-	-	-	-
	MDPC	-	-	-	100	-	-	-	-	-
	MMGL	-	-	-	100	-	-	-	-	-
	MMMX	-	-	100	-	-	-	-	-	-
	MMUN	-	-	100	-	-	-	-	-	-
	MPTO	-	-	-	100	-	-	-	-	-
	PAFA	-	-	-	100	-	-	-	-	-
	PANC	-	-	-	100	-	-	-	-	-
	TJSJ	-	-	-	100	-	-	-	-	-
	Overall	8.5	50.4	21.2	19.9	-	-	-	-	-
747400	EGLL	-	-	-	-	100	-	-	-	-
	EHAM	-	-	-	-	-	100	-	-	-
	KDFW	-	100	-	-	-	-	-	-	-
	PANC	-	-	-	100	-	-	-	-	-
	VIDP	-	-	-	-	-	-	-	100	-
	Overall (5)	-	14.3	-	42.9	14.3	14.3	-	14.3	-
7478	EDDF	-	-	-	-	-	100	-	-	-
	EDDM	-	-	-	-	-	100	-	-	-
	KATL	-	100	-	-	-	-	-	-	-
	KDFW	-	100	-	-	-	-	-	-	-
	KJFK	-	100	-	-	-	-	-	-	-
	PANC	-	-	-	100	-	-	-	-	-
	Overall (5)	-	44.4	-	22.2	-	33.3	-	-	-
757RR	BIKF	-	-	-	-	100	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	KABQ	-	100	-	-	-	-	-	-	-
	KALB	-	100	-	-	-	-	-	-	-
	KATL	-	100	-	-	-	-	-	-	-
	KAVP	-	100	-	-	-	-	-	-	-
	KBDL	-	100	-	-	-	-	-	-	-
	KBGR	-	100	-	-	-	-	-	-	-
	KBIL	-	100	-	-	-	-	-	-	-
	KBIS	-	100	-	-	-	-	-	-	-
	KBNA	100	-	-	-	-	-	-	-	-
	KBUF	100	-	-	-	-	-	-	-	-
	KBZN	-	-	100	-	-	-	-	-	-
	KCAE	-	100	-	-	-	-	-	-	-
	KCHA	100	-	-	-	-	-	-	-	-
	KCID	100	-	-	-	-	-	-	-	-
	KCLE	100	-	-	-	-	-	-	-	-
	KCLT	-	100	-	-	-	-	-	-	-
	KCMH	100	-	-	-	-	-	-	-	-
	KCMI	100	-	-	-	-	-	-	-	-
	KCOS	-	100	-	-	-	-	-	-	-
	KCVG	100	-	-	-	-	-	-	-	-
	KCWA	100	-	-	-	-	-	-	-	-
	KDAY	100	-	-	-	-	-	-	-	-
	KDCA	-	100	-	-	-	-	-	-	-
	KDFW	-	100	-	-	-	-	-	-	-
	KDLH	100	-	-	-	-	-	-	-	-
	KDSM	100	-	-	-	-	-	-	-	-
	KDTW	100	-	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	EGPH	-	-	-	-	100	-	-	-	-
	EIDW	-	-	-	-	100	-	-	-	-
	EINN	-	-	-	-	100	-	-	-	-
	KBWI	-	100	-	-	-	-	-	-	-
	KDEN	-	100	-	-	-	-	-	-	-
	KDFW	-	100	-	-	-	-	-	-	-
	KEWR	-	100	-	-	-	-	-	-	-
	KLAX	-	-	-	100	-	-	-	-	-
	KMIA	-	-	100	-	-	-	-	-	-
	KPHL	-	100	-	-	-	-	-	-	-
	KPHX	-	-	100	-	-	-	-	-	-
	KSFO	-	-	-	100	-	-	-	-	-
	Overall	-	50.0	11.1	16.7	22.2	-	-	-	-
767300	EGCC	-	-	-	-	100	-	-	-	-
	EGLL	-	-	-	-	100	-	-	-	-
	EHAM	-	-	-	-	-	100	-	-	-
	KCVG	100	-	-	-	-	-	-	-	-
	LFPG	-	-	-	-	-	100	-	-	-
	Overall	14.3	-	-	-	57.1	28.6	-	-	-
767JT9	KMCI	100	-	-	-	-	-	-	-	-
	KMEM	100	-	-	-	-	-	-	-	-
777200	EBBR	-	-	-	-	-	100	-	-	-
	EDDF	-	-	-	-	-	100	-	-	-
	EDDM	-	-	-	-	-	100	-	-	-
	KLAX	-	-	-	100	-	-	-	-	-
	KSFO	-	-	-	100	-	-	-	-	-
	LFPG	-	-	-	-	-	100	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	KELP	-	-	100	-	-	-	-	-	-
	KERI	100	-	-	-	-	-	-	-	-
	KEWR	-	100	-	-	-	-	-	-	-
	KFAR	100	-	-	-	-	-	-	-	-
	KFNT	100	-	-	-	-	-	-	-	-
	KFSD	100	-	-	-	-	-	-	-	-
	KFWA	100	-	-	-	-	-	-	-	-
	KGPI	-	-	100	-	-	-	-	-	-
	KGRB	100	-	-	-	-	-	-	-	-
	KGRR	100	-	-	-	-	-	-	-	-
	KHPN	-	100	-	-	-	-	-	-	-
	KIND	100	-	-	-	-	-	-	-	-
	KJAX	-	100	-	-	-	-	-	-	-
	KJFK	-	100	-	-	-	-	-	-	-
	KLEX	100	-	-	-	-	-	-	-	-
	KMCI	100	-	-	-	-	-	-	-	-
	KMDT	-	100	-	-	-	-	-	-	-
	KMEM	100	-	-	-	-	-	-	-	-
	KMKE	100	-	-	-	-	-	-	-	-
	KMLI	100	-	-	-	-	-	-	-	-
	KMOB	-	100	-	-	-	-	-	-	-
	KMSN	100	-	-	-	-	-	-	-	-
	KMSO	-	-	100	-	-	-	-	-	-
	KMSY	-	100	-	-	-	-	-	-	-
	KOKC	-	100	-	-	-	-	-	-	-
	KOMA	100	-	-	-	-	-	-	-	-
	KORF	-	100	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	LIRF	-	-	-	-	-	100	-	-	-
	LOWW	-	-	-	-	-	100	-	-	-
	LTBA	-	-	-	-	-	-	-	-	-
	PHNL	-	-	-	-	-	-	-	-	-
	SBGR	-	-	-	-	-	-	-	-	-
	VHHH	-	-	-	-	-	-	-	-	-
	ZBAA	-	-	-	-	-	-	-	100	-
	ZSPD	-	-	-	-	-	-	-	100	-
	Overall	-	-	-	17.6	-	52.9	11.8	11.8	5.9
777300	KLAX	-	-	-	100	-	-	-	-	-
	KMEM	100	-	-	-	-	-	-	-	-
	PANC	-	-	-	100	-	-	-	-	-
	RCTP (1)	-	-	-	-	-	-	100	-	-
	ZBAA (1)	-	-	-	-	-	-	100	-	-
	Overall	16.7	-	-	33.3	-	-	50.0	-	-
7773ER	LSZH	-	-	-	-	-	100	-	-	-
	OMAA	-	-	-	-	-	-	-	100	-
	OTHH	-	-	-	-	-	-	-	-	100
	RJAA	-	-	-	-	-	-	100	-	-
	RJTT	-	-	-	-	-	-	100	-	-
	RKSI	-	-	-	-	-	-	-	100	-
	VHHH	-	-	-	-	-	-	-	-	100
	ZSPD	-	-	-	-	-	-	-	100	-
	Overall	-	-	-	-	-	10.0	30.0	40.0	20.0
7878R	EGLL	-	-	-	-	100	-	-	-	-
	EIDW	-	-	-	-	100	-	-	-	-
	EPWA	-	-	-	-	-	100	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	KPHL	-	100	-	-	-	-	-	-	-
	KPNS	-	100	-	-	-	-	-	-	-
	KPVD	-	100	-	-	-	-	-	-	-
	KRAP	-	100	-	-	-	-	-	-	-
	KRIC	-	100	-	-	-	-	-	-	-
	KROC	100	-	-	-	-	-	-	-	-
	KSAT	-	100	-	-	-	-	-	-	-
	KSAW	100	-	-	-	-	-	-	-	-
	KSDF	100	-	-	-	-	-	-	-	-
	KSGF	100	-	-	-	-	-	-	-	-
	KSLC	-	-	100	-	-	-	-	-	-
	KSTL	100	-	-	-	-	-	-	-	-
	KSUX	100	-	-	-	-	-	-	-	-
	KSYR	-	100	-	-	-	-	-	-	-
	KTOL	100	-	-	-	-	-	-	-	-
	KTUL	-	100	-	-	-	-	-	-	-
	KTVC	100	-	-	-	-	-	-	-	-
	KTYS	100	-	-	-	-	-	-	-	-
	KXNA	100	-	-	-	-	-	-	-	-
	MMMY	-	-	100	-	-	-	-	-	-
	Overall	62.4	33.2	4.4	-	-	-	-	-	-
DC1010	KAFW	-	100	-	-	-	-	-	-	-
	KIND	100	-	-	-	-	-	-	-	-
	KMEM	100	-	-	-	-	-	-	-	-
	KOAK	-	-	-	100	-	-	-	-	-
	Overall	60.0	20.0	-	20.0	-	-	-	-	-
DHC6	KOMA	100	-	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	KDFW	-	100	-	-	-	-	-	-	-
	KLAX	-	-	-	-	-	-	-	-	-
	KPHL	-	100	-	-	-	-	-	-	-
	KSEA	-	-	100	-	-	-	-	-	-
	LEBL	-	-	-	-	-	100	-	-	-
	OJAI	-	-	-	-	-	-	100	-	-
	RJAA	-	-	-	-	-	-	100	-	-
	ZBAA	-	-	-	-	-	-	-	100	-
	ZSPD	-	-	-	-	-	-	-	100	-
	Overall (5)	-	11.8	11.8	11.8	29.4	11.8	11.8	11.8	-
A300-622R	KOMA	100	-	-	-	-	-	-	-	-
	KSDF	100	-	-	-	-	-	-	-	-
A319-131	CYUL	-	100	-	-	-	-	-	-	-
	CYVR	-	-	-	100	-	-	-	-	-
	CYYC	-	-	100	-	-	-	-	-	-
	KALB	-	100	-	-	-	-	-	-	-
	KATL	-	100	-	-	-	-	-	-	-
	KBNA	100	-	-	-	-	-	-	-	-
	KCLT	-	100	-	-	-	-	-	-	-
	KCMH	100	-	-	-	-	-	-	-	-
	KDCA	-	100	-	-	-	-	-	-	-
	KDSM	100	-	-	-	-	-	-	-	-
	KEWR	-	100	-	-	-	-	-	-	-
	KIAD	-	100	-	-	-	-	-	-	-
	KICT	-	100	-	-	-	-	-	-	-
	KIND	100	-	-	-	-	-	-	-	-
	KJAX	-	100	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
EMB145	CYOW	-	100	-	-	-	-	-	-	-
	CYUL	-	100	-	-	-	-	-	-	-
	CYWG	-	100	-	-	-	-	-	-	-
	CYYZ	100	-	-	-	-	-	-	-	-
	KALO	100	-	-	-	-	-	-	-	-
	KATW	100	-	-	-	-	-	-	-	-
	KAVL	100	-	-	-	-	-	-	-	-
	KAZO	100	-	-	-	-	-	-	-	-
	KBHM	-	100	-	-	-	-	-	-	-
	KBMI	100	-	-	-	-	-	-	-	-
	KBNA	100	-	-	-	-	-	-	-	-
	KBTV	-	100	-	-	-	-	-	-	-
	KCAE	-	100	-	-	-	-	-	-	-
	KCAK	100	-	-	-	-	-	-	-	-
	KCHA	100	-	-	-	-	-	-	-	-
	KCHO	100	-	-	-	-	-	-	-	-
	KCHS	-	100	-	-	-	-	-	-	-
	KCID	100	-	-	-	-	-	-	-	-
	KCLE	100	-	-	-	-	-	-	-	-
	KCMI	100	-	-	-	-	-	-	-	-
	KCMX	100	-	-	-	-	-	-	-	-
	KCOS	-	100	-	-	-	-	-	-	-
	KCOU	100	-	-	-	-	-	-	-	-
	KCRW	100	-	-	-	-	-	-	-	-
	KCVG	100	-	-	-	-	-	-	-	-
	KCWA	100	-	-	-	-	-	-	-	-
	KDAY	100	-	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	KLGA	-	100	-	-	-	-	-	-	-
	KMCI	100	-	-	-	-	-	-	-	-
	KMDT	-	100	-	-	-	-	-	-	-
	KMKE	100	-	-	-	-	-	-	-	-
	KMSN	100	-	-	-	-	-	-	-	-
	KOMA	100	-	-	-	-	-	-	-	-
	KPIT	100	-	-	-	-	-	-	-	-
	KRIC	-	100	-	-	-	-	-	-	-
	KSAN	-	-	100	-	-	-	-	-	-
	KSLC	-	-	100	-	-	-	-	-	-
	MMMX	-	-	100	-	-	-	-	-	-
	MMMY	-	-	100	-	-	-	-	-	-
	Overall	36.0	42.0	16.0	6.0	-	-	-	-	-
A320-211	KATL	-	100	-	-	-	-	-	-	-
	KJAC	-	-	100	-	-	-	-	-	-
	KLAX	-	-	-	100	-	-	-	-	-
	KMSP	100	-	-	-	-	-	-	-	-
	KSFO	-	-	-	100	-	-	-	-	-
	KSLC	-	-	100	-	-	-	-	-	-
	MDPC	-	-	-	100	-	-	-	-	-
	MMMX	-	-	100	-	-	-	-	-	-
	Overall	21.4	7.1	28.6	42.9	-	-	-	-	-
A320-232	CYVR	-	-	-	100	-	-	-	-	-
	CYYZ	100	-	-	-	-	-	-	-	-
	KAUS	-	100	-	-	-	-	-	-	-
	KBDL	-	100	-	-	-	-	-	-	-
	KBNA	100	-	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	KDBQ	100	-	-	-	-	-	-	-	-
	KDLH	100	-	-	-	-	-	-	-	-
	KEAU	100	-	-	-	-	-	-	-	-
	KEVV	100	-	-	-	-	-	-	-	-
	KFAR	100	-	-	-	-	-	-	-	-
	KFNT	100	-	-	-	-	-	-	-	-
	KFSD	100	-	-	-	-	-	-	-	-
	KFWA	100	-	-	-	-	-	-	-	-
	KGRB	100	-	-	-	-	-	-	-	-
	KGRR	100	-	-	-	-	-	-	-	-
	KGSO	-	100	-	-	-	-	-	-	-
	KGSP	-	100	-	-	-	-	-	-	-
	KHPN	-	100	-	-	-	-	-	-	-
	KIAD	-	100	-	-	-	-	-	-	-
	KICT	-	100	-	-	-	-	-	-	-
	KIND	100	-	-	-	-	-	-	-	-
	KJAN	-	100	-	-	-	-	-	-	-
	KLAN	100	-	-	-	-	-	-	-	-
	KLEX	100	-	-	-	-	-	-	-	-
	KLIT	100	-	-	-	-	-	-	-	-
	KLNK	100	-	-	-	-	-	-	-	-
	KLSE	100	-	-	-	-	-	-	-	-
	KMBS	100	-	-	-	-	-	-	-	-
	KMHK	100	-	-	-	-	-	-	-	-
	KMHT	-	100	-	-	-	-	-	-	-
	KMKE	100	-	-	-	-	-	-	-	-
	KMKG	100	-	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	KBOS	-	100	-	-	-	-	-	-	-
	KBUF	100	-	-	-	-	-	-	-	-
	KBWI	-	100	-	-	-	-	-	-	-
	KCLE	100	-	-	-	-	-	-	-	-
	KCMH	100	-	-	-	-	-	-	-	-
	KDCA	-	100	-	-	-	-	-	-	-
	KDFW	-	100	-	-	-	-	-	-	-
	KEWR	-	100	-	-	-	-	-	-	-
	KFLL	-	-	100	-	-	-	-	-	-
	KGRR	100	-	-	-	-	-	-	-	-
	KIAD	-	100	-	-	-	-	-	-	-
	KIAH	-	100	-	-	-	-	-	-	-
	KJFK	-	100	-	-	-	-	-	-	-
	KLAX	-	-	-	100	-	-	-	-	-
	KLGA	-	100	-	-	-	-	-	-	-
	KMDT	-	100	-	-	-	-	-	-	-
	KMEM	100	-	-	-	-	-	-	-	-
	KMSP	100	-	-	-	-	-	-	-	-
	KMSY	-	100	-	-	-	-	-	-	-
	KOAK	-	-	-	100	-	-	-	-	-
	KPHL	-	100	-	-	-	-	-	-	-
	KPHX	-	-	100	-	-	-	-	-	-
	KPIT	100	-	-	-	-	-	-	-	-
	KRDU	-	100	-	-	-	-	-	-	-
	KROC	100	-	-	-	-	-	-	-	-
	KSAN	-	-	100	-	-	-	-	-	-
	KSFO	-	-	-	100	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	KMLI	100	-	-	-	-	-	-	-	-
	KMSN	100	-	-	-	-	-	-	-	-
	KPAH	100	-	-	-	-	-	-	-	-
	KPIA	100	-	-	-	-	-	-	-	-
	KPIT	100	-	-	-	-	-	-	-	-
	KPVD	-	100	-	-	-	-	-	-	-
	KPWM	-	100	-	-	-	-	-	-	-
	KRAP	-	100	-	-	-	-	-	-	-
	KRIC	-	100	-	-	-	-	-	-	-
	KROA	100	-	-	-	-	-	-	-	-
	KRST	100	-	-	-	-	-	-	-	-
	KSAV	-	100	-	-	-	-	-	-	-
	KSBN	100	-	-	-	-	-	-	-	-
	KSDF	100	-	-	-	-	-	-	-	-
	KSGF	100	-	-	-	-	-	-	-	-
	KSPI	100	-	-	-	-	-	-	-	-
	KSTL	100	-	-	-	-	-	-	-	-
	KSYR	-	100	-	-	-	-	-	-	-
	KTOL	100	-	-	-	-	-	-	-	-
	KTUL	-	100	-	-	-	-	-	-	-
	KTVC	100	-	-	-	-	-	-	-	-
	KTYS	100	-	-	-	-	-	-	-	-
	KUNV	100	-	-	-	-	-	-	-	-
	KXNA	100	-	-	-	-	-	-	-	-
	Overall	76.3	23.7	-	-	-	-	-	-	-
EMB170	CYUL	-	100	-	-	-	-	-	-	-
	CYYC		-	100	-	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	KSNA	-	-	100	-	-	-	-	-	-
	KTPA	-	100	-	-	-	-	-	-	-
	MMMX	-	-	100	-	-	-	-	-	-
	Overall	32.9	42.1	13.2	11.8	-	-	-	-	-
A321-232	KAUS	-	100	-	-	-	-	-	-	-
	KBDL	-	100	-	-	-	-	-	-	-
	KBOS	-	100	-	-	-	-	-	-	-
	KCLT	-	100	-	-	-	-	-	-	-
	KDCA	-	100	-	-	-	-	-	-	-
	KDEN	-	100	-	-	-	-	-	-	-
	KDFW	-	100	-	-	-	-	-	-	-
	KFLL	-	-	100	-	-	-	-	-	-
	KJFK	-	100	-	-	-	-	-	-	-
	KLAS	-	-	100	-	-	-	-	-	-
	KLAX	-	-	-	100	-	-	-	-	-
	KLGA	-	100	-	-	-	-	-	-	-
	KMCO	-	100	-	-	-	-	-	-	-
	KMIA	-	-	100	-	-	-	-	-	-
	KPDX	-	-	-	100	-	-	-	-	-
	KPHL	-	100	-	-	-	-	-	-	-
	KPHX	-	-	100	-	-	-	-	-	-
	KRSW	-	100	-	-	-	-	-	-	-
	KSAN	-	-	100	-	-	-	-	-	-
	KSEA	-	-	100	-	-	-	-	-	-
	KSFO	-	-	-	100	-	-	-	-	-
	KTPA	-	100	-	-	-	-	-	-	-
	KTTN	-	100	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	Destination	1	2	3	4	5	6	7	8	9
	KALB	-	100	-	-	-	-	-	-	-
	KASE	-	100	-	-	-	-	-	-	-
	KATL	-	100	-	-	-	-	-	-	-
	KBDL	-	100	-	-	-	-	-	-	-
	KBNA	100	-	-	-	-	-	-	-	-
	KBOI	-	-	100	-	-	-	-	-	-
	KBTV	-	100	-	-	-	-	-	-	-
	KBUF	100	-	-	-	-	-	-	-	-
	KBWI	-	100	-	-	-	-	-	-	-
	KCHS	-	100	-	-	-	-	-	-	-
	KCID	100	-	-	-	-	-	-	-	-
	KCLE	100	-	-	-	-	-	-	-	-
	KCLT	-	100	-	-	-	-	-	-	-
	KCMH	100	-	-	-	-	-	-	-	-
	KCMX	100	-	-	-	-	-	-	-	-
	KCVG	100	-	-	-	-	-	-	-	-
	KDCA	-	100	-	-	-	-	-	-	-
	KDFW	-	100	-	-	-	-	-	-	-
	KDSM	100	-	-	-	-	-	-	-	-
	KDTW	100	-	-	-	-	-	-	-	-
	KEWR	-	100	-	-	-	-	-	-	-
	KFSD	100	-	-	-	-	-	-	-	-
	KIAH	-	100	-	-	-	-	-	-	-
	KICT	-	100	-	-	-	-	-	-	-
	KIND	100	-	-	-	-	-	-	-	-
	KJAX	-	100	-	-	-	-	-	-	-
	KLGA	-	100	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	**Destination**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	MMGL			-	100	-	-	-	-	-
	MMMX		-	100	-	-	-	-	-	-
	MMUN		-	100	-	-	-	-	-	-
	Overall	-	55.6	29.6	14.8	-	-	-	-	-
A330-301	EFHK	-	-	-	-	-	100	-	-	-
	EIDW	-	-	-	-	100	-	-	-	-
	LFPG	-	-	-	-	-	100	-	-	-
	LIRF	-	-	-	-	-	100	-	-	-
	Overall	-	-	-	-	40.0	60.0	-	-	-
A330-343	EDDT	-	-	-	-	-	100	-	-	-
	EKCH	-	-	-	-	-	100	-	-	-
	ESSA	-	-	-	-	-	100	-	-	-
	RKSI (1)	-	-	-	-	-	-	100	-	-
	Overall	-	-	-	-	-	75.0	25.0	-	-
A340-642	LEMD	-	-	-	-	-	100	-	-	-
A380-841	EGLL	-	-	-	-	100	-	-	-	-
A380-861	OMDB	-	-	-	-	-	-	-	100	-
CIT3	KLUK	100	-	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length								
AEDT_ID	**Destination**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	KLIT	100	-	-	-	-	-	-	-	-
	KMCI	100	-	-	-	-	-	-	-	-
	KMEM	100	-	-	-	-	-	-	-	-
	KMSN	100	-	-	-	-	-	-	-	-
	KMSY	-	100	-	-	-	-	-	-	-
	KMTJ	-	100	-	-	-	-	-	-	-
	KOKC	-	100	-	-	-	-	-	-	-
	KOMA	100	-	-	-	-	-	-	-	-
	KORF	-	100	-	-	-	-	-	-	-
	KPAH	100	-	-	-	-	-	-	-	-
	KPHL	-	100	-	-	-	-	-	-	-
	KPIT	100	-	-	-	-	-	-	-	-
	KRDU	-	100	-	-	-	-	-	-	-
	KSAT	-	100	-	-	-	-	-	-	-
	KSDF	100	-	-	-	-	-	-	-	-
	KSLC	-	-	100	-	-	-	-	-	-
	KSPI	100	-	-	-	-	-	-	-	-
	KTUL	-	100	-	-	-	-	-	-	-
	KXNA	100	-	-	-	-	-	-	-	-
	Overall (5)	41.7	53.2	5.0	-	-	-	-	-	-
EMB190	CYYZ	100	-	-	-	-	-	-	-	-
	KBOS	-	100	-	-	-	-	-	-	-
	Overall	80.0	20.0	-	-	-	-	-	-	-
GV	KDAL (2)	100	-	-	-	-	-	-	-	-
	KLAS (3)	100	-	-	-	-	-	-	-	-
	KLAX (4)	100	-	-	-	-	-	-	-	-
IA1125	KBKL	100	-	-	-	-	-	-	-	-

		Percentage of Flights at Stage Length											Percentage of Flights at Stage Length								
AEDT_ID	**Destination**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**AEDT_ID**	**Destination**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
												KPIT	100	-	-	-	-	-	-	-	-
											LEAR35	KBNA	100	-	-	-	-	-	-	-	-
												KGEU (3)	100	-	-	-	-	-	-	-	-
												KICT (2)	100	-	-	-	-	-	-	-	-
												KLAN	100	-	-	-	-	-	-	-	-
												KMKC	100	-	-	-	-	-	-	-	-
												KPEO	100	-	-	-	-	-	-	-	-
											MD11GE	EDDF	-	-	-	-	-	100	-	-	-
											MD82	KAUS	-	100	-	-	-	-	-	-	-
												KDFW	-	100	-	-	-	-	-	-	-
												KDTW	100	-	-	-	-	-	-	-	-
												KRDU	-	100	-	-	-	-	-	-	-
												KSTL	100	-	-	-	-	-	-	-	-
												KTPA	-	100	-	-	-	-	-	-	-
												KTUL	-	100	-	-	-	-	-	-	-
												KTUS	-	-	100	-	-	-	-	-	-
												Overall (5)	33.3	57.1	9.5	-	-	-	-	-	-
											MD83	KATL	-	100	-	-	-	-	-	-	-
												KDTW	100	-	-	-	-	-	-	-	-
												Overall	10.0	90.0	-	-	-	-	-	-	-
											MD9025	KMSP	100	-	-	-	-	-	-	-	-
											MU3001	KIFA	100	-	-	-	-	-	-	-	-

Note: 1) Destination is Stage Length 8 but 7 is AEDT's maximum for this aircraft type

2) Destination is Stage Length 2 but 1 is AEDT's maximum for this aircraft type

3) Destination is Stage Length 3 but 1 is AEDT's maximum for this aircraft type

4) Destination is Stage Length 4 but 1 is AEDT's maximum for this aircraft type

5) Values rounded to 1 decimal point; total may not equal to 100.0 due to rounding

Source: HMMH, 2018.

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Zero Runway Use Memo

HMMH
77 South Bedford Street
Burlington, Massachusetts 01803
781.229.0707
www.hmmh.com

TECHNICAL MEMORANDUM

To:	Amy Hanson Environmental Specialist FAA
From:	Robert Mentzer Jr. Principal Consultant
Date:	August 18, 2018
Subject:	Final – Interim Fly Quiet Re-Evaluation Zero Runway Use Methodology
Reference:	HMMH Project Number 307171.001.006.001

1. Runway Use

The TAAM model was used to model the most commonly used configurations for the Existing Fly Quiet at Chicago O'Hare International Airport (ORD). Given the large number of runway configurations at ORD, it is impractical to model all configurations and therefore TAAM modeling includes only the most prevalent configurations. This results in zero-percent runway usage for runways that in reality have a small usage percentage. During the Interim Fly Quiet Re-Evaluation modeling period, we expect that most runways, even those with very low usage percentage, may have some operations to allow for safe and efficient operations during unforeseen circumstances such as runway maintenance closures or weather potential conditions. Therefore, post-processing adjustments to the TAAM outputs to allocate flights to the runways with zero percent utilization prior to noise modeling is required. The adjustments developed below would be applied to the Existing Fly Quiet and the Proposed Interim Fly Quiet. The 2015 Re-Evaluation of the EIS used a methodology similar to that presented below.

2. TAAM Runway Use

Annualization of the TAAM model 24-hour simulation results provide the annual average runway use for the Interim Fly Quiet Re-Evaluation's Existing Fly Quiet. Table 1 provides the daytime runway use (7:00 AM to 9:59 PM) and Table 2 presents the nighttime runway use (10:00 PM to 6:59 AM). As previously discussed, the TAAM runway use results in multiple runways having zero percent usage.

Date: 8/18/2018

Table 1 - 24 Hour Factor TAAM Day Runway Use Percentage
Source: Ricondo & Associates 6/22/2018

From Table 2B: Runway Use (Daytime)			
Annualized - 24 Hour Factor (Experiments 551 through 554)			
Runway	Arrivals	Departures	Grand Total
9L	13.9%	0.0%	6.9%
9R	0.9%	16.6%	8.9%
10L	0.0%	0.8%	0.4%
10L(INT)	0.0%	17.5%	8.8%
10C	13.4%	0.0%	6.6%
10R	6.8%	0.0%	3.4%
27L	23.7%	0.0%	11.7%
27R	20.2%	0.0%	10.0%
28L	0.0%	0.0%	0.0%
28C	21.0%	0.0%	10.4%
28R	0.0%	1.9%	1.0%
28R(INT)	0.0%	35.5%	17.9%
22L	0.0%	27.7%	14.0%
22R	0.0%	0.0%	0.0%
4L	0.0%	0.0%	0.0%
4R	0.0%	0.0%	0.0%
Totals	**100.0%**	**100.0%**	**100.0%**
Note: Totals may not equal 100% due to rounding			

Table 2 - 24 Hour Factor TAAM Night Runway Use Percentage
Source: Ricondo & Associates 6/22/2018

From Table 2C: Runway Use (Nighttime)			
Annualized - 24 Hour Factor (Experiments 551 through 554)			
Runway	Arrivals	Departures	Grand Total
9L	6.3%	0.0%	3.5%
9R	1.1%	22.2%	10.5%
10L	18.0%	7.2%	13.2%
10L(INT)	0.0%	6.9%	3.1%
10C	9.4%	0.0%	5.3%
10R	0.6%	0.0%	0.3%
27L	41.4%	0.0%	23.1%
27R	9.2%	0.0%	5.2%
28L	0.0%	0.0%	0.0%
28C	8.2%	0.0%	4.5%
28R	5.7%	37.3%	19.7%
28R(INT)	0.0%	11.6%	5.1%
22L	0.0%	14.8%	6.5%
22R	0.0%	0.0%	0.0%
4L	0.0%	0.0%	0.0%
4R	0.0%	0.0%	0.0%
Totals	**100.0%**	**100.0%**	**100.0%**
Note: Totals may not equal 100% due to rounding			

Date: 8/18/2018

3. Evaluation of 2017-2018 Radar Data

To identify proper runway usage for each of the TAAM zero percent runways we evaluated a historical sample of radar data collected from the Chicago Department of Aviation (CDA) Airport Noise Management System (ANMS). The data is representative of the expected Interim Fly Quiet modeling period[1] (one week of each month between Jan 2017 - May 15, 2017 and Sep 16, 2017 - Apr 2018 totaling 86 days). As shown in grey shading in Table 3, during daytime, for both arrivals and departures, the radar data sample showed most runways at 0.2% or less for the zero percent runways. There is one runway at 0.4%, three at 0.2% and two at 0.1%. We propose to use 0.2% for all daytime zero percent runways.

The nighttime percentages are higher for several runways, such as arrivals to Runways 22R, and departures from Runways 10C and 28C. Some of the difference may be attributable to the start of Interim Fly Quiet Test 2 and the end of Interim Fly Quiet Test 3, however each sample only overlaps the tests by one week. Blue shading in Table 3 shows the nighttime percentages for the zero percent runways.

Table 3 – Aircraft Operations Counts and Runway Usage from Radar Data Sample (Jan -May 2017, Sept 2017 - April 2018)
Source: ANMS Data and HMMH Analysis, July 2018

Runway	Arrivals				Departures			
	Daytime		Nighttime		Daytime		Nighttime	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
4L[1]	0	0.0%	0	0.0%	206	0.2%	28	0.4%
4R	190	0.2%	34	0.3%	3	0.0%	0	0.0%
9L	10,183	11.6%	491	4.2%	0	0.0%	0	0.0%
9R	610	0.7%	130	1.1%	15,364	17.0%	1,227	17.1%
10C	12,132	13.9%	1,811	15.7%	8	0.0%	111	1.6%
10L	325	0.4%	1,120	9.7%	13,494	14.9%	966	13.5%
10R	4,728	5.4%	104	0.9%	1	0.0%	0	0.0%
22L	1	0.0%	0	0.0%	21,934	24.2%	1,111	15.5%
22R[2]	0	0.0%	89	0.8%	0	0.0%	0	0.0%
27L	25,908	29.6%	3,747	32.4%	219	0.2%	19	0.3%
27R	16,969	19.4%	498	4.3%	0	0.0%	2	0.0%
28C	16,300	18.6%	2,611	22.6%	119	0.1%	269	3.8%
28L	1	0.0%	1	0.0%	1	0.0%	0	0.0%
28R	91	0.1%	925	8.0%	39,187	43.3%	3,426	47.9%
Total (no 15/33)[1]	**87,438**	**100.0%**	**11,561**	**100.0%**	**90,536**	**100.0%**	**7,159**	**100.0%**

Notes:
Grey shading indicates TAAM daytime zero use runways
Blue shading indicates TAAM nighttime zero use runways
Totals may not equal 100% due to rounding
1) Arrivals to Runway 4L remain at zero
2) Departures from Runway 22R remain at zero
3) Runway 15/33 closed permanently in March 2018; therefore, data from Runway 15/33 is excluded from the sample.

[1] IFQ period is expected to be Nov 2019 –May 15, 2020 and Sept 16, 2020 to Jan, 2021

Date: 8/18/2018

To check the influence of the Interim Fly Quiet test period on the radar sample nighttime operations, we reviewed the CDA ANMS Reports for Nov 2017 - Mar 2018 (this period is after Test 3 completed) for the two runway ends in the radar data sample with night runway usage greater than or equal to 0.5%. This information is provided in Table 4 and shows general agreement for departures from Runways 28C (4.8% from ANMS reports and 3.8% from radar data sample) and 10C (1.6% from ANMS reports and 1.6% from radar data sample). Based on this information, the recommended adjustments for departures from Runway 28C is 4.0%, and departures from 10C is 1.6%.

Table 4 – Night Runway Use Percentage from ANMS Reports
Source: ANMS Reports –Page 5 and HMMH Analysis, May 2018

Mode/Rwy	Nov 2017	Dec 2017	Jan 2018	Feb 2018	Mar 2018	Average	Radar Data Sample
Dep/28C	3%	5%	8%	6%	2%	4.8%	3.8%
Dep/10C	2%	0%	0%	1%	5%	1.6%	1.6%

The 2015 Re-Evaluation on average shifted 0.5% of the traffic to the zero percent runways. Based on this analysis, we recommend shifting 0.2% of the overall traffic between runways barring other operational considerations. Other operational considerations present in the 2015 Re-Evaluation, and still valid for nighttime operations for this analysis, are:

- Arrivals to Runway 4L and departures from Runway 22R should remain at zero percent for the Existing Fly Quiet Alternative; those runways are not expected to be used due to interactions with intersecting operations from Runway 10L-28R
- For departures shifting from Runway 10L/28R, only the intersection departure operations should be shifted between runways
- Wide-body departure operations are excluded from being shifted from one runway to another

In general, operations shifting from one runway to the other were determined by selecting the nearest runway with similar operations (same mode and flow) so that operations remain remained over similar areas if possible.

For example: Runway 4L departures were shifted from Runway 9L departures since the runway end is very close, they would both be in the same flow and are on the same side of the airfield.

Exceptions to this are situations such as Runway 28R departures to Runways 27L and 27R because there were no TAAM assigned departures in West flow on the North side of the airfield.

Date: 8/18/2018

4. Proposed Runway Use Adjustments for Existing Fly Quiet

The following table presents the proposed adjustments for Existing Fly Quiet.

Table 5 - Existing Fly Quiet Runway Use Adjustments for TAAM Zero Percent Runways
Source: HMMH Analysis, May 2018

Source Runway	Operation Type	Receiving Runway	Day/Night	Activity Shift
09R	Departure	04L	Day	0.2%
09R	Departure	09L	Day	0.2%
10L	Departure	10C	Day	0.2%
10L	Departure	10R	Day	0.2%
10L	Departure	04R	Day	0.2%
28R	Departure	27R	Day	0.2%
28R	Departure	27L	Day	0.2%
22L	Departure	28C	Day	0.2%
22L	Departure	28L	Day	0.2%
09R	Departure	04L	Night	0.4%
09R	Departure	09L	Night	0.2%
10L	Departure	10C	Night	1.6%
10L	Departure	10R	Night	0.2%
10L	Departure	04R	Night	0.2%
28R	Departure	27R	Night	0.2%
28R	Departure	27L	Night	0.2%
28R	Departure	28C	Night	4.0%
28R	Departure	28L	Night	0.2%
10C	Arrival	10L	Day	0.2%
10R	Arrival	04R	Day	0.2%
27R	Arrival	22R	Day	0.2%
28C	Arrival	22L	Day	0.2%
28C	Arrival	28L	Day	0.2%
28C	Arrival	28R	Day	0.2%
10C	Arrival	04R	Night	0.2%
28R	Arrival	22L	Night	0.2%
27L	Arrival	22R	Night	0.2%
28C	Arrival	28L	Night	0.2%

Note: For Arrivals - all operations were shifted from the source to the receiving runway.
For Departures:
1) from Runway 10L/28R– only operations from the intersection departures were shifted from the source to the receiving runway.
2) Wide-body operations are excluded from being shifted from one runway to another

Source: FAA & HMMH, July 2018.

Date: 8/18/2018

5. Comparison of TAAM and Adjusted Existing Fly Quiet Runway Use

Tables 6 and 7 below provide annual average runway use for the Existing Fly Quiet from TAAM and the Existing Flight Quiet runway use after the adjustments discussed in Section 3 above. Table 6 provides the daytime (7:00 AM to 9:59 PM) runway use and Table 7 presents the nighttime (10:00 PM to 6:59 AM) runway use.

Table 6 - TAAM and Existing Fly Quiet Daytime Runway Use Percentage
Source: Ricondo & Associates 6/22/2018 and HMMH analysis July 2018

Runway Use (Daytime)				
Runway	TAAM Departures	Existing Fly Quiet Departures	TAAM Arrivals	Existing Fly Quiet Arrivals
09L	0.0%	0.2%	13.9%	13.9%
09R	16.6%	16.2%	0.9%	0.9%
10L	0.8%	0.8%	0.0%	0.2%
10L(INT)[1]	17.5%	16.9%	0.0%	0.0%
10C	0.0%	0.2%	13.4%	13.2%
10R	0.0%	0.2%	6.8%	6.6%
27L	0.0%	0.2%	23.7%	23.7%
27R	0.0%	0.2%	20.2%	20.0%
28L	0.0%	0.2%	0.0%	0.2%
28C	0.0%	0.2%	21.0%	20.4%
28R	1.9%	1.9%	0.0%	0.2%
28R(INT)[1]	35.5%	35.1%	0.0%	0.0%
22L	27.7%	27.3%	0.0%	0.2%
22R	0.0%	0.0%	0.0%	0.2%
04L	0.0%	0.2%	0.0%	0.0%
04R	0.0%	0.2%	0.0%	0.2%
Totals	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Notes: Totals may not equal 100% due to rounding
1) Intersection (INT) departures are allowed on Runways 10L/28R

Table 7 - TAAM and Existing Fly Quiet Nighttime Runway Use Percentage
Source: Ricondo & Associates 6/22/2018 and HMMH analysis July 2018

Runway Use (Nighttime)				
Runway	TAAM Departures	Existing Fly Quiet Departures	TAAM Arrivals	Existing Fly Quiet Arrivals
09L	0.0%	0.2%	6.3%	6.3%
09R	22.2%	21.6%	1.1%	1.1%
10L	7.2%	7.2%	18.0%	18.0%
10L(INT)[1]	6.9%	4.9%	0.0%	0.0%
10C	0.0%	1.6%	9.4%	9.2%
10R	0.0%	0.2%	0.6%	0.6%
27L	0.0%	0.2%	41.4%	41.2%
27R	0.0%	0.2%	9.2%	9.3%
28L	0.0%	0.2%	0.0%	0.2%
28C	0.0%	4.0%	8.2%	8.0%
28R	37.3%	37.3%	5.7%	5.5%
28R(INT)[1]	11.6%	7.0%	0.0%	0.0%
22L	14.8%	14.8%	0.0%	0.2%
22R	0.0%	0.0%	0.0%	0.2%
04L	0.0%	0.4%	0.0%	0.0%
04R	0.0%	0.2%	0.0%	0.2%
Totals	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Notes: Totals may not equal 100% due to rounding
1) Intersection (INT) departures are allowed on Runways 10L/28R

Date: 8/18/2018

6. Proposed Runway Use Adjustments for Proposed Interim Fly Quiet

The Proposed Interim Fly Quiet, Revised Interim Fly Quiet 1 and Revised interim Fly Quiet 2 will use similar adjustments as Existing Fly Quiet. The daytime adjustments and runway use are the same between Existing Fly Quiet and the Proposed Interim Fly Quiet alternatives. The CDA Runway Use Process modified the nighttime usage only of the runways for each Proposed Interim Fly Quiet alternative, therefore different zero runway use adjustments are needed. The following table presents the proposed adjustments for Proposed Interim Fly Quiet.

Table 8 – Proposed Interim Fly Quiet Runway Use Adjustments for TAAM Zero Percent Runways
Source: HMMH Analysis, August 2018

Source Runway	Operation Type	Receiving Runway	Day/Night	Activity Shift
09R	Departure	04L	Day	0.2%
09R	Departure	09L	Day	0.2%
10L(Int.)	Departure	10C	Day	0.2%
10L(Int.)	Departure	10R	Day	0.2%
10L(Int.)	Departure	04R	Day	0.2%
28R(Int.)	Departure	27R	Day	0.2%
28R(Int.)	Departure	27L	Day	0.2%
22L	Departure	28C	Day	0.2%
22L	Departure	28L	Day	0.2%
09R	**Departure**	**09L**	**Night**	**0.2%**
10L(Int.)	**Departure**	**10R**	**Night**	**0.2%**
10L(Int.)	**Departure**	**04R**	**Night**	**0.2%**
28R(Int.)	**Departure**	**27L**	**Night**	**0.2%**
28R(Int.)	**Departure**	**27R**	**Night**	**0.2%**
28C	**Departure**	**28L**	**Night**	**0.2%**
10C	Arrival	10L	Day	0.2%
10R	Arrival	04R	Day	0.2%
27R	Arrival	22R	Day	0.2%
28C	Arrival	22L	Day	0.2%
28C	Arrival	28L	Day	0.2%
28C	Arrival	28R	Day	0.2%
28C	**Arrival**	**28L**	**Night**	**0.2%**
28C	**Arrival**	**22L**	**Night**	**0.2%**

Note: Day adjustments are the same as Existing Fly Quiet.
Night adjustments for Proposed Interim Fly Quiet and Revised Interim Fly Quiet 1 and 2 are shown in **BOLD**.
For Arrivals, all operations were shifted from the Source to the Receiving Runway.
For Departures, only non-wide-body operations were shifted from the Source to the Receiving Runway.
Source: FAA & HMMH, August 2018.

Date: 8/18/2018

7. Comparison of TAAM and Adjusted Proposed Interim Fly Quiet Runway Use

Table 9 below provide nighttime (10:00 PM to 6:59 AM) annual average runway use for the Proposed Interim Fly Quiet from the CDA Runway Use Process and the Proposed Interim Flight Quiet runway use after the adjustments discussed in Section 6 above.

Table 9 – CDA Runway Use Process and Proposed Interim Fly Quiet Nighttime Runway Use Percentage
Source: CDA 8/16/2018 and HMMH analysis, August 2018

Runway Use (Nighttime)				
Runway	CDA Runway Use Process Proposed Interim Fly Quiet Departures	Adjusted Proposed Interim Fly Quiet Departures	CDA Runway Use Process Proposed Interim Fly Quiet Arrivals	Adjusted Proposed Interim Fly Quiet Arrivals
09L	0.0%	0.2%	6.3%	6.3%
09R	16.3%	16.1%	0.3%	0.3%
10L	9.0%	9.0%	7.1%	7.1%
10L(INT)[1]	6.8%	6.4%	-	-
10C	1.2%	1.2%	16.1%	16.1%
10R	0.0%	0.2%	0.6%	0.6%
27L	0.0%	0.2%	22.3%	22.3%
27R	0.0%	0.2%	9.2%	9.2%
28L	0.0%	0.2%	0.0%	0.2%
28C	5.6%	5.4%	19.8%	19.4%
28R	26.9%	26.9%	2.6%	2.6%
28R(INT)[1]	11.0%	10.6%	-	-
22L	20.2%	20.2%	0.0%	0.2%
22R	-	-	10.6%	10.6%
04L	3.0%	3.0%	-	-
04R	0.0%	0.2%	5.0%	5.0%
Totals	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Notes: Totals may not equal 100% due to rounding
2) Intersection (INT) departures are allowed on Runways 10L/28R

The nighttime runway use for the Revised Interim Fly Quiet 1 and Revised Interim Fly Quiet 2 is different than the Proposed Interim Fly Quiet however the zero runways and adjustments are the same.

Date: 8/18/2018

ATTACHMENT C-3

BASICS OF NOISE & TERMINOLOGY

BASICS OF NOISE

In this appendix we introduce the basic terms needed to understand the noise analysis in this document. FAA specifies[25] how to analyze aviation noise. Day-Night Average Sound Level (DNL) is the most important metric used to assess overall noise exposure. For a given location over a year, the DNL value represents all the aviation noise over the course of an average annual day. Many other simpler noise metrics build to the final DNL calculation. The following sections introduce basic acoustics terms. The final page presents currently accepted guidelines for land use within certain noise levels.

Introduction to Acoustics and Noise Terminology

Noise is a complex physical quantity. To understand the DNL metric, you need some knowledge of the more basic sound metrics. This chapter introduces the following sound metrics, all of which relate to DNL:

- Decibel (dB)
- A-Weighted Decibel (dBA)
- Maximum Sound Level (L_{max})
- Sound Exposure Level (SEL)
- Equivalent Sound Level (L_{eq})
- Day-Night Average Sound Level (DNL)

The Decibel (dB)

All sounds come from a source, such as a musical instrument, a voice speaking, or an airplane passing overhead. It takes energy to produce sound. The sound energy produced by any source travels through the air in waves: tiny, quick oscillations of pressure just above and just below atmospheric pressure. These waves impact the ear, creating the sounds we hear.

Humans cannot detect the small differences in the wide range of sound pressures that we can hear. Using the logarithmic concept of sound pressure level (SPL), we can mathematically chart how humans hear sound. SPL is basically a comparison of the sound pressure from a given noise source to the quietest sound that a person can detect. Decibels (abbreviated dB) are the units of SPL.

Because decibels are logarithmic quantities, we cannot add them like common numbers. For example, if two sound sources each produce 100 dB at the same time, they combine to produce only 103 dB (not 200 dB, as we might expect). Four equal 100 dB simultaneous sounds result in a total SPL or noise level of 106 dB. In fact, each time the number of equal sources doubles, the noise level rises only 3 dB.

If one source is much louder than another, the two sources together produce the same noise level (and sound to our ears) as if the louder source were operating alone. For example, a 100 dB source plus an 80 dB

[25] FAA Order 1050.1F, Chapter 4 and FAA 1050.1F Desk Reference, Chapter 11.

source produces 100 dB when operating together. The louder source "masks" the quieter one. If the quieter source gets louder, it will have an increasing effect on the total noise level. People hear noise level changes according to the following rules of thumb:

1) Generally, a change of 1 dB or less to a given noise level is not noticeable except in a laboratory setting;
2) A 5 dB change in sound level is generally noticeable in a community setting; and
3) It takes approximately a 10 dB increase to be heard as a doubling of a sound's loudness. Similarly, it takes about a 10 dB decrease to be judged as a halving of noise.

A-Weighted Decibel (dBA)

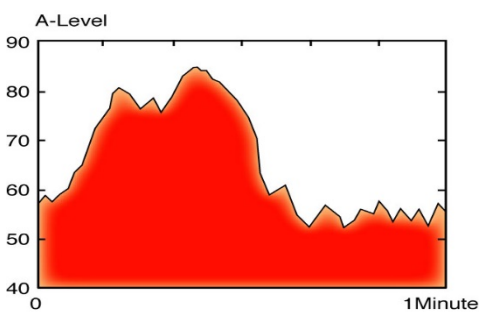
Frequency (sometimes called pitch) is another important quality of sound. Frequency is the rate of repetition of the sound waves as they reach our ears. The units of frequency are known as Hertz (Hz). The human ear does not respond equally to equal noise levels at different frequencies. The normal frequency range of hearing for most people goes from a low of about 20 Hz to a high of up to 20,000 Hz. However, people are most sensitive to sounds in the voice range, about 500 Hz to 2,000 Hz.

To adjust noise levels to resemble the way they are heard by humans, we apply the "A-filter". The resulting value is the A-weighted sound level. A-weighting discounts sound waves in the range that people do not hear well. The filter has very little effect in the middle range, between 500 and 10,000 Hz. Studies have shown that A-weighted sound levels compare well with human judgment of "noisiness." Most government agencies, including FAA, have adopted the A-weighted level as the basic measure of environmental sound.

Maximum A-Weighted Noise Level (L_{max})

Sound levels vary over time. Even peaceful background noise varies; birds chirp, the wind blows, or a vehicle passes by. As an aircraft approaches, the sound level increases, then falls and blends into the background as the aircraft recedes into the distance. This change in sound level over time often makes it convenient to describe a particular "noise event" by its maximum sound level, abbreviated as L_{max}. **Figure C.3-1** illustrates this concept showing a noise event with an L_{max} of about 85 dB.

FIGURE C.3-1
VARIATIONS IN THE A-WEIGHTED SOUND LEVEL OVER TIME



Source: HMMH

The maximum level (in this example, the number 85) describes only one dimension of the noise event. It provides no information about cumulative noise exposure. In fact, two events with the same L_{max} may

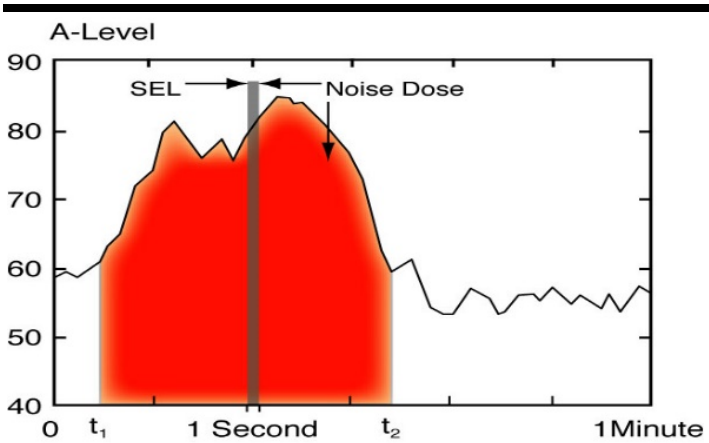
produce very different human responses. One may be of very short duration, while the other may continue for an extended period and be perceived as much more annoying. To account for the duration of noise events, we use the Sound Exposure Level metric.

Sound Exposure Level (SEL)

Sound Exposure Level (SEL) is the most frequently used measure of noise exposure for an individual aircraft noise event. SEL measures the total noise energy produced during an event. To calculate SEL, we first define a threshold just above the background noise level. The noise event starts when the sound level first exceeds the threshold and ends when the sound level drops below the threshold. Next we convert the total noise energy for the event into its logarithmic (decibel) form as if it had lasted exactly one second. A steady noise lasting just one second that is equal in noise energy to an actual longer-duration, time-varying noise event has the same SEL value. In other words, SEL "squeezes" the entire noise event into one second.

Using the SEL metric allows for comparison of noise events with different durations, since SEL "normalizes" the duration in every case to one second. **Figure C.3-2** depicts this process for a sample noise event. In this example, the event threshold is 60 dB. The t_1 and t_2 marks show the times at which the noise exceeded and then dropped below the threshold value. The lighter (red) shading includes the entire noise event, which lasted many seconds and had a maximum (L_{max}) of about 85 dB. The darkly shaded vertical bar, which is 90 dB high and just one second long (wide), contains the same exact sound energy as the full event.

FIGURE C.3-2
SOUND EXPOSURE LEVEL



Source: HMMH

The SEL value is always larger than the L_{max} number for an event that lasts longer than one second. For most aircraft overflights, the SEL is normally about 7 to 12 dB higher than the L_{max}. Longer exposure to slower, quieter aircraft (such as propeller models) can yield the same or higher SEL values than a shorter time exposure to faster, louder aircraft (such as corporate jets). This corresponds well with people's reports of annoyance with those events.

Aircraft noise models use SEL as the basis for computing exposure from multiple events such as the computation of DNL.

Day-Night Average Sound Level (DNL)

FAA requires that airports use a noise metric which depicts the overall noise environment. Peak event metrics like L_{max}, or single event total noise energy metrics like SEL, do not address how often the noise occurs. Analysts developed the DNL noise metric to adequately describe cumulative noise exposure. The USEPA identified DNL as the most appropriate means[26] to evaluate airport noise, using these considerations:

1. The measure should be applicable to the evaluation of pervasive long-term noise in various defined areas, under various conditions, over long periods.
2. The measure should correlate well with known effects of the noise environment and on individuals and the public.
3. The measure should be simple, practical, and accurate. It should be useful for planning as well as for enforcement or monitoring.
4. The required measurement equipment, with standard characteristics, should be commercially available.
5. The measure should be closely related to existing methods currently in use.
6. The single measure of noise at a given location should be predictable, within an acceptable tolerance, from knowledge of the physical events that produce the noise.
7. The measure should lend itself to small, simple monitors, which can be left unattended in public areas for long periods.

FAA has formally adopted DNL to assess effects such as community annoyance from airport noise. The Federal Interagency Committee on Noise (FICON) confirmed the appropriateness of DNL in 1992. The FICON report stated, "There are no new descriptors or metrics of sufficient scientific standing to substitute for the present DNL cumulative noise exposure metric." [27]

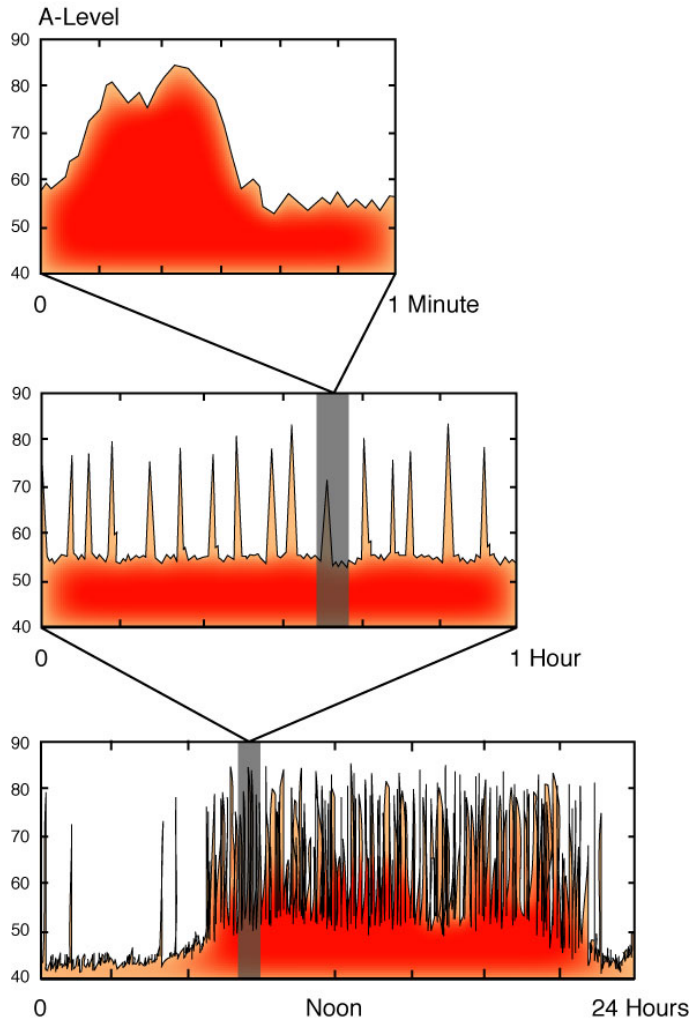
The DNL metric represents noise as it occurs over a 24-hour period, with one important exception: DNL treats noise occurring at night differently from daytime noise. The calculation adds 10 decibels to events between 10:00 p.m. and 6:59 a.m. This increase reflects a greater sensitivity to nighttime sound. People often judge noises at night as more intrusive because background noise at night is lower.

Figure C.3-3 illustrates how the various noise metrics are related. The top frame repeats the single noise event from **Figure C.3-1**. Its SEL value accounts for both the loudness and duration of the event by condensing it in terms of sound energy. The shaded area reflects the noise dose that a listener receives during the one-minute period of the sample.

The center frame of **Figure C.3-3** includes this one-minute sample within a full hour. The hour-long center frame shows 16 detectable noise events, each producing an SEL value. Similarly, the bottom frame includes the one-hour interval within a full 24 hours. Here, the frame shows the listener's noise dose over a complete day. Note that several loud events occur in the late night and early morning when the background noise drops some 10 dB to approximately 45 dB. In the calculation of DNL, we add 10 decibels to the SEL values of the nighttime events. Then we report the total noise energy from all identified events as the DNL.

[26] EPA, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," Report No. 550/9-74-004, March 1974.
[27] FICON, "Federal Agency Review of Selected Airport Noise Analysis Issues," September 1992.

FIGURE C.3-3
DAILY NOISE DOSE



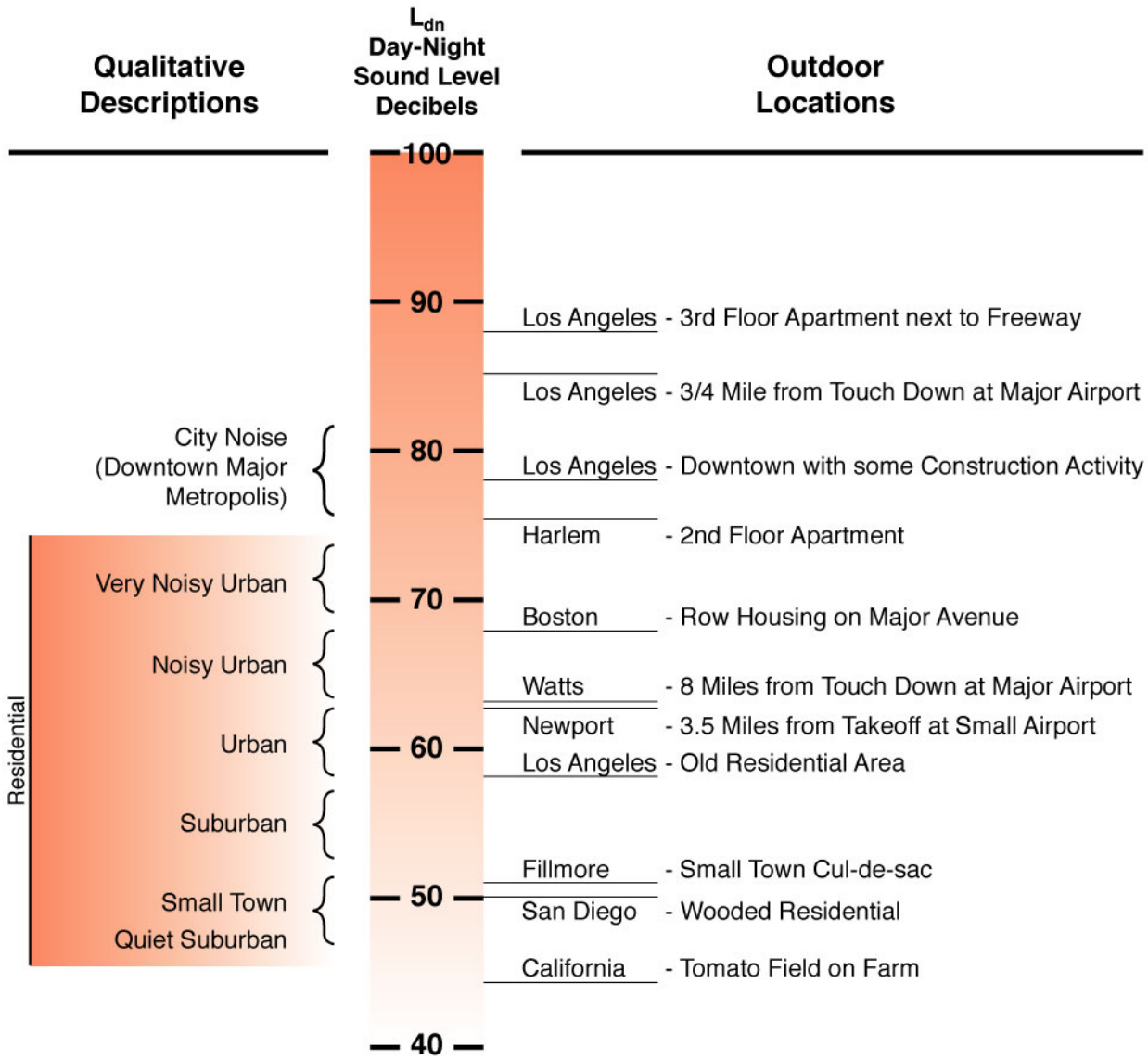
Source: HMMH

We can either measure or estimate DNL. To measure DNL, we must place noise monitors in the community. We can measure DNL values only for a limited number of points; without a permanently installed monitoring system, we can measure only for relatively short time periods. Most noise studies use computer-generated DNL estimates. The computer model adds all the SEL values from separate events that make up the total noise dose at a given location. The calculation of an average annual day includes an entire year's aircraft operations. A map, showing equal-exposure noise contours visually, displays the computed DNL values. Sometimes color-coded grid points on a map report the computed DNL at locations of interest.

For reference, **Figure C.3-4** shows how DNL values may vary for a variety of noise environments. **Table C.1-1** shows the land-use compatability levels with the yearly DNL.

FAA recently completed the analysis on the next step in a multi-year Noise Research Program that will update the scientific evidence on the relationship between aircraft noise exposure and its effects on communities around airports.

FIGURE C.3-4
EXAMPLES OF DAY-NIGHT AVERAGE SOUND LEVELS (DNL)



Source: Figure 1; Information on Levels of Environmental Noise Requisite to Protect Public Helath and Welfare with an Adequate Margin of Safety, Page 14, March 1974.

TABLE C.3-1
LAND-USE COMPATIBILITY WITH YEARLY DAY-NIGHT AVERAGE SOUND LEVELS

	Yearly Day-Night Average Sound Level, DNL, in Decibels (Key and notes on following page)					
Land Use	**<65**	**65-70**	**70-75**	**75-80**	**80-85**	**>85**
Residential Use						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home park	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware, and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	Y(2)	Y(3)	Y(4)	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production Use						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational Use						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Source: 14 CFR Part 150, Appendix A, Table 1. Numbers in parentheses refer to notes shown on the next page.

The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise-compatible land uses.

Key to Table 1

SLUCM:	Standard Land Use Coding Manual
Y (Yes):	Land use and related structures compatible without restrictions
N (No):	Land use and related structures are not compatible and should be prohibited
NLR:	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure
25, 30, or 35:	Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dBA must be incorporated into design and construction of structure

Notes for Table 1

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dBA and 30 dBA should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dBA, thus, the reduction requirements are often started as 5, 10, or 15 dBA over standard construction and normally assume mechanical ventilation and closed windows year-round. However, the use of NLR criteria will not eliminate outdoor noise problems.

(2) Measures to achieve NLR of 25 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

(3) Measures to achieve NLR of 30 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

(4) Measures to achieve NLR of 35 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

(5) Land-use compatible, provided special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25.

ATTACHMENT C-4

ALTITUDE CONTROL CODE DEVELOPMENT MEMORANDUM

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HMMH
77 South Bedford Street
Burlington, Massachusetts 01803
781.229.0707
www.hmmh.com

TECHNICAL MEMORANDUM

To:	Amy Hanson, Environmental Protection Specialist Chicago ADO Federal Aviation Administration
From:	Robert Mentzer Jr., Principal Consultant Brad Dunkin, Senior Consultant
Date:	October 26, 2018
Subject:	Use of Altitude Control Codes in AEDT Modeling of Existing and Interim Fly Quiet Scenarios at Chicago O'Hare International Airport – Automated Process Update
Reference:	HMMH Project Number 307171

The Federal Aviation Administration's Aviation Environmental Design Tool (AEDT) models noise and emissions using a standard aircraft database. Among the aircraft properties in this database is a set of standard climb and descent procedures[1]. A typical AEDT standard departure procedure consists of the following procedure statements 1) Takeoff, 2) Climb to 1,000 feet, 3) Accelerate and retract flaps, 4) Climb to 3,000 feet, 5) Accelerate to 250 knots, 6) Climb to 10,000 feet. The standard procedures in AEDT can be refined by including altitude control codes (ACC) to represent target altitudes at various points along the flight track that would not normally be present in the standard climb/descent procedure. The use of ACCs is considered an acceptable modeling method by the FAA and therefore does not require FAA approval as a nonstandard modeling method.

Due to traffic separation requirements in the busy airspace near Chicago O'Hare International Airport (ORD), Air Traffic Control (ATC) uses altitude holds (level-offs) for many operations at the airport. These altitude holds are examples of flight procedures that can be modeled by using ACCs. This memo describes the methodology developed by HMMH to implement ACCs and refine the modeling of altitude holds for this study.

Before beginning any altitude analysis, modeled flight track bundles[2] were developed from FAA radar flight tracking data. The modeled flight tracks are representative of the primary routes flown by a specific aircraft category (wide body jet, non-wide body jet and propeller-driven aircraft). The type of flight operations used to develop a particular modeled track were then assigned to that track bundle for modeling. The flight track bundles are input to AEDT in only two dimensions, essentially as longitude, latitude coordinates representing the aircraft's location above the ground. The model assigns altitude according to its database of standard climb and descent profiles for specific aircraft types if no ACCs are used. When AEDT encounters an ACC on a model track, all of the flight procedures assigned to that track are modified to match the ACC instructions.

1. Initial visual assessment

The ORD radar flight track data was analyzed to determine where level (constant altitude) flight segments occur and therefore where an ACC should be applied to the operations on the corresponding modeled track bundle. This analysis was done by plotting the altitude vs. cumulative track distance for all the radar tracks assigned to the model track bundle, and visually assessing whether the majority of the operations featured a level flight segment over a repeatable track distance. Using this method, level segments were identified for ten of the modeled arrival track bundles and four of the modeled departure track bundles.

The left side of Figure 1 shows an example plot of radar altitude profiles for a particular modeled representative track, in this case for departures from Runway 9R. The right side of Figure 1 depicts those same

[1] The standard procedures in the noise model instruct the model how the aircraft flies along a model flight track under the provided conditions.
[2] The model flight track bundles generally consist of a main average track and four average sub-tracks representing the dispersion of the actual radar track data.

flights over the ground plane, centered on the airport.

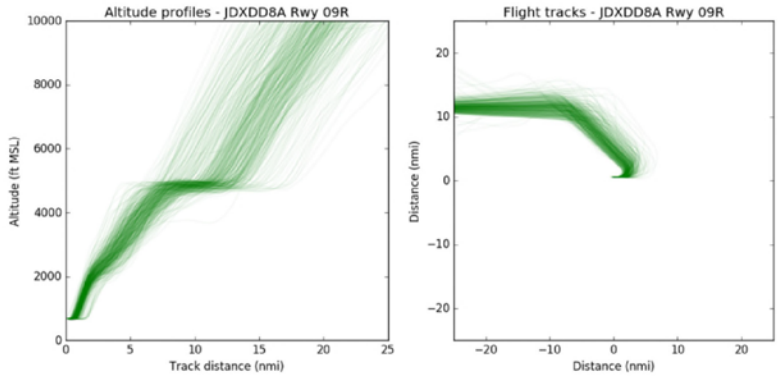

Figure 1: Radar altitude profiles and flight tracks for departure model track JDXDD8A from Runway 9R

This figure shows a concentration of radar flight tracks performing an altitude hold at an altitude of 5,000 feet (ft.) above Mean Sea level (MSL), starting at a track distance around 7 nautical miles (NM) and ending at around 12 NM. There is some variation at the start of the level segment due to the varying climb rates of individual aircraft on a given day due to the meteorological conditions present or to pilot technique. There is substantially more variation in the location where aircraft resume climbing, with some radar tracks not showing any level segment at all, and others remaining level longer to resume climbing as late as 17 NM. However, there is an observable band of tracks that resume climbing between 10 and 14 NM, so this track was modeled with ACCs to simulate a level segment at 5,000 ft. from 7 to 12 NM.

A more common situation is shown in Figure 2, which displays departures from Runway 10L. In this case, the altitude of the level segment is evident, but there is no concentration of tracks at an identifiable location where climbing resumes. Instead, the end of the level segment is distributed uniformly between approximately eight and 17 NM. In this and similar cases, since the ACC would result in all aircraft flight procedures leveling off with climb resuming only at the defined distance, instead of being spread out realistically as shown in the graphic, ACCs were not applied to the modeled tracks.

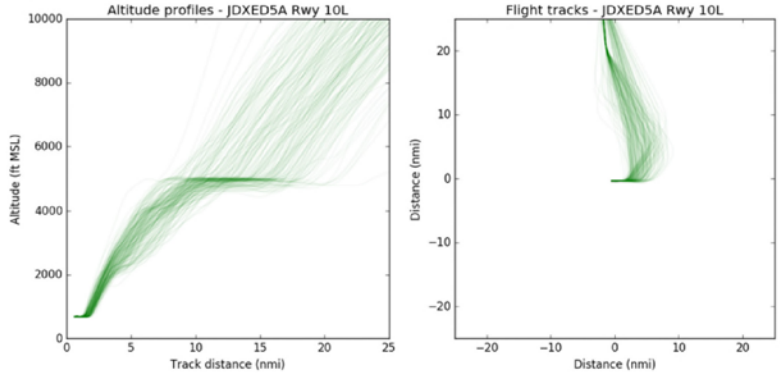

Figure 2: Radar altitude profiles and flight tracks for departure model track JDXED5A from Runway 10L

Table 1 provides a summary of the fourteen tracks which were initially identified for modeling using ACCs. The start and end distances refer to the beginning and end of the level portion along the modeled track as an aircraft is flown.

Table 1: Modeled Flight Tracks with Level Flight Segments

Runway	Mode	Modeled Track Name	Airspace Fix	Level Flight Altitude (ft. MSL)	Start Distance (NM)	End Distance (NM)
9L	Arrival	JAXCD1B	ERNNY	4,000	25	10
9L	Arrival	JAXCD4A	MADII	4,000	22	10
9L	Arrival	JAXCD4B	MADII	4,000	22	10
9R	Departure	JDXDD8A	MYKIE	5,000	7	12
9R	Departure	JDXDD8C	NOONY	5,000	7	12
9R	Departure	JDXDD8E	OLINN	5,000	7	12
10R	Arrival	JAXWD2A	ESSPO	5,000	33	12
10R	Arrival	JAXWD2B	ESSPO	5,000	32	12
10R	Arrival	JAXWD2F	ESSPO	5,000	32	12
27R	Arrival	JAXND1C	ERNNY	4,000	22	10
27R	Arrival	JAXND1D	WYNDE	4,000	25	10
27R	Arrival	JAXND4F	MADII	4,000	25	10
27R	Arrival	JAXND4K	MADII	4,000	25	10
28R	Departure	JDXOD6B	DUFEE	5,000	7	12

Note: Start and end distances are measured along the track flown by the aircraft, and are referenced to the runway end (i.e. opposite to the direction of travel for arrivals).

2. Quantitative altitude hold analysis

In order to make the identification of ACC candidate model tracks more repeatable and traceable, a numeric analysis method was developed to analyze track bundles. This process still required a visual assessment of the hold altitude, but statistical analysis of the tracks then determined where the hold starts and ends, and whether the concentration of tracks is sufficient for ACC to be applied to the track bundle. This level of concentration is a criterion HMMH established for the use of ACC for this project. The results of this analysis supersede the visual evaluation from Section 1.

Examples of the statistical analysis are shown in Figures 3 and 4 below. These plots are similar to those above, but include bars to illustrate the analysis process. The central black bar shows the altitude and extent of the altitude hold. The upper and lower red bars indicate the top and bottom of the altitude band along the vertical axis, and extend ±1 standard deviation from the mean entry and exit along the horizontal axis.

Figure 3 shows an arrival bundle with a fairly concentrated entry to the hold band, and a very concentrated exit. This bundle satisfies the criteria HMMH established for modeling with ACC for this project.

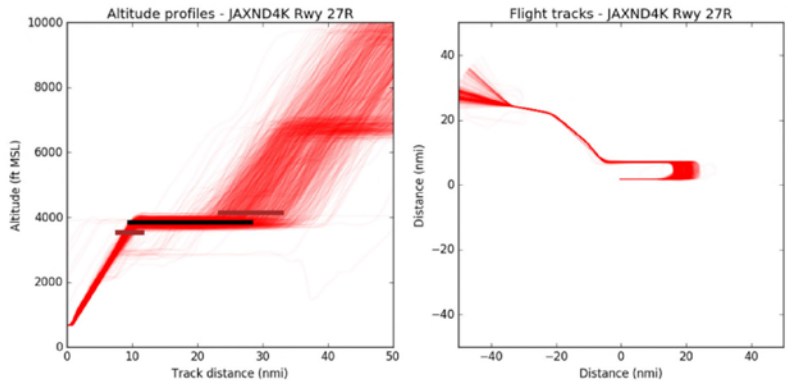

Figure 3: Arrival Track Bundle Meeting ACC Criteria

The track bundle in Figure 4 has more spread in both the entry and exit, partly due to additional hold altitudes nearby. This bundle does not satisfy the ACC criteria HMMH established for this project.

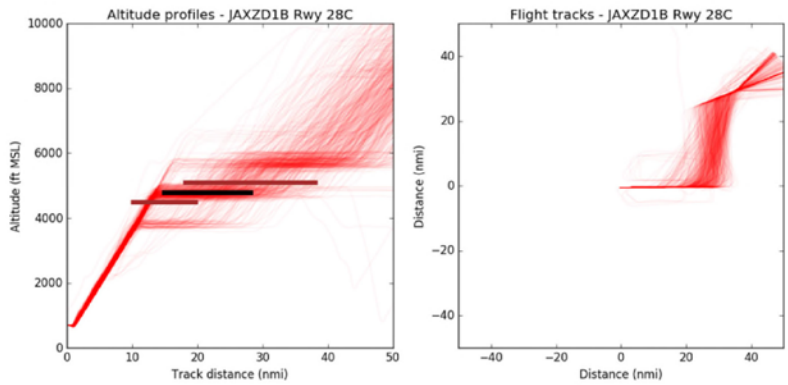

Figure 4: Arrival Track Bundle Not Meeting ACC Criteria

Departure tracks in general have more spread in their hold entry and exit, as reflected in the looser criteria applied in the departure bundle analysis as compared with arrivals. Figures 5 and 6 present examples of those tracks. The departure bundle in Figure 5 includes tracks that exit the hold at a wide range of track distances, but due to the concentration near 13 NM it statistically satisfies the established HMMH criteria for modeling with ACC for this project.

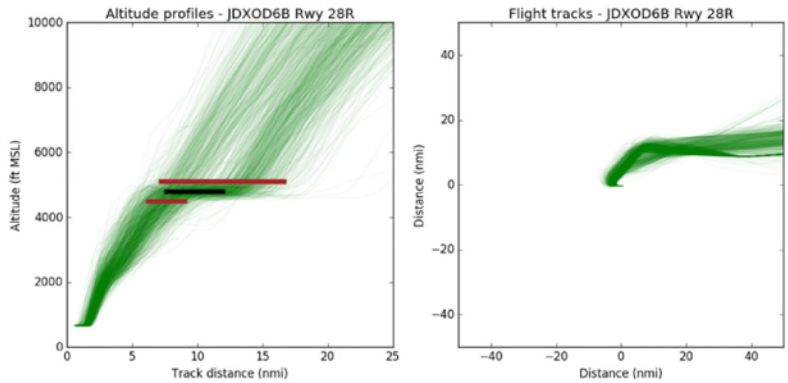

Figure 5: Departure Track Bundle Meeting ACC Criteria

The track bundle in Figure 6 is similar, but with two concentrated exit bands spaced widely apart at around 8 NM and 13 NM, it fails to meet the ACC criteria HMMH established for this project. This track distribution results in a shorter calculated hold distance to the previous example, but with a similar entry deviation, the ratio of the two exceeds the criterion. Although the less restrictive exit criterion is satisfied by both bundles in Figures 5 and 6, the bundle in Figure 6 was not modeled using ACC.

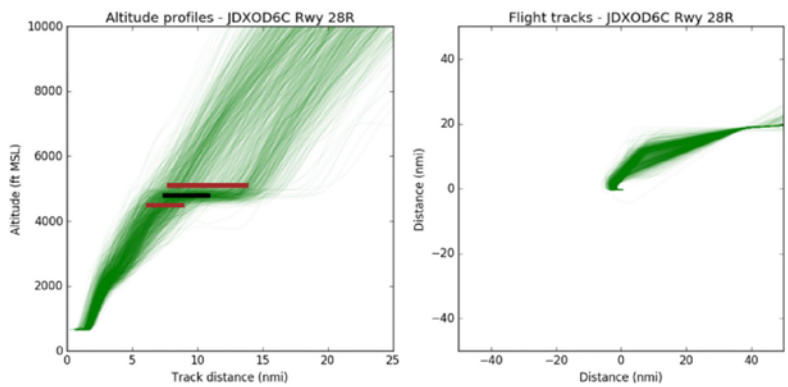

Figure 6: Departure Track Bundle Not Meeting ACC Criteria

The statistical analysis identified a total of 63 track bundles for ACC to be applied to, including those identified previously. Altitude hold information for these bundles is provided in Table 2.

Table 2: ACC Track Bundles Determined by Quantitative Analysis

Runway	Mode	Modeled Track Name	Level Flight Altitude (ft. MSL)	Start Distance (NM)	End Distance (NM)
04L	Departure	JDXAD7B	4750	6.4	10.9
04L	Departure	JDXAD7C	4700	6.8	12.0

Runway	Mode	Modeled Track Name	Level Flight Altitude (ft. MSL)	Start Distance (NM)	End Distance (NM)
04L	Departure	JDXAD7D	4750	6.2	10.9
04L	Departure	JDXAD7E	4700	6.7	11.7
04R	Arrival	JAXBD2B	4650	16.3	12.0
09L	Arrival	JAXCD1B	3900	29.4	9.7
09L	Arrival	JAXCD1C	3850	29.6	9.4
09L	Arrival	JAXCD2G	3950	27.6	9.7
09L	Arrival	JAXCD4B	3900	24.4	9.9
09L	Arrival	PAXCD1B	3938	29.1	9.5
09R	Arrival	JAXDD2D	6800	28.3	18.5
09R	Arrival	JAXDD3B	6900	29.0	18.7
09R	Arrival	JAXDD4B	3950	26.1	9.7
09R	Departure	JDXDD8A	4850	7.5	11.6
09R	Departure	JDXDD8C	4850	7.4	11.7
09R	Departure	JDXDD8E	4850	7.3	11.9
09R	Departure	PDXDD8A	4000	6.1	37.4
10C	Arrival	JAXVD1B	4800	35.4	12.5
10C	Arrival	JAXVD2E	4850	31.0	13.0
10L	Arrival	JAXED1A	3800	16.0	9.6
10L	Arrival	JAXED2B	3900	17.2	9.9
10L	Arrival	JAXED4A	3750	17.5	9.4
10L	Departure	JDXED5C	4950	9.4	14.2
10L	Departure	JDXED8Z	4800	8.6	12.8
10R	Arrival	JAXWD1B	4150	20.7	9.8
10R	Arrival	JAXWD1C	5100	39.9	13.6
10R	Arrival	JAXWD2A	4850	34.3	13.3
10R	Arrival	JAXWD2B	4850	34.8	12.7
10R	Arrival	JAXWD2F	4900	34.2	13.5
10R	Arrival	JAXWD2L	4900	35.3	12.9
10R	Arrival	JAXWD2M	4000	16.6	9.5
10R	Arrival	JAXWD2Z	5050	37.9	13.5
22L	Arrival	JAXKD1A	4100	20.2	10.4
22L	Arrival	JAXKD3A	4000	19.8	10.3
22L	Arrival	JAXKD4A	4025	17.5	10.6
22L	Departure	JDXKN6A	5150	7.3	11.0
22R	Arrival	JAXLD2B	5200	25.9	13.5
22R	Arrival	JAXLD3B	4100	19.5	11.0
27L	Arrival	JAXMD1A	3800	19.3	10.0
27L	Departure	JDXMD5B	4900	6.7	10.8
27L	Departure	JDXMD6A	4900	6.5	10.2

Runway	Mode	Modeled Track Name	Level Flight Altitude (ft. MSL)	Start Distance (NM)	End Distance (NM)
27L	Departure	JDXMD6C	4850	6.5	10.4
27R	Arrival	JAXND1C	3800	27.1	9.3
27R	Arrival	JAXND1D	3850	26.8	9.5
27R	Arrival	JAXND3A	3800	30.3	9.4
27R	Arrival	JAXND3D	3800	28.9	9.5
27R	Arrival	JAXND3E	3800	28.4	9.9
27R	Arrival	JAXND4C	3850	28.2	9.5
27R	Arrival	JAXND4F	3850	27.6	9.7
27R	Arrival	JAXND4K	3850	28.2	9.6
28C	Arrival	JAXZD2A	4800	26.1	13.1
28C	Arrival	JAXZD3A	4800	37.7	13.7
28C	Arrival	JAXZD3L	5000	37.6	14.1
28C	Arrival	JAXZD3M	4800	33.9	14.0
28C	Departure	JDXZN5C	5200	9.6	17.0
28R	Arrival	JAXOD2A	3800	16.1	9.9
28R	Arrival	JAXOD3A	3900	16.9	10.0
28R	Arrival	JAXOD3B	3850	16.4	10.1
28R	Arrival	JAXOD3C	3950	18.7	10.5
28R	Arrival	JAXOD4A	3800	17.6	10.1
28R	Departure	JDXOD6B	4800	7.6	11.9
28R	Departure	JDXON6B	4800	6.8	11.5
28R	Departure	PDXOD5A	5650	12.4	46.0

Note: Start and end distances are measured along the track flown by the aircraft, and referenced to the runway end (i.e. opposite to the direction of travel for arrivals).

3. AEDT implementation

If it was determined that ACC should be applied to a model track, duplicate tracks were created in AEDT, one with ACC and one without. To simulate the altitude hold, pairs of track points were added to the track at the beginning and end of the hold, specifying the altitude the aircraft should achieve at these points. It was determined empirically that single points at the beginning and end of the hold caused spikes in the calculated thrust, whereas using paired ACC points results in a smooth transition between climb or descent and level flight. Finally, a single point was added to the end of the track specifying a 30,000 ft altitude, to simulate the resumed climbing for departures, or the beginning of a normal descent for arrivals.

To test the ACC modeling, a simplified model run was performed using the ACC tracks, using each aircraft type represented in the track bundle. Some AEDT aircraft failed to perform correctly on the ACC track, for example because of the nature of how their performance profiles are defined, or because they do not have sufficient thrust to reach the specified altitude at the specified distance. These aircraft were reassigned to the non-ACC track, while those that performed correctly on the ACC track were retained on that track.

The AEDT study comprises 266 track bundles. ACCs were applied to 63 (24%) of these bundles, representing 21% of the operations in the study.

Figure 7 shows an example of altitude profiles with and without ACC from AEDT. An A320-232 aircraft was modeled performing a stage length 3 departure on a simplified track that continues straight out on runway heading. The altitude hold is modeled using the parameters determined for track bundle JDXOD6B shown above in Figure 5. These parameters specify a hold at 4,800 ft MSL starting at 7.6 NM and ending at 11.9 NM.

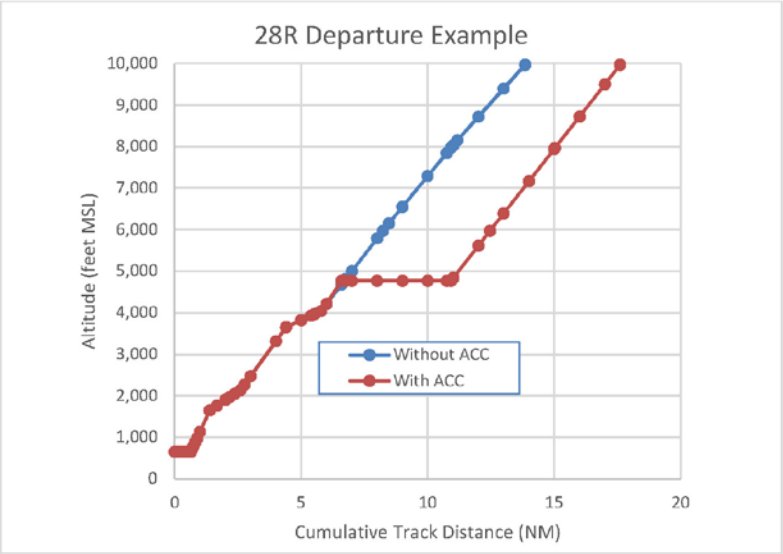

Figure 7: AEDT Modeled ACC Profile Example

Figure 8 shows the sound exposure levels (SEL) generated by this specific departure, with the non-ACC operation in black and the ACC operation in red. The 80 dB SEL contours are identical, since the aircraft has not reached the ACC altitude in this region. The 70 dB SEL contour is shortened in the ACC case, reflecting the reduced thrust in level flight. The 60 dB SEL contour is narrower but longer in the ACC case, reflecting a noise impact that is at a reduced level but over a longer range due to extended flight closer to the ground.

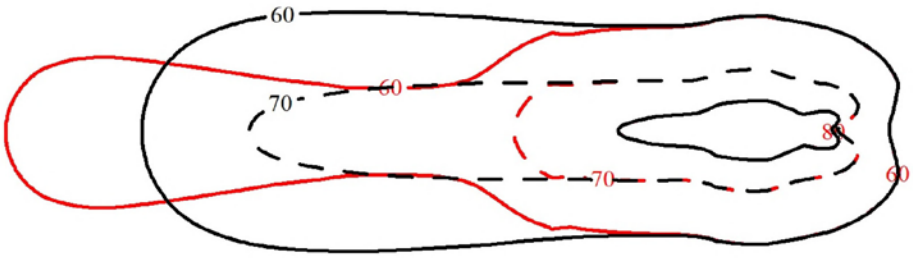

Figure 8: AEDT Modeled ACC SEL Contours

ATTACHMENT C-5

NOISE RESEARCH PROGRAM UPDATE

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O'HARE NOISE COMPATIBILITY COMMISSION
Celebrating 20+ years

Arlene A. Juracek
Chair
Joseph J. Annunzio
Vice-Chair
Dr. Raymond J. Kuper
Treasurer
Chair, School Committee
Ginger S. Evans
Commissioner of Aviation
Frank A. Damato
Chair, Residential Committee
Catherine Dunlap
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Hoffman Estates
Itasca
Lincolnwood
Maywood
Melrose Park
Mount Prospect
Niles
Norridge
Northlake
Palatine
Park Ridge
River Forest
River Grove
Rolling Meadows
Rosemont
Schaumburg
Schiller Park
South Barrington
Stone Park
Wayne
Wood Dale

School Districts:
2, 7, 48, 59, 63, 64, 80, 81, 84, 84.5, 85.5, 86, 87, 88, 89, 100, 205, 207, 214, 234, 299, 401

July 19, 2018

Mr. Daniel K. Elwell
Acting Administrator
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, DC 20591

Dear Acting Administrator Elwell:

The O'Hare Noise Compatibility Commission is extremely disappointed by the Federal Aviation Administration's decision to delay the results of the nationwide annoyance survey. We have been patiently following the announcements and developments of the noise research roadmap plan on noise impacts since 2013.

In a letter to the ONCC dated December 24, 2013 the FAA said, "the current anticipated time for completing the national survey and the analysis of survey results is December 2015. We are moving as quickly as possible within the constraints of the sequential nature of this work."

Then the FAA released a statement dated May 7, 2015, saying "We understand the interest in expediting this research, and we will complete this work as quickly as possible."

The release went on to say that "the FAA obtained approval from the Office of Management and Budget to conduct the survey and hopes to finish gathering data by the end of 2016. The agency will then analyze the results to determine whether to update its methods for determining exposure to noise."

Recently on June 15, 2018, the Airport Noise Report (Volume 30, Number 19) wrote that the FAA could not say when the results of the survey would be released. "The survey results, which will determine if the agency needs to update its 40-year-old aircraft noise policy and the dose/response curve it uses to estimate community annoyance to aircraft noise were expected in June," reported ANR.

P.O. Box 1126 • Des Plaines, IL 60017-1126
773-686-3198 • www.oharenoise.org

Now we are in the middle of July 2018 and still no survey findings from your agency. As community leaders we are losing our patience and ask that the findings be published immediately.

Thank you for your consideration and I look forward to hearing from you regarding this important national aircraft noise study.

Sincerely,

Arlene A. Juracek, Mount Prospect Mayor and
O'Hare Noise Compatibility Commission Chair

Cc: Rebecca MacPherson, Administrator, Great Lakes Region, FAA
U.S Senator Richard Durbin
U.S Senator Tammy Duckworth
U.S. Representatives Janice Schakowsky, Michael Quigley, Raja Krishnamoorthi
Members, O'Hare Noise Compatibility Commission

U.S. Department
of Transportation

**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

October 3, 2018

Ms. Arlene A. Juracek
Chairman, O'Hare Noise
Compatibility Commission
P.O. Box 1126
Des Plaines, IL 60017

Dear Ms. Juracek:

Thank you for your July 19 letter asking for the results of Federal Aviation Administration's (FAA) national survey to update our understanding of annoyance due to aircraft noise.

In 2014 FAA issued a Federal Register Notice to initiate a nation-wide survey to update the scientific evidence of the relationship between aircraft noise exposure and its effects on communities around airports. The survey, which includes responses from over 10,000 people living near 20 airports, is a part of the FAA's broader research portfolio related to aircraft noise. The draft survey report is being reviewed by the FAA, in coordination with the U.S. Department of Transportation and other Federal agencies.

If I can be of further assistance, please contact me or Chris Brown, Assistant Administrator for Government and Industry Affairs, at (202) 267-3277.

Sincerely,

Daniel K. Elwell
Acting Administrator

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ATTACHMENT C-6

GRID POINT ANALYSIS EXHIBITS

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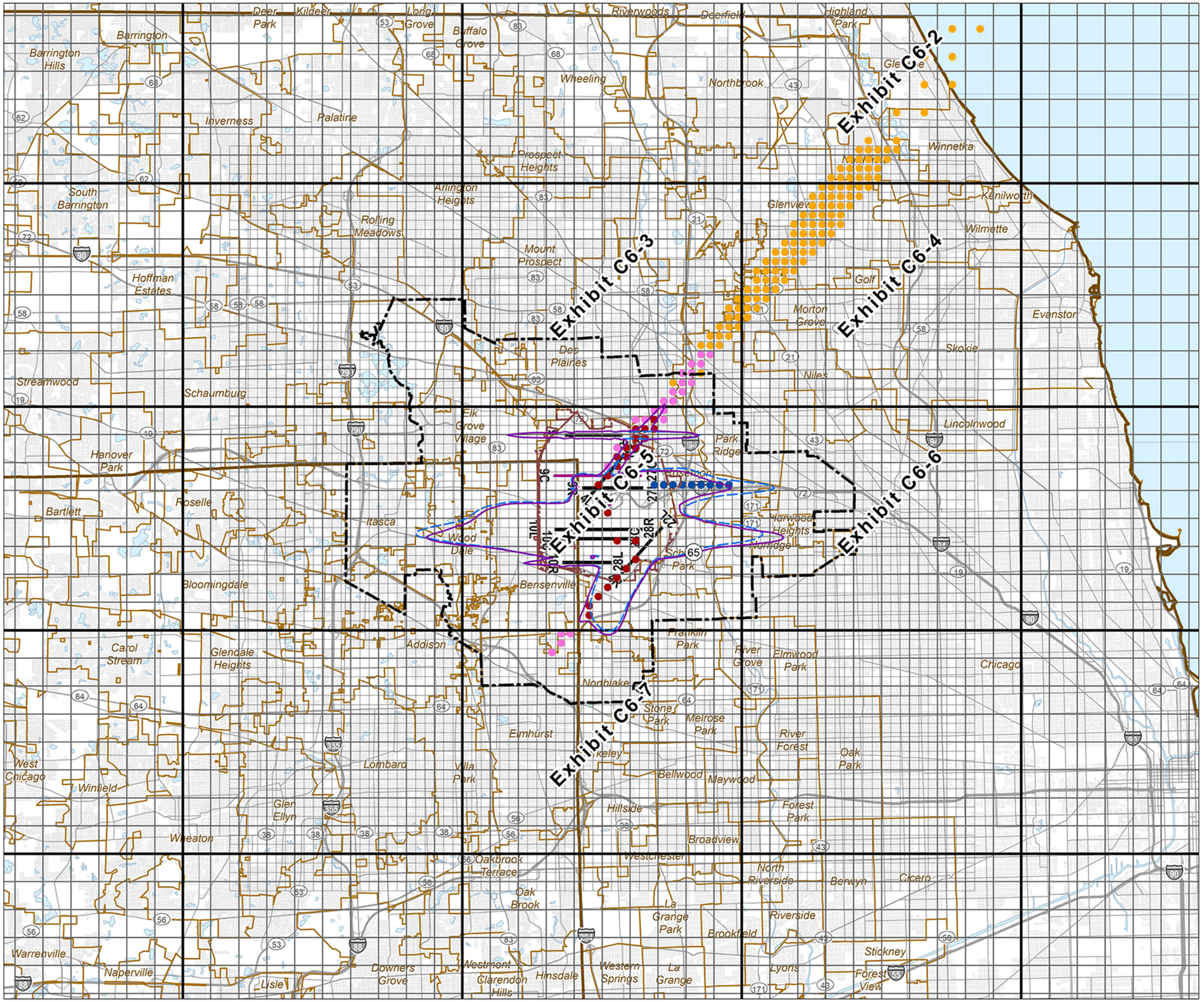

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- 1.5 dB and Greater Increase
- 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- 3 dB and Greater Increase
- 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- 5 dB and Greater Increase
- 5 dB and Greater Decrease

Existing Fly Quiet 65 DNL Noise Contour

Proposed Interim Fly Quiet 65 DNL Noise Contour

Project Area

Airport Boundary

Existing Runways

Runway 9C/27C - Opens Nov. 2020

Noncompatible Land Use

Water

County Boundary

Community Boundary

Highway

Primary Roads

Secondary Roads

Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 3 6
Miles

Proposed Interim Fly Quiet Grid Point DNL Change

▶ Exhibit C6-1

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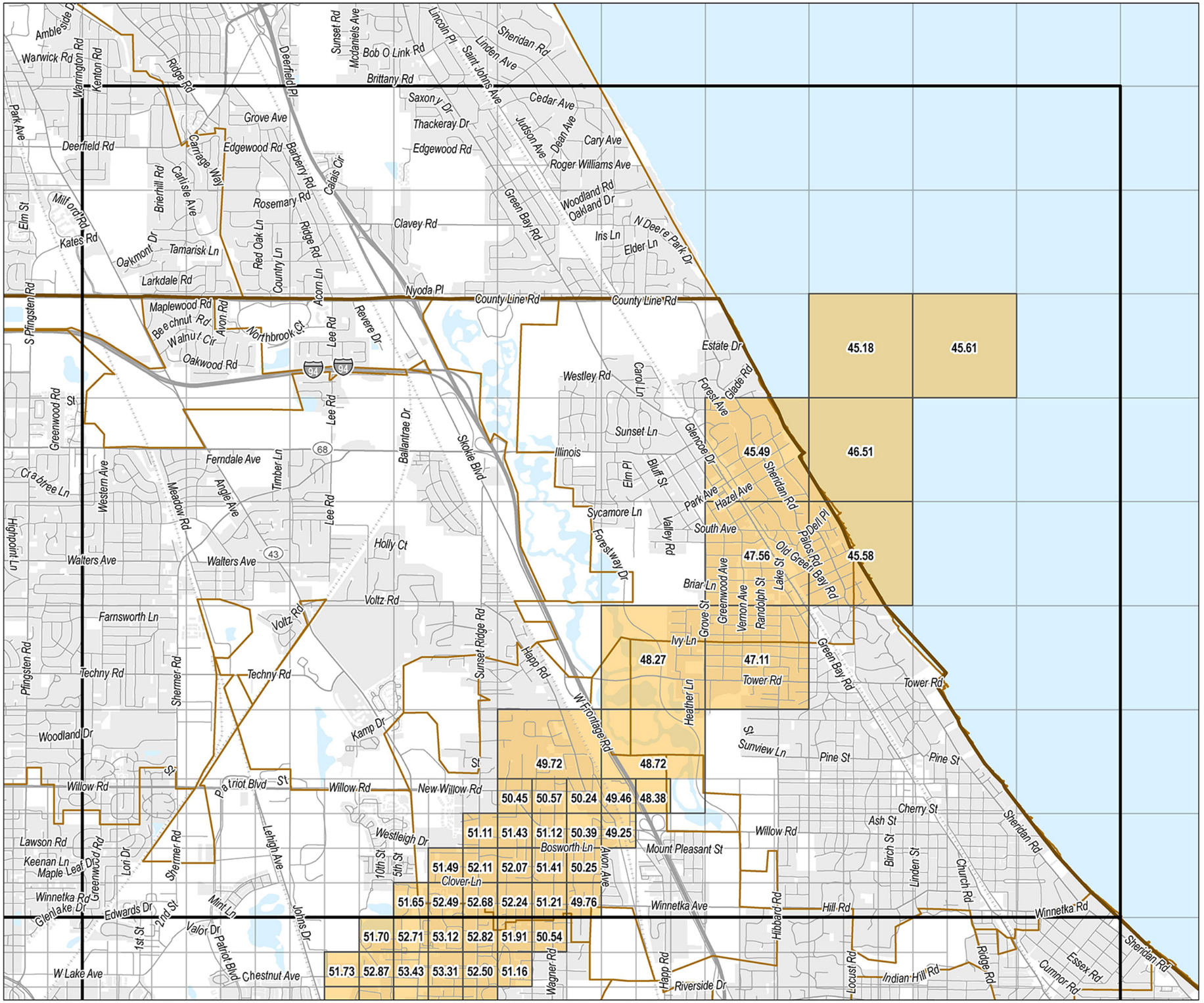

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

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0 0.5 1
Miles

Proposed Interim Fly Quiet
Grid Point Detail DNL Change

▶ Exhibit C6-2

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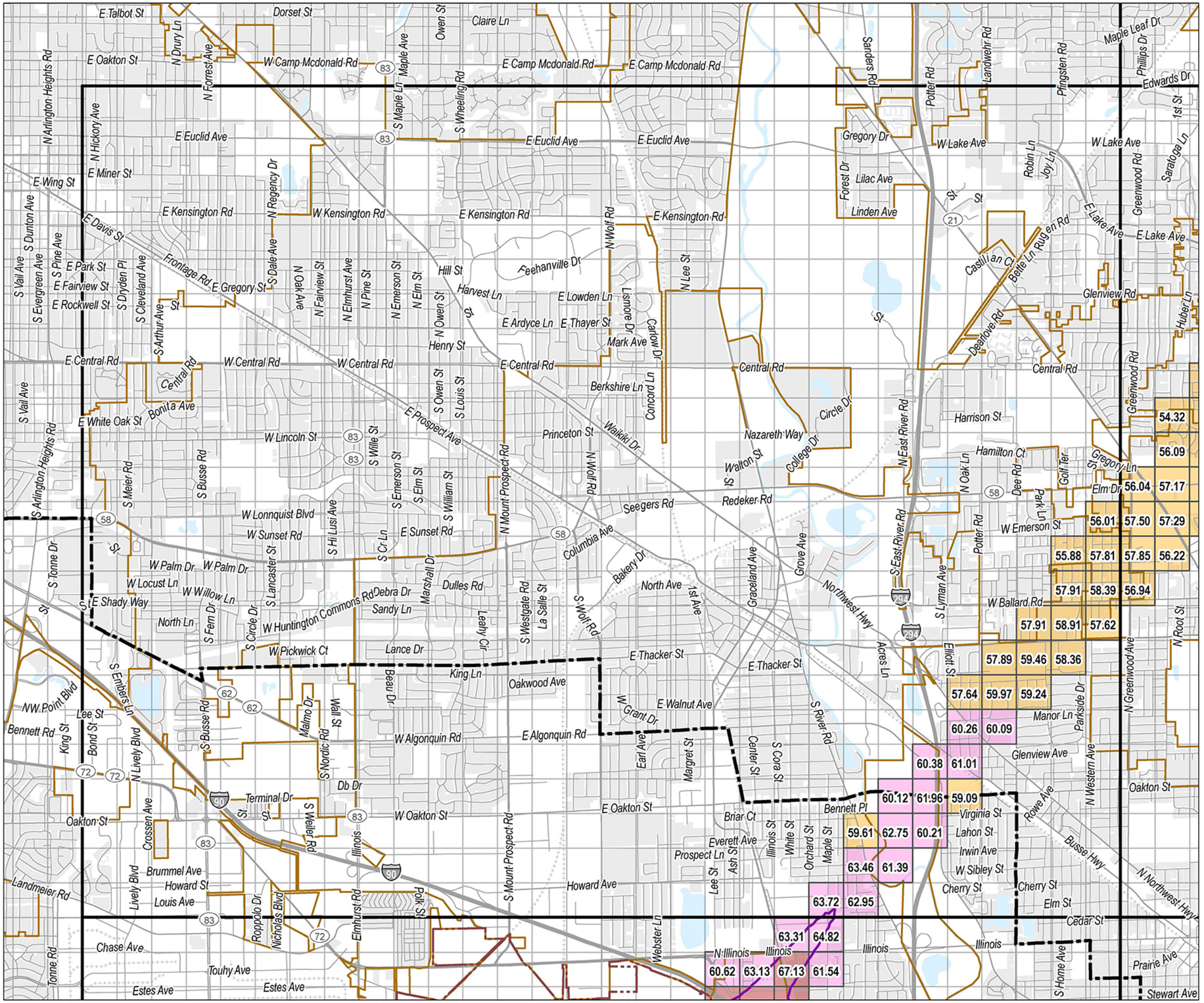

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0 0.5 1
Miles

Proposed Interim Fly Quiet Grid Point Detail DNL Change

▶ Exhibit C6-3

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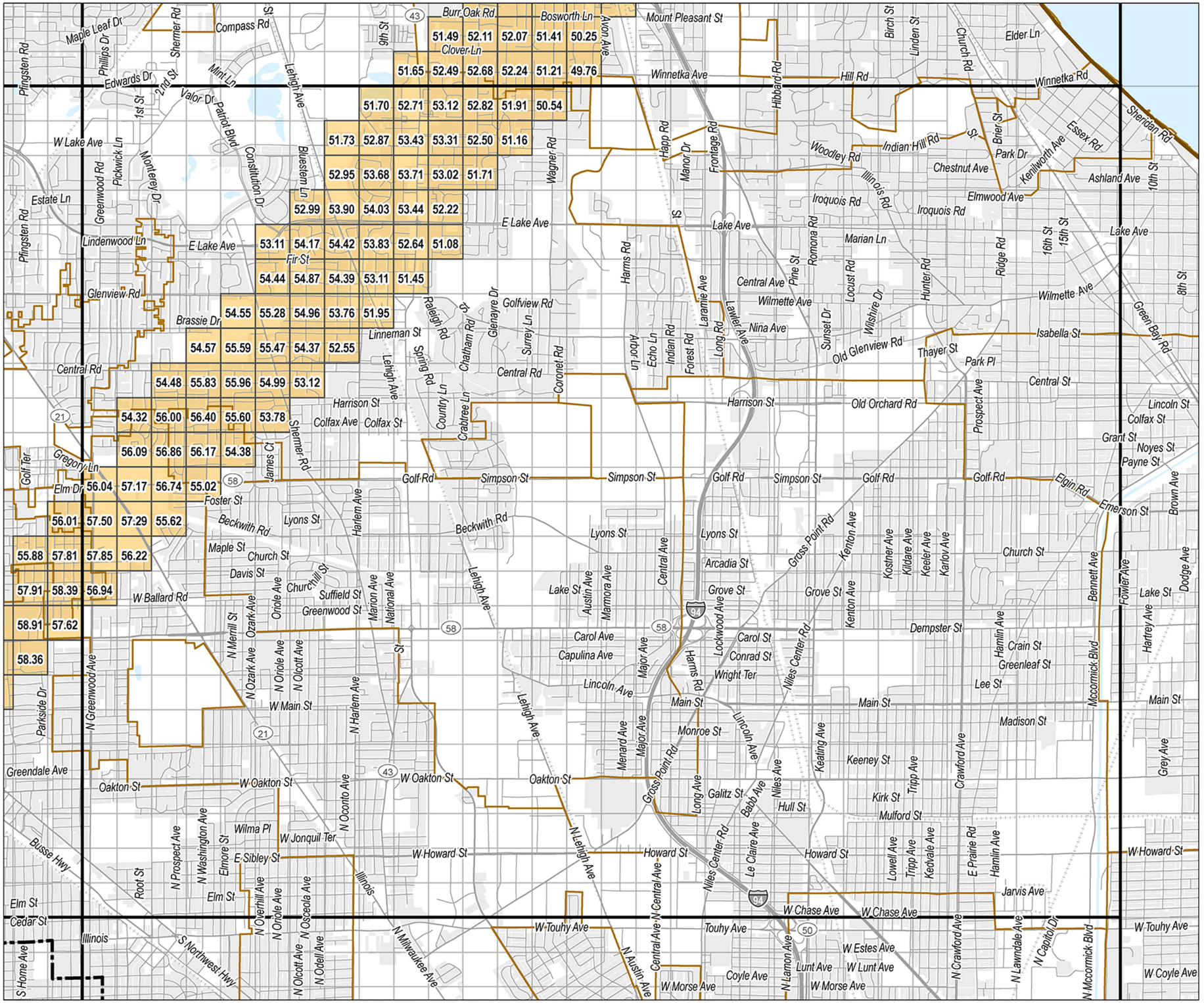

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0 0.5 1
Miles

Proposed Interim Fly Quiet Grid Point Detail DNL Change

▶ Exhibit C6-4

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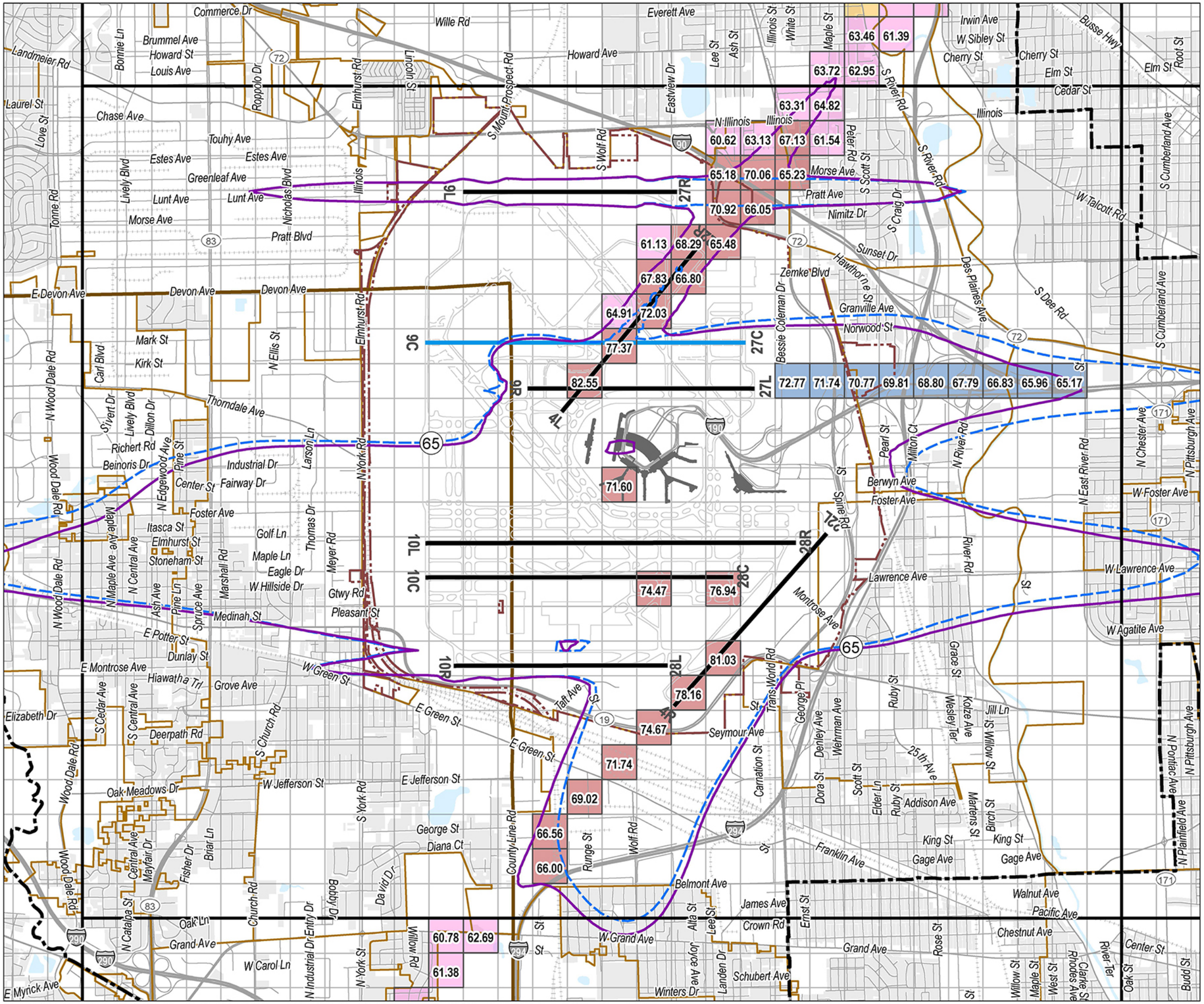

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

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0 0.5 1
Miles

Proposed Interim Fly Quiet
Grid Point Detail DNL Change

▶ Exhibit C6-5

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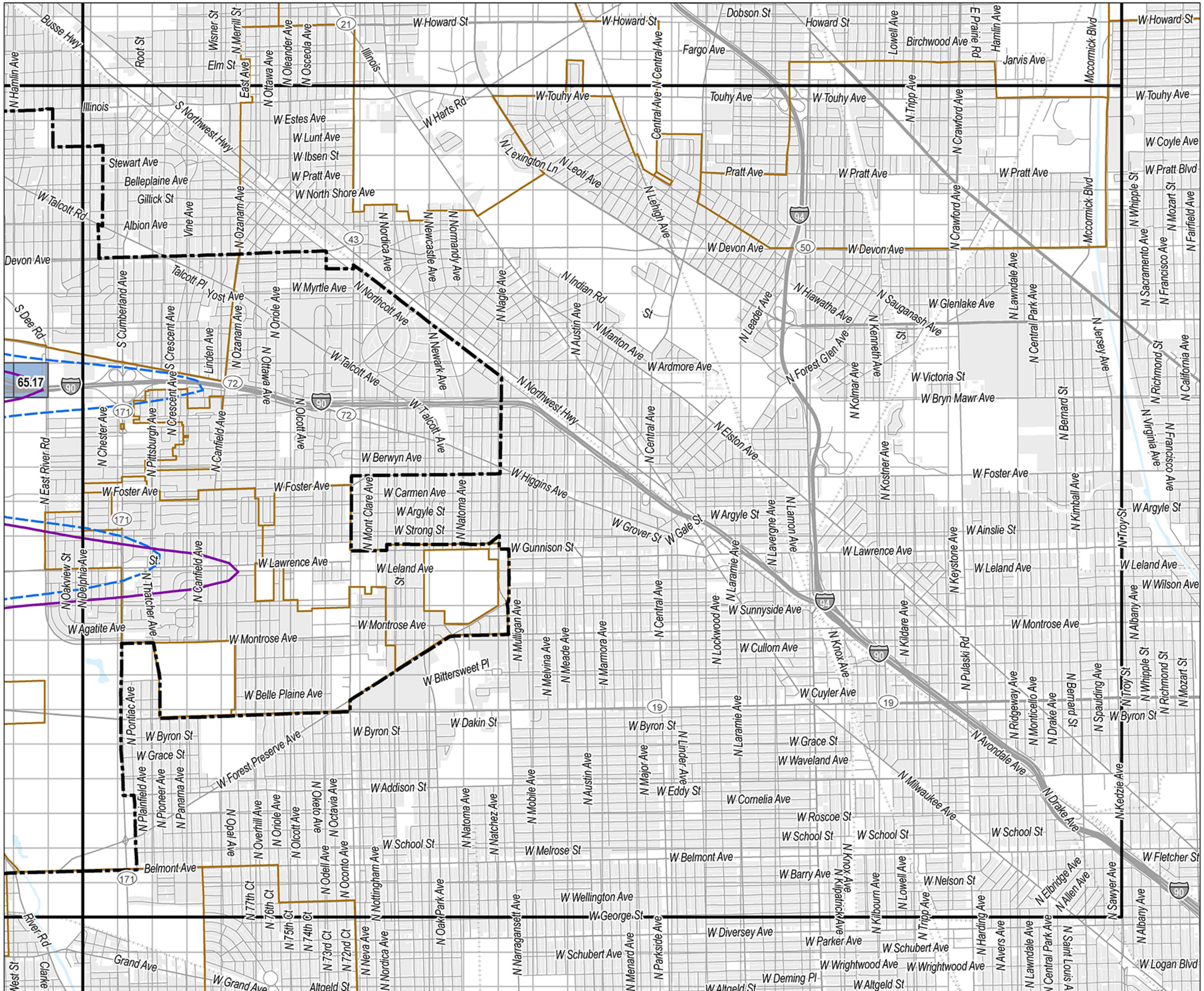

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

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Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1 Miles

Proposed Interim Fly Quiet Grid Point Detail DNL Change

▶ Exhibit C6-6

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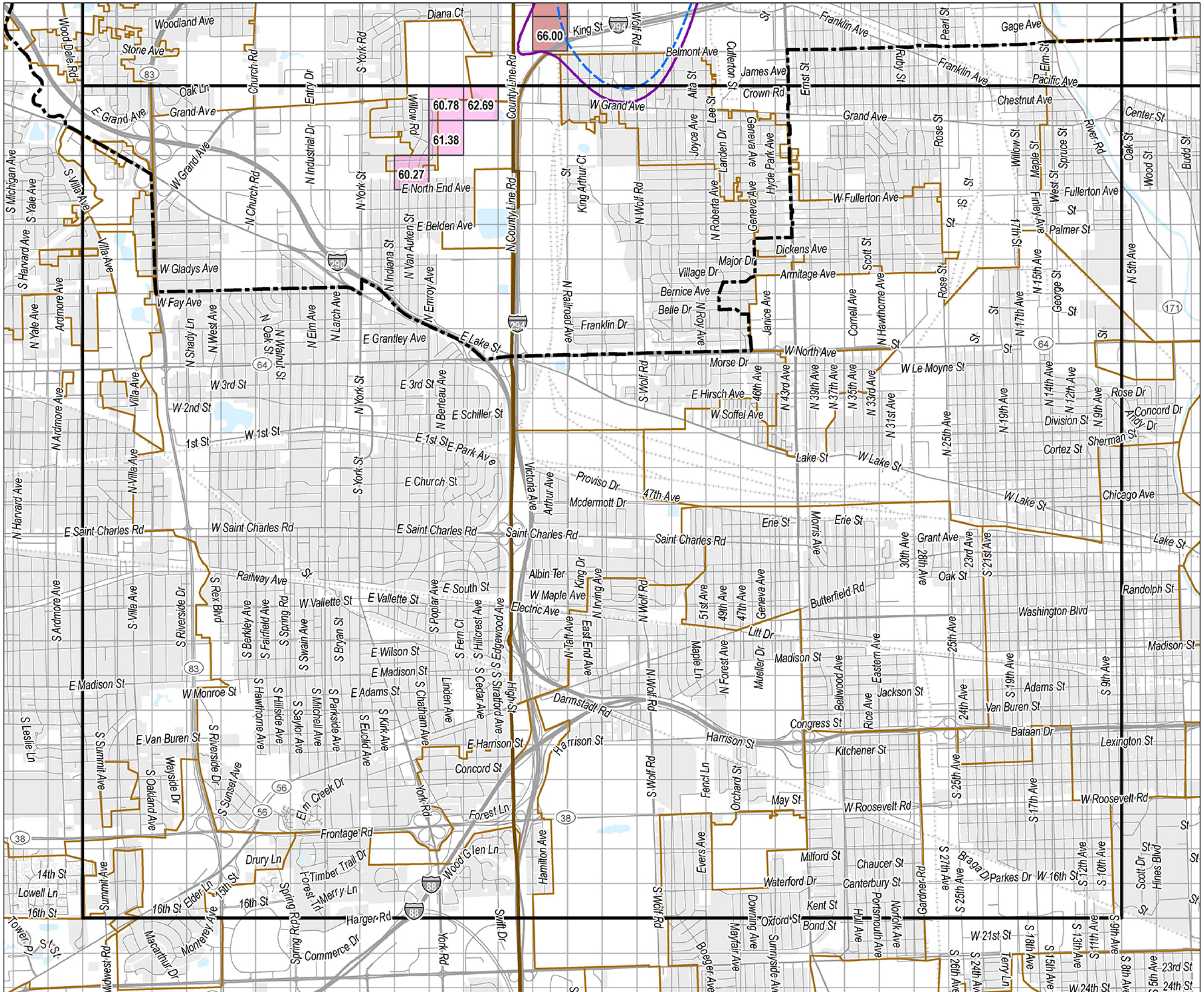

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0 0.5 1
Miles

Proposed Interim Fly Quiet Grid Point Detail DNL Change

▶ Exhibit C6-7

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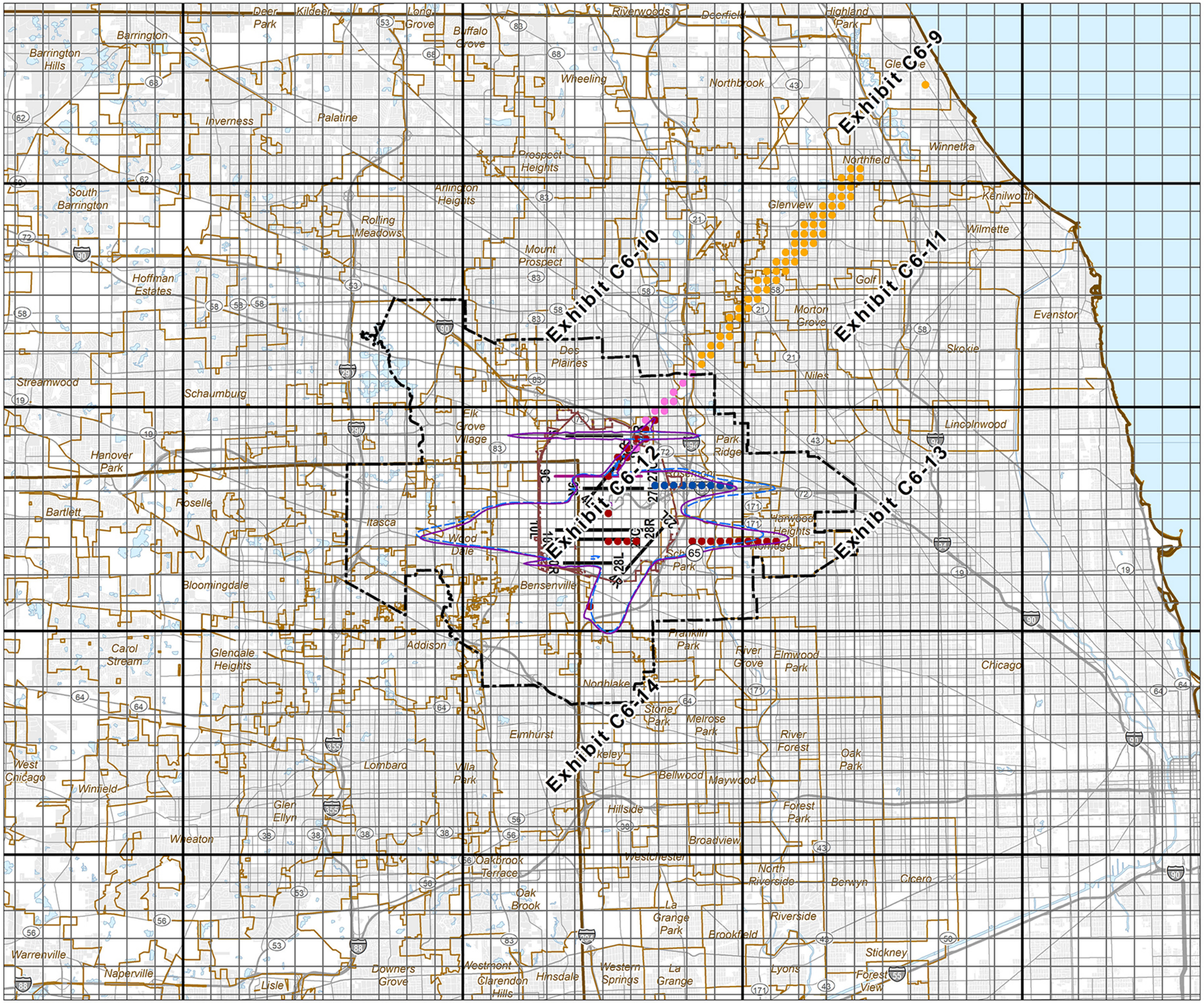

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Existing Fly Quiet 65 DNL Noise Contour

Revised Interim Fly Quiet 1 65 DNL Noise Contour

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0 3 6
Miles

Revised Interim Fly Quiet 1
Grid Point DNL Change

▶ Exhibit C6-8

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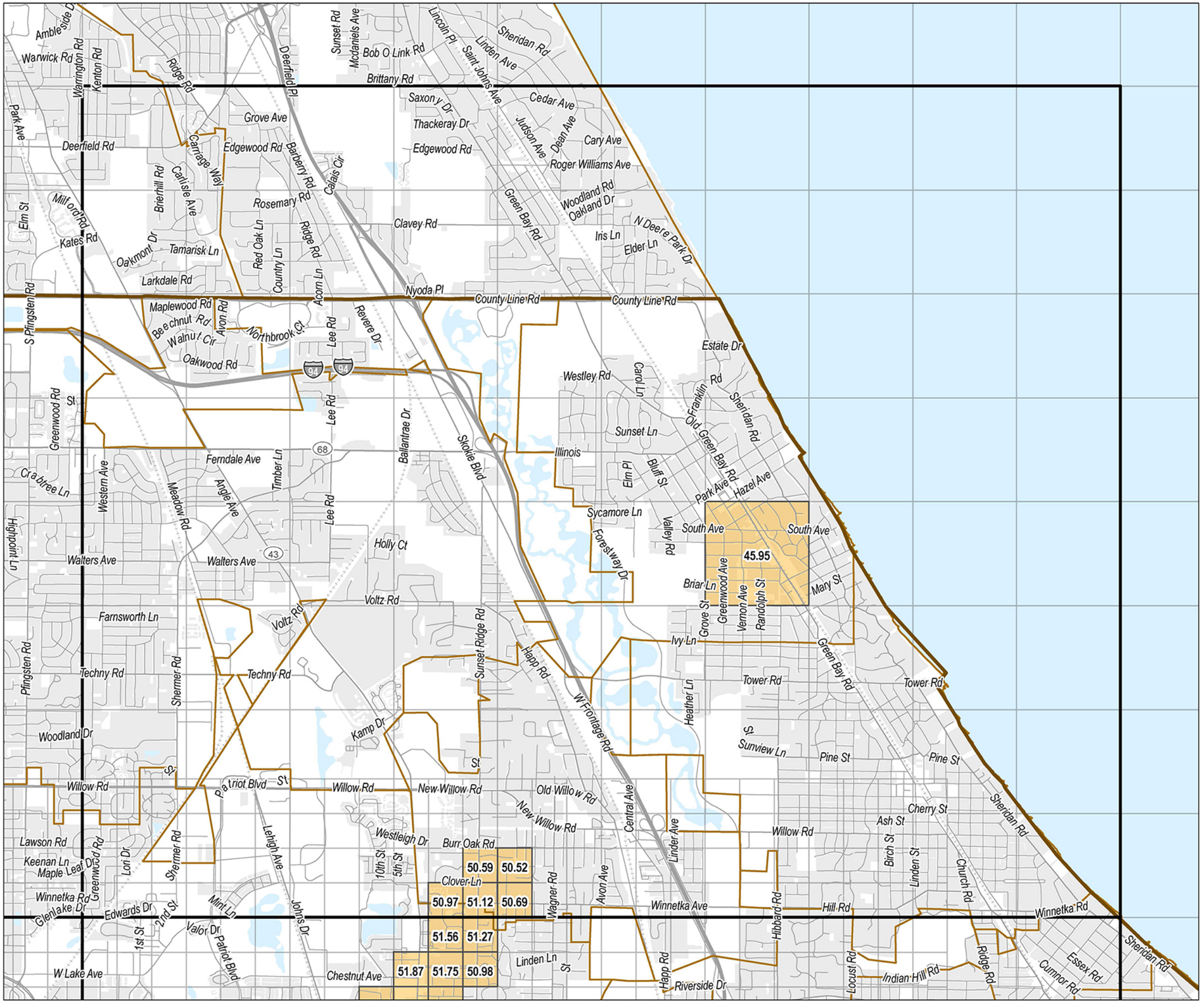

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- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1
Miles

Revised Interim Fly Quiet 1 Grid Point Detail DNL Change

▶ Exhibit C6-9

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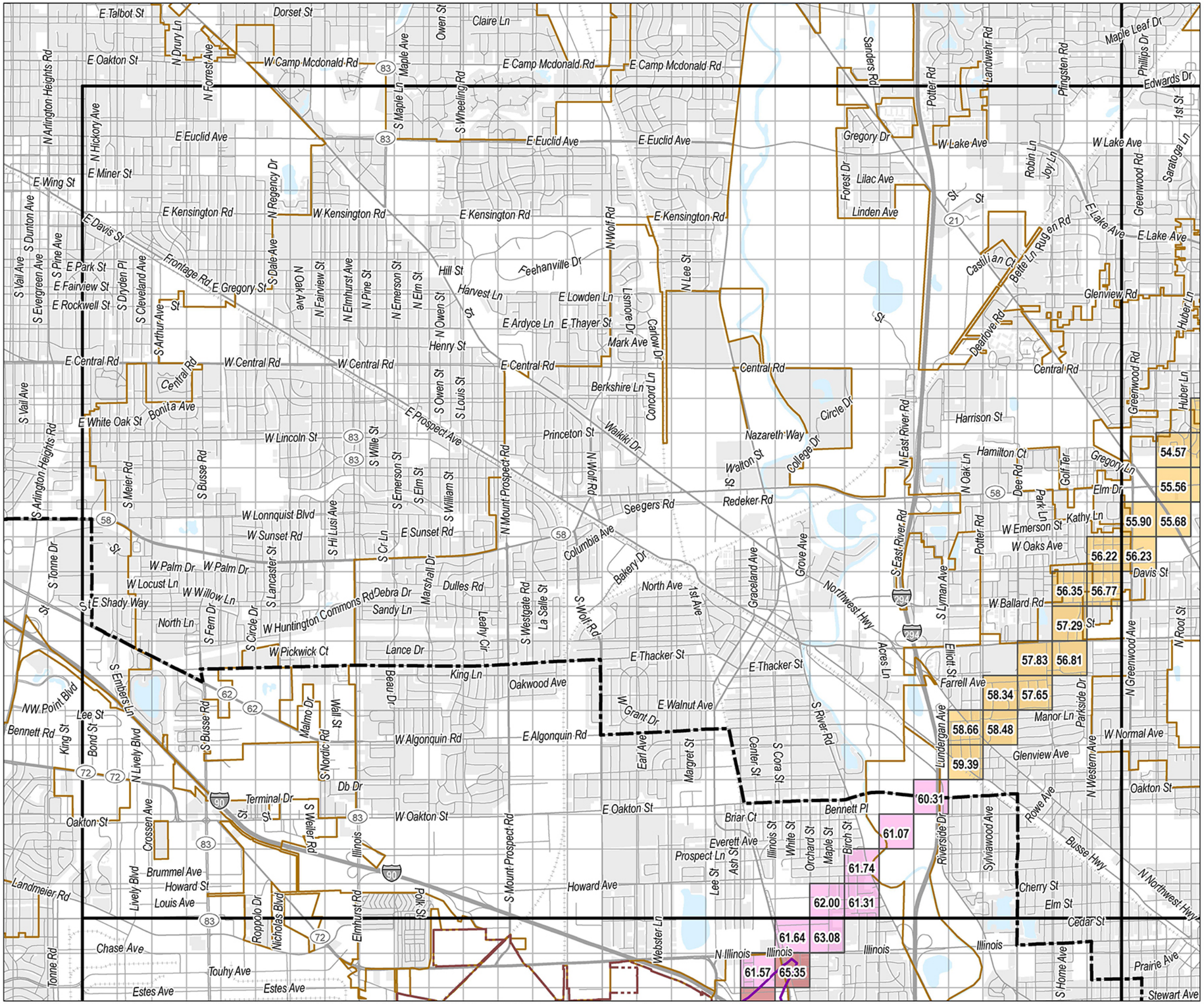

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- ## 1.5 dB and Greater Increase
- ## 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- ## 3 dB and Greater Increase
- ## 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- ## 5 dB and Greater Increase
- ## 5 dB and Greater Decrease

- Existing Fly Quiet 65 DNL Noise Contour
- Revised Interim Fly Quiet 1 65 DNL Noise Contour
- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noncompatible Land Use
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1
Miles

Revised Interim Fly Quiet 1 Grid Point Detail DNL Change

▶ Exhibit C6-10

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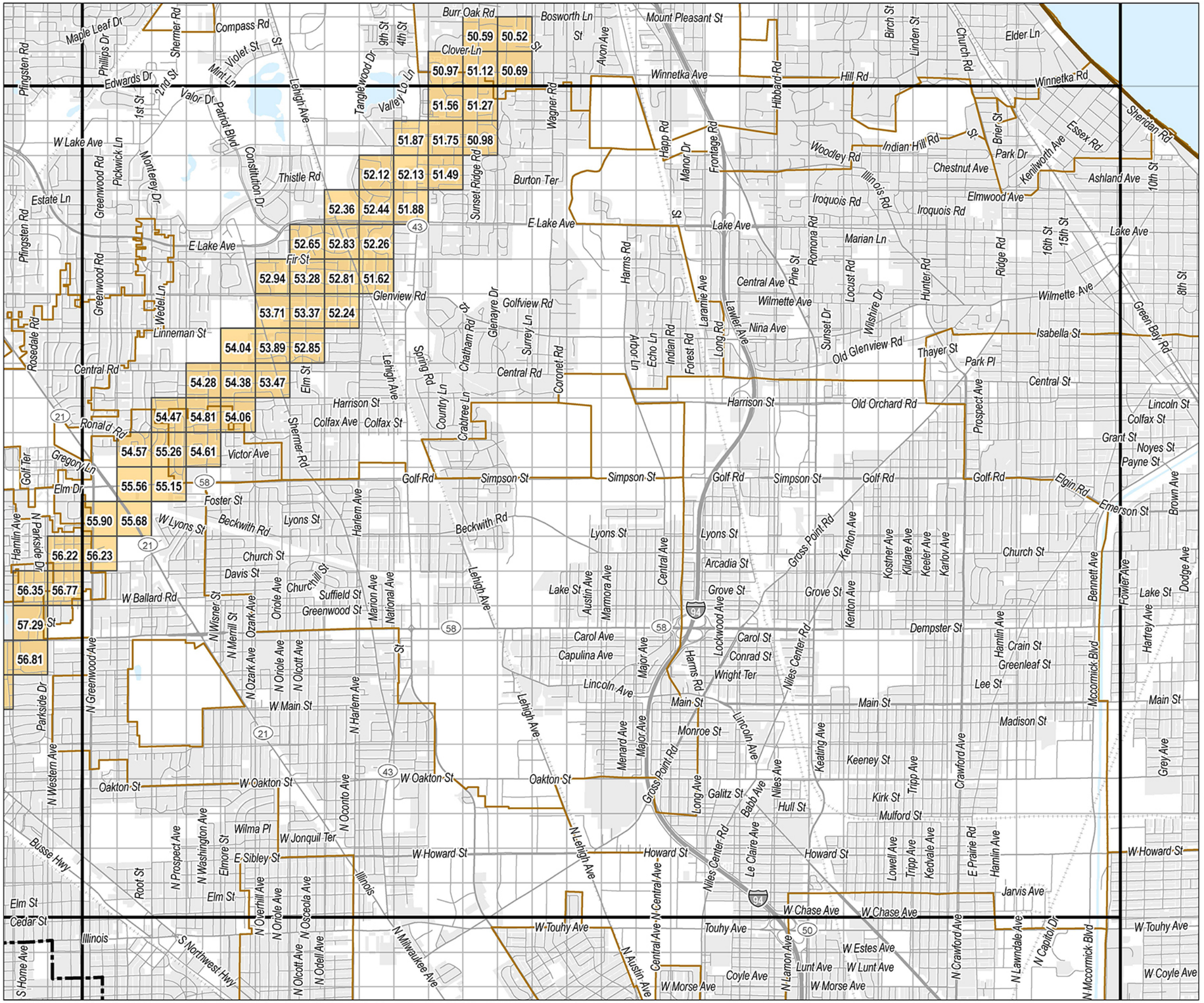

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- ## 1.5 dB and Greater Increase
- ## 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- ## 3 dB and Greater Increase
- ## 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- ## 5 dB and Greater Increase
- ## 5 dB and Greater Decrease

- Existing Fly Quiet 65 DNL Noise Contour
- Revised Interim Fly Quiet 1 65 DNL Noise Contour
- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noncompatible Land Use
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1
Miles

Revised Interim Fly Quiet 1
Grid Point Detail DNL Change

▶ Exhibit C6-11

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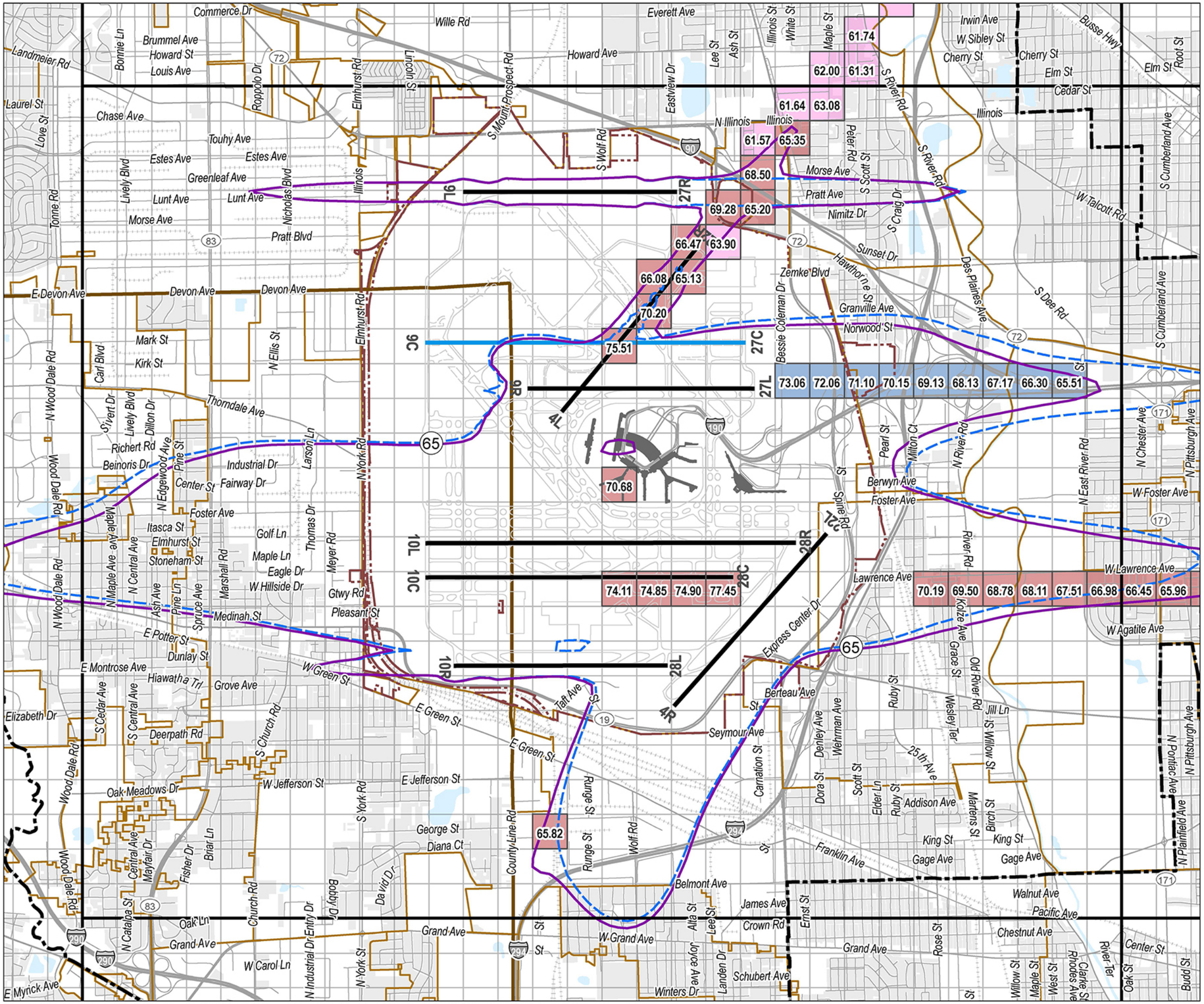

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- ## 1.5 dB and Greater Increase
- ## 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- ## 3 dB and Greater Increase
- ## 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- ## 5 dB and Greater Increase
- ## 5 dB and Greater Decrease

- Existing Fly Quiet 65 DNL Noise Contour
- Revised Interim Fly Quiet 1 65 DNL Noise Contour
- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noncompatible Land Use
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1
Miles

Revised Interim Fly Quiet 1 Grid Point Detail DNL Change

▶ Exhibit C6-12

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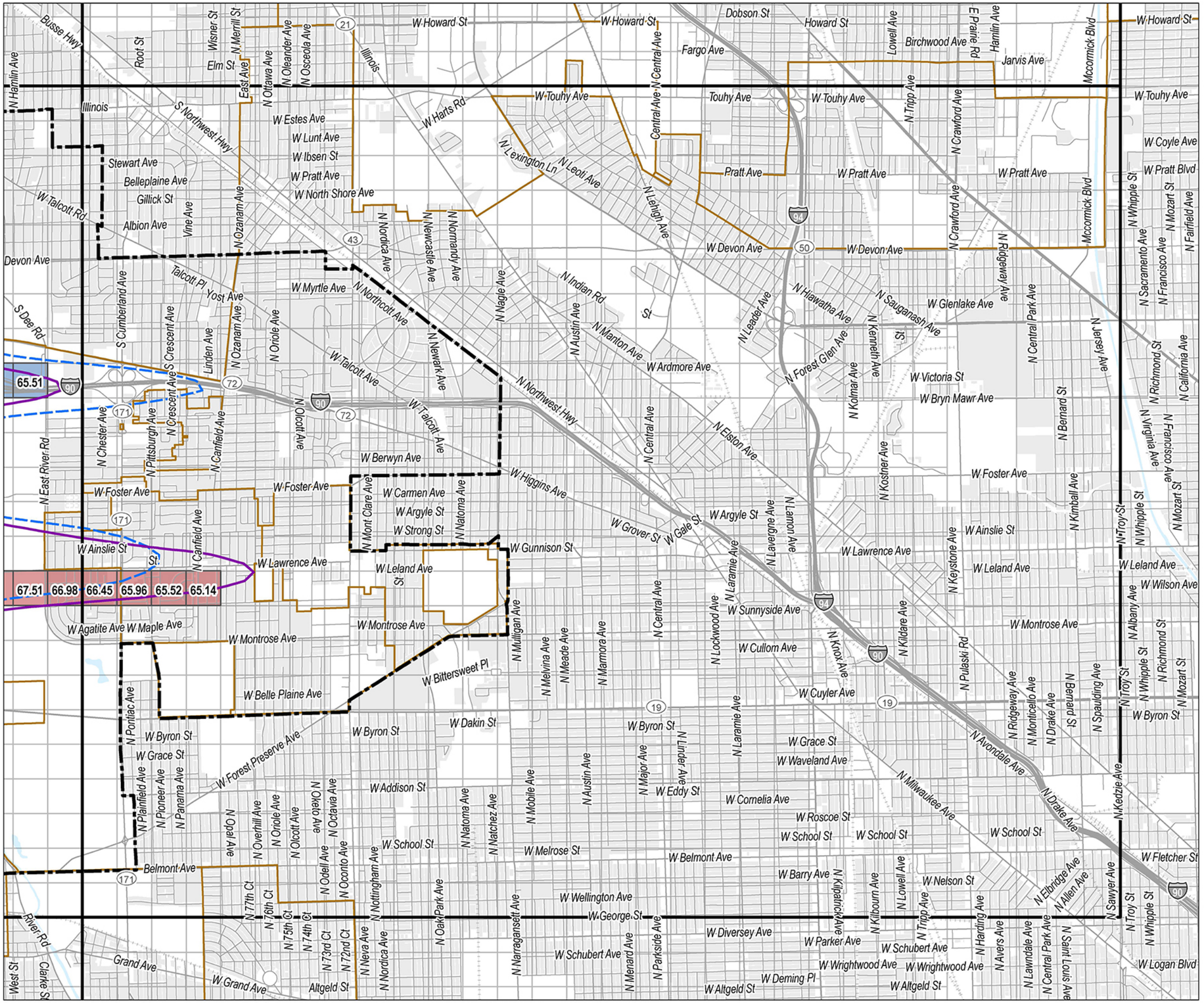

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- ## 1.5 dB and Greater Increase
- ## 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- ## 3 dB and Greater Increase
- ## 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- ## 5 dB and Greater Increase
- ## 5 dB and Greater Decrease

Existing Fly Quiet 65 DNL Noise Contour

Revised Interim Fly Quiet 1 65 DNL Noise Contour

Project Area

Airport Boundary

Existing Runways

Runway 9C/27C - Opens Nov. 2020

Noncompatible Land Use

Water

County Boundary

Community Boundary

Highway

Primary Roads

Secondary Roads

Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1
Miles

Revised Interim Fly Quiet 1
Grid Point Detail DNL Change

▶ Exhibit C6-13

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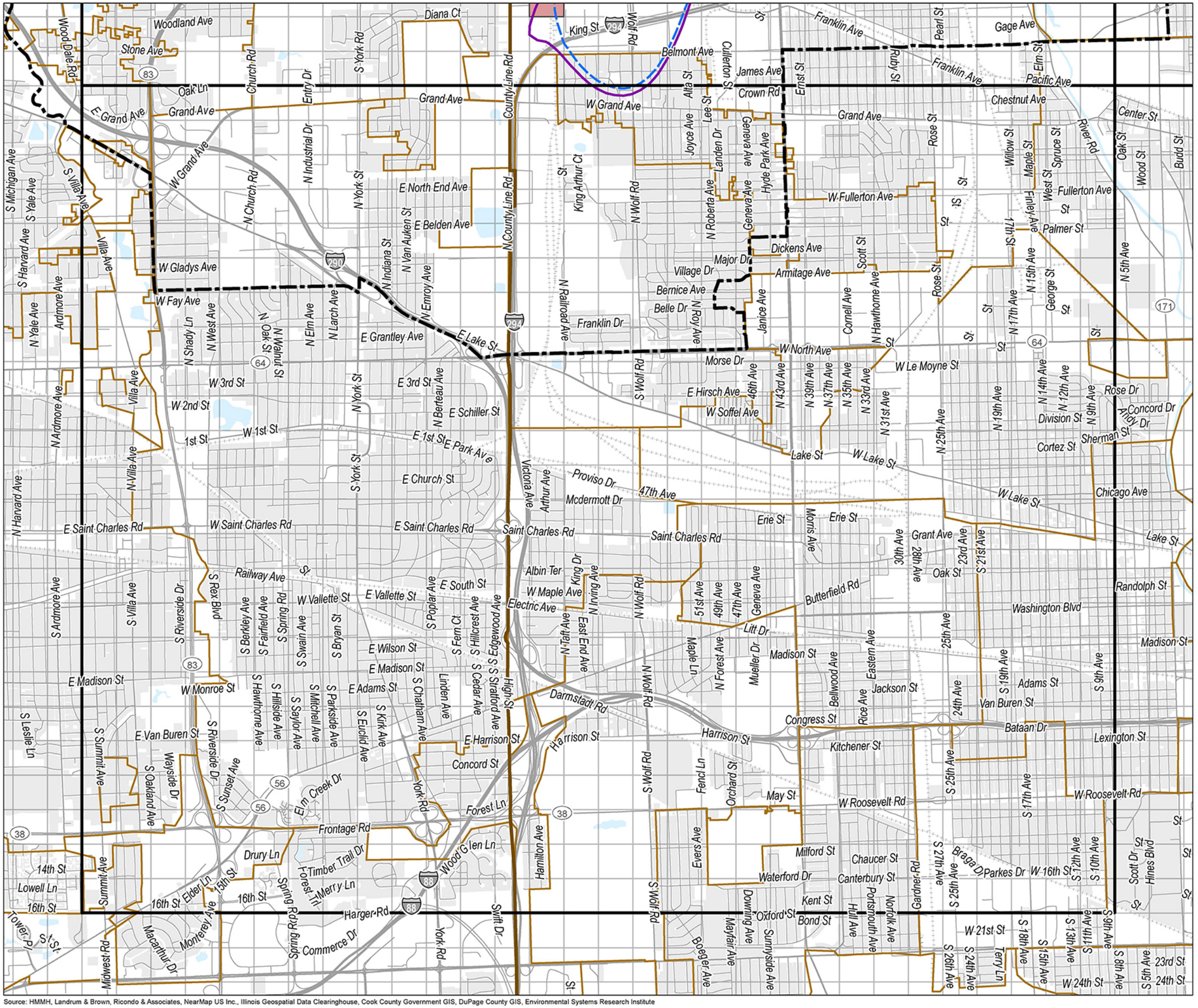

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- ## 1.5 dB and Greater Increase
- ## 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- ## 3 dB and Greater Increase
- ## 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- ## 5 dB and Greater Increase
- ## 5 dB and Greater Decrease

- Existing Fly Quiet 65 DNL Noise Contour
- Revised Interim Fly Quiet 1 65 DNL Noise Contour
- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noncompatible Land Use
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1
Miles

Revised Interim Fly Quiet 1 Grid Point Detail DNL Change

▶ Exhibit C6-14

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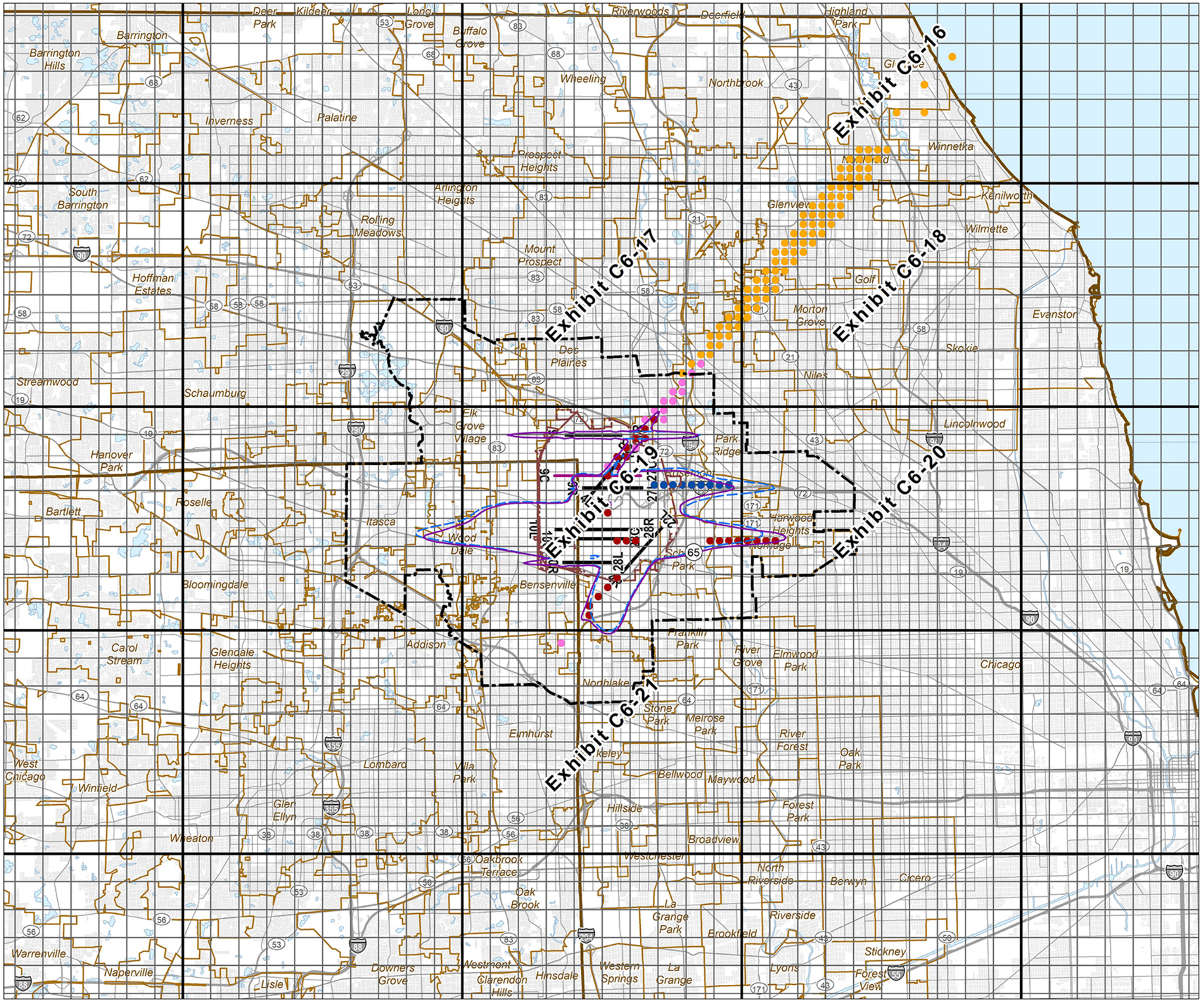

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- 1.5 dB and Greater Increase
- 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- 3 dB and Greater Increase
- 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- 5 dB and Greater Increase
- 5 dB and Greater Decrease

Existing Fly Quiet 65 DNL Noise Contour

Revised Interim Fly Quiet 2 65 DNL Noise Contour

Project Area

Airport Boundary

Existing Runways

Runway 9C/27C - Opens Nov. 2020

Noncompatible Land Use

Water

County Boundary

Community Boundary

Highway

Primary Roads

Secondary Roads

Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 3 6
Miles

Revised Interim Fly Quiet 2
Grid Point DNL Change

▶ Exhibit C6-15

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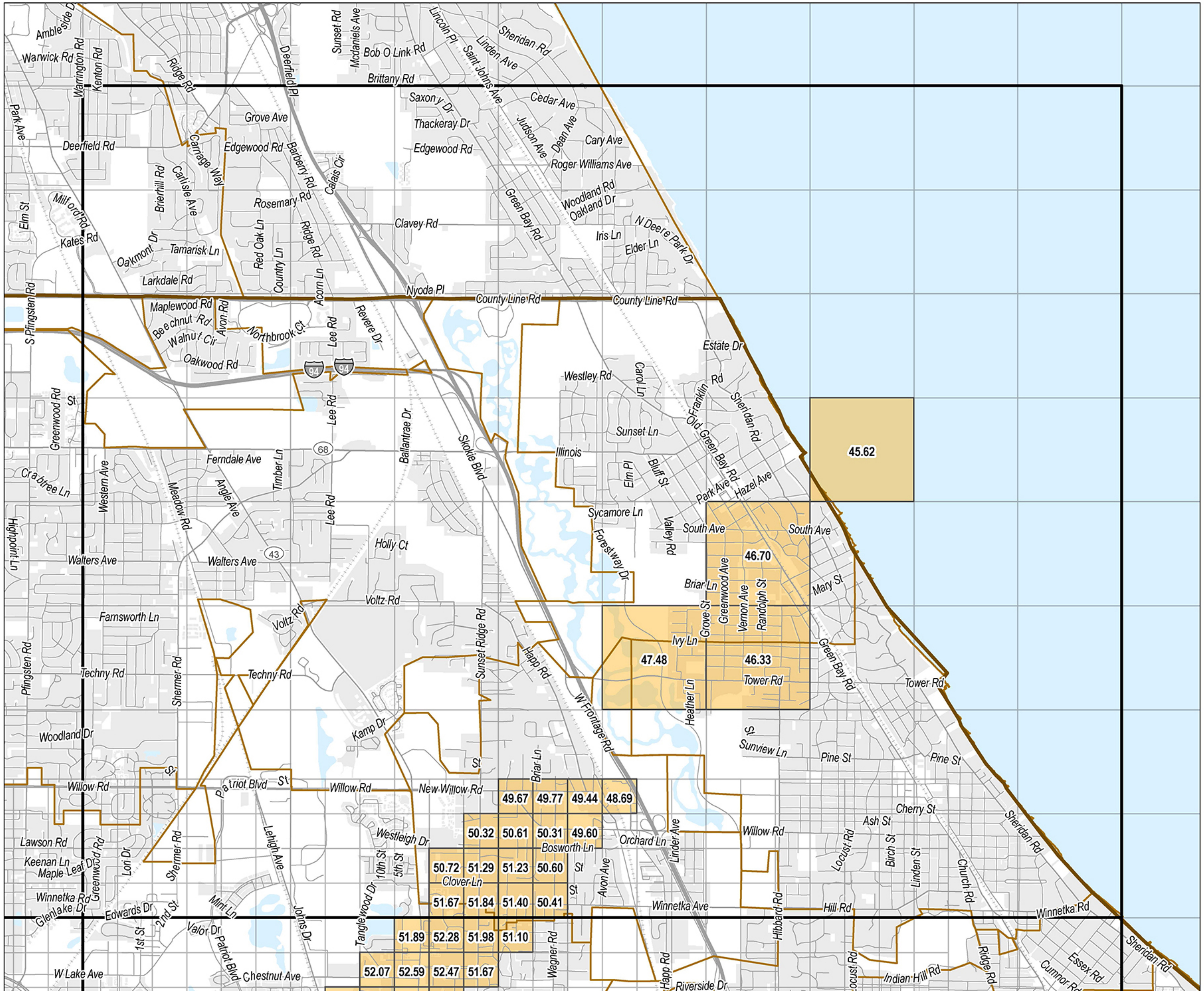

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- ## 1.5 dB and Greater Increase
- ## 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- ## 3 dB and Greater Increase
- ## 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- ## 5 dB and Greater Increase
- ## 5 dB and Greater Decrease

- Existing Fly Quiet 65 DNL Noise Contour
- Revised Interim Fly Quiet 2 65 DNL Noise Contour
- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noncompatible Land Use
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1
Miles

Revised Interim Fly Quiet 2 Grid Point Detail DNL Change

▶ Exhibit C6-16

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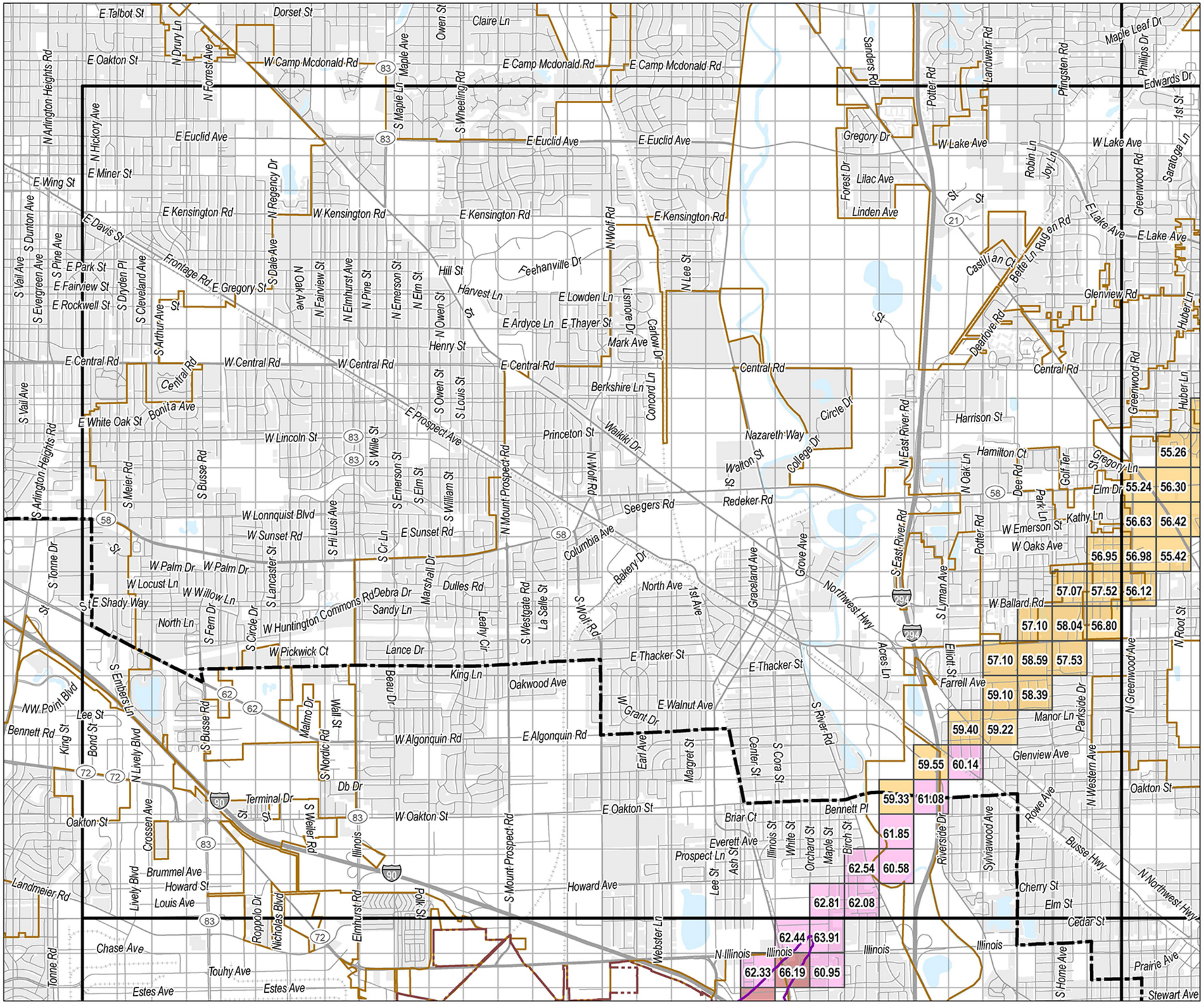

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- ## 1.5 dB and Greater Increase
- ## 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- ## 3 dB and Greater Increase
- ## 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- ## 5 dB and Greater Increase
- ## 5 dB and Greater Decrease

- Existing Fly Quiet 65 DNL Noise Contour
- Revised Interim Fly Quiet 2 65 DNL Noise Contour
- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noncompatible Land Use
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1
Miles

Revised Interim Fly Quiet 2 Grid Point Detail DNL Change

▶ Exhibit C6-17

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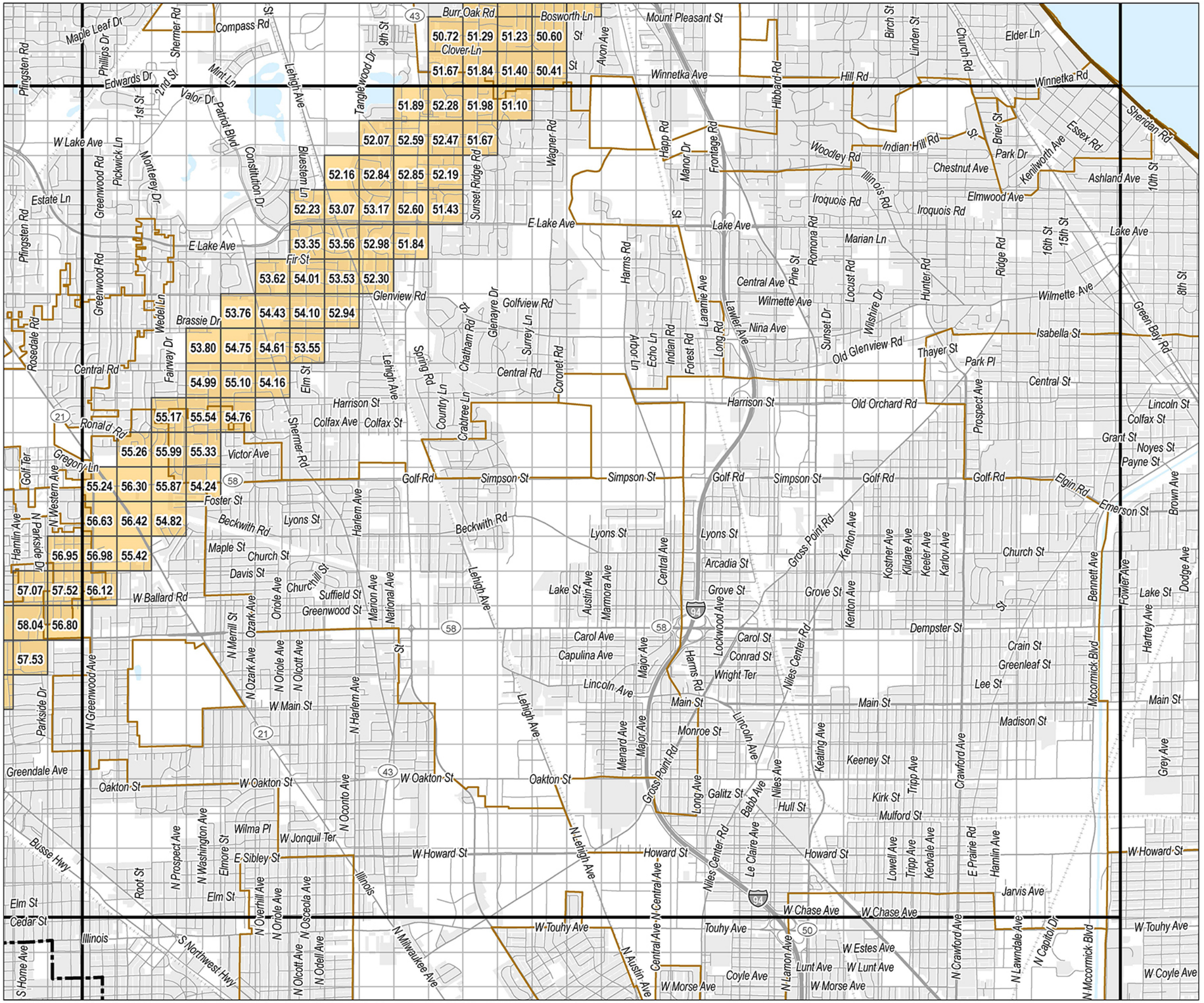

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- ## 1.5 dB and Greater Increase
- ## 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- ## 3 dB and Greater Increase
- ## 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- ## 5 dB and Greater Increase
- ## 5 dB and Greater Decrease

- Existing Fly Quiet 65 DNL Noise Contour
- Revised Interim Fly Quiet 2 65 DNL Noise Contour
- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noncompatible Land Use
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1
Miles

Revised Interim Fly Quiet 2 Grid Point Detail DNL Change

▶ Exhibit C6-18

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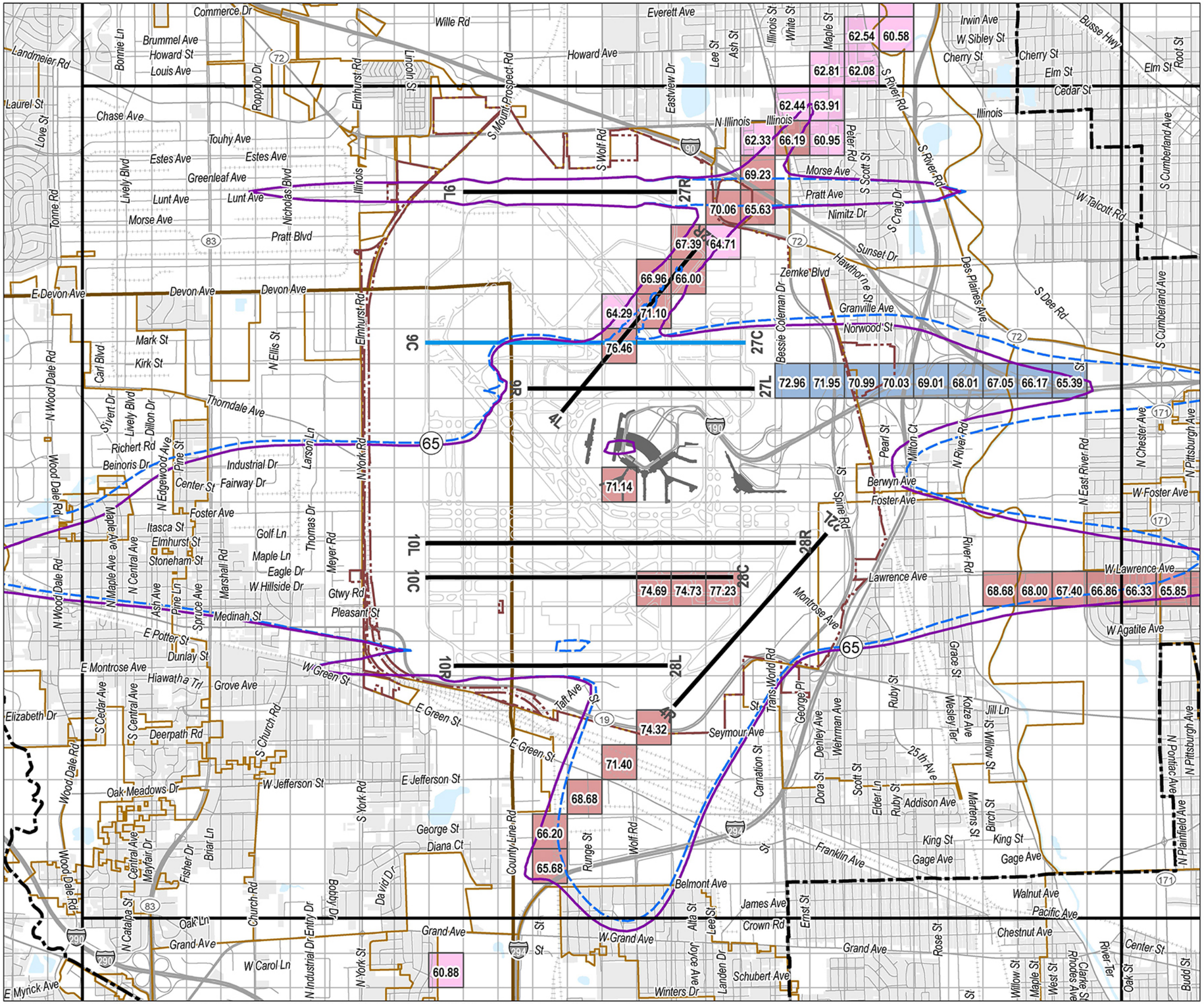

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- ## 1.5 dB and Greater Increase
- ## 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- ## 3 dB and Greater Increase
- ## 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- ## 5 dB and Greater Increase
- ## 5 dB and Greater Decrease

- Existing Fly Quiet 65 DNL Noise Contour
- Revised Interim Fly Quiet 2 65 DNL Noise Contour
- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noncompatible Land Use
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1
Miles

Revised Interim Fly Quiet 2
Grid Point Detail DNL Change

▶ Exhibit C6-19

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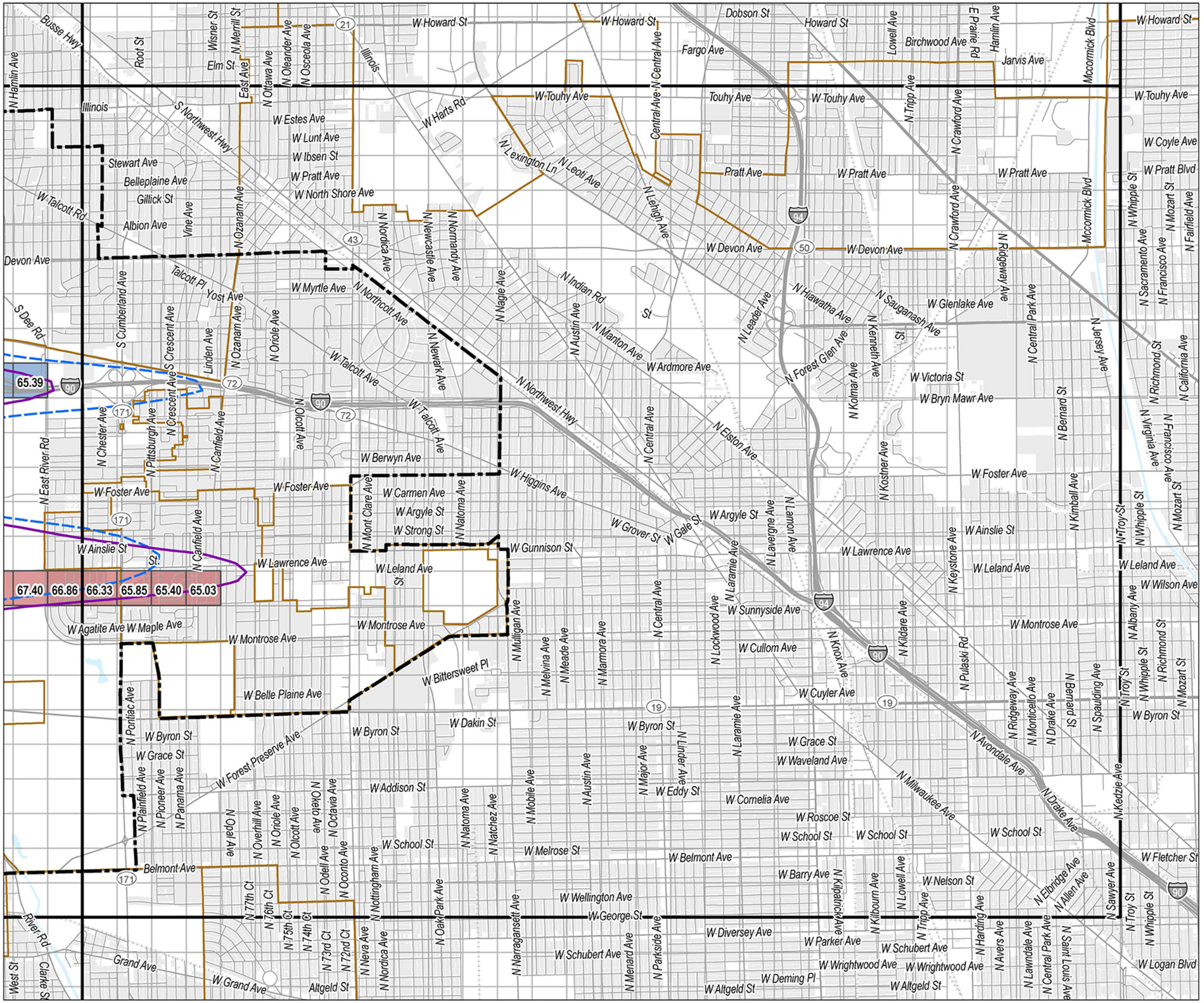

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- ## 1.5 dB and Greater Increase
- ## 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- ## 3 dB and Greater Increase
- ## 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- ## 5 dB and Greater Increase
- ## 5 dB and Greater Decrease

Existing Fly Quiet 65 DNL Noise Contour

Revised Interim Fly Quiet 2 65 DNL Noise Contour

Project Area

Airport Boundary

Existing Runways

Runway 9C/27C - Opens Nov. 2020

Noncompatible Land Use

Water

County Boundary

Community Boundary

Highway

Primary Roads

Secondary Roads

Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1
Miles

Revised Interim Fly Quiet 2
Grid Point Detail DNL Change

▶ Exhibit C6-20

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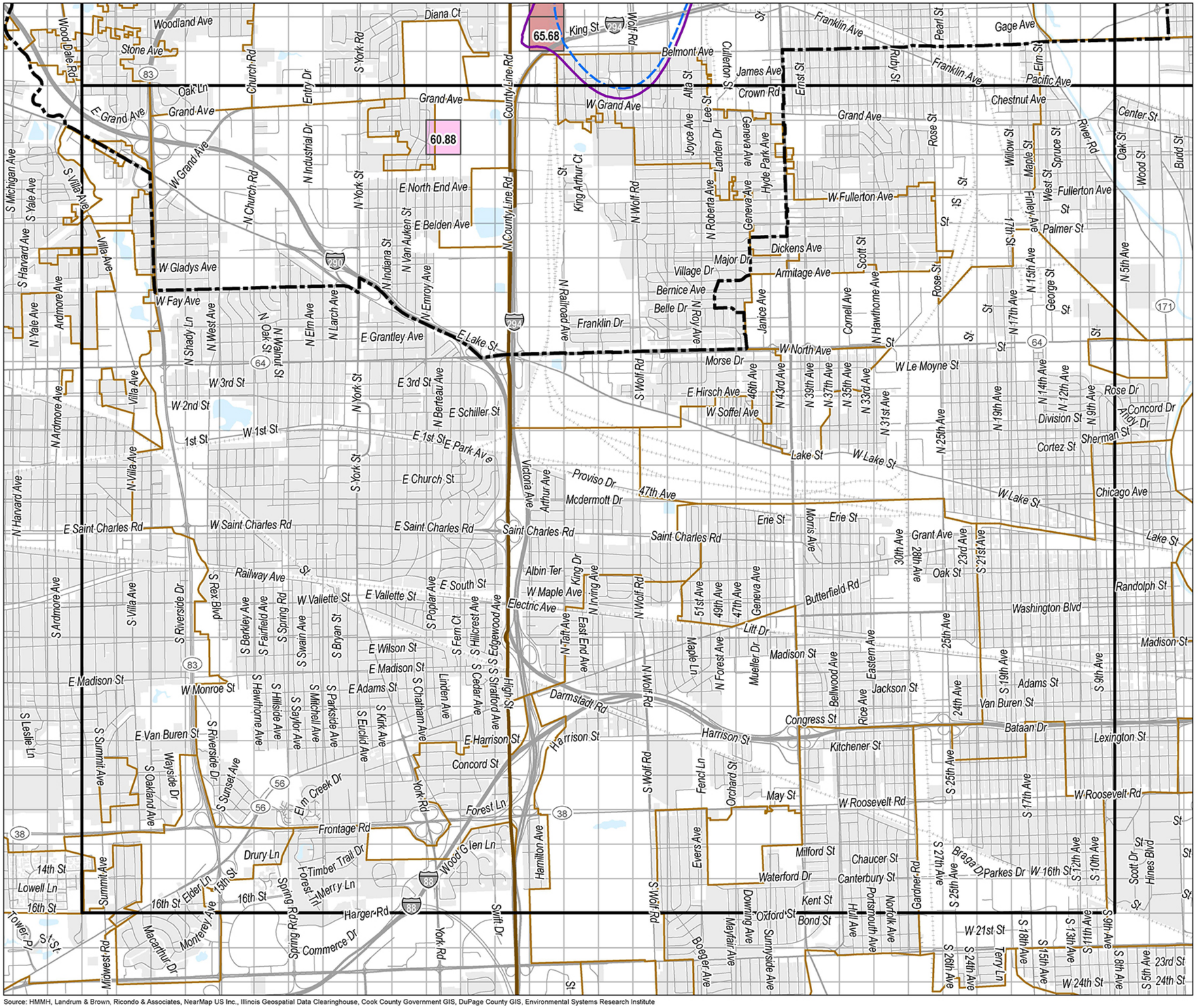

Source: HMMH, Landrum & Brown, Ricondo & Associates, NearMap US Inc., Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Written Re-Evaluation of the O'Hare Modernization Environmental Impact Statement for the Interim Fly Quiet Runway Rotation Plan

Grid Points 65 DNL and Greater
- ## 1.5 dB and Greater Increase
- ## 1.5 dB and Greater Decrease

Grid Points 60 DNL - 65 DNL
- ## 3 dB and Greater Increase
- ## 3 dB and Greater Decrease

Grid Points 45 DNL - 60 DNL
- ## 5 dB and Greater Increase
- ## 5 dB and Greater Decrease

- Existing Fly Quiet 65 DNL Noise Contour
- Revised Interim Fly Quiet 2 65 DNL Noise Contour
- Project Area
- Airport Boundary
- Existing Runways
- Runway 9C/27C - Opens Nov. 2020
- Noncompatible Land Use
- Water
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Railroad Lines

Note: DNL contours and grid points represent November 2019 to May 2020 and September 2020 to January 2021

0 0.5 1
Miles

Revised Interim Fly Quiet 2
Grid Point Detail DNL Change

▶ Exhibit C6-21

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