

LAX Arrivals near La Habra Heights

Presented to: LAX/Community Noise Roundtable

By: WSC Operations Support Group

Date: January 11, 2012



Federal Aviation
Administration



LAX Arrival Flow

1/14/2011

LAX Class B



5000

7000

LAX

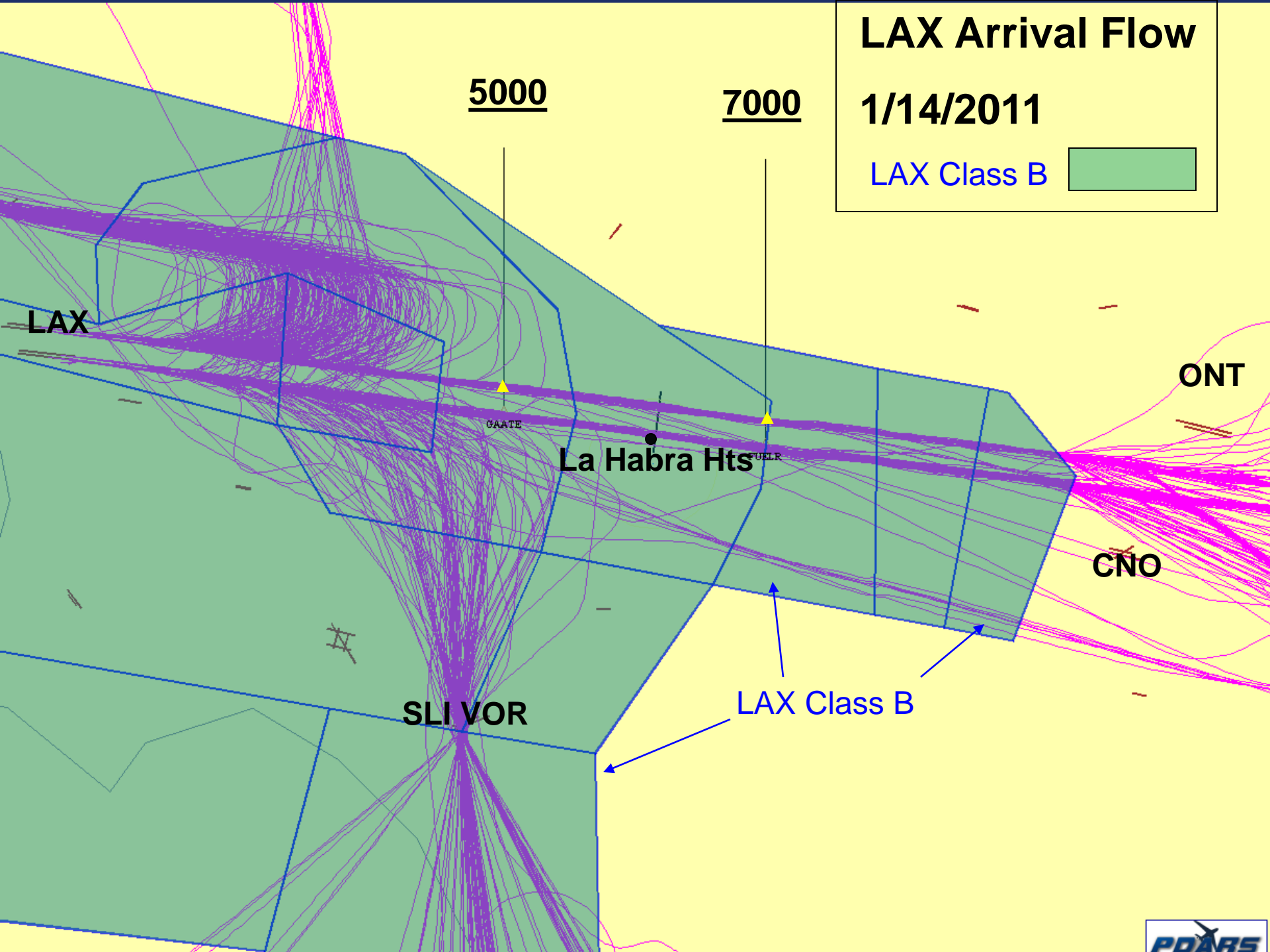
ONT

La Habra Hts

CNO

SLI VOR

LAX Class B



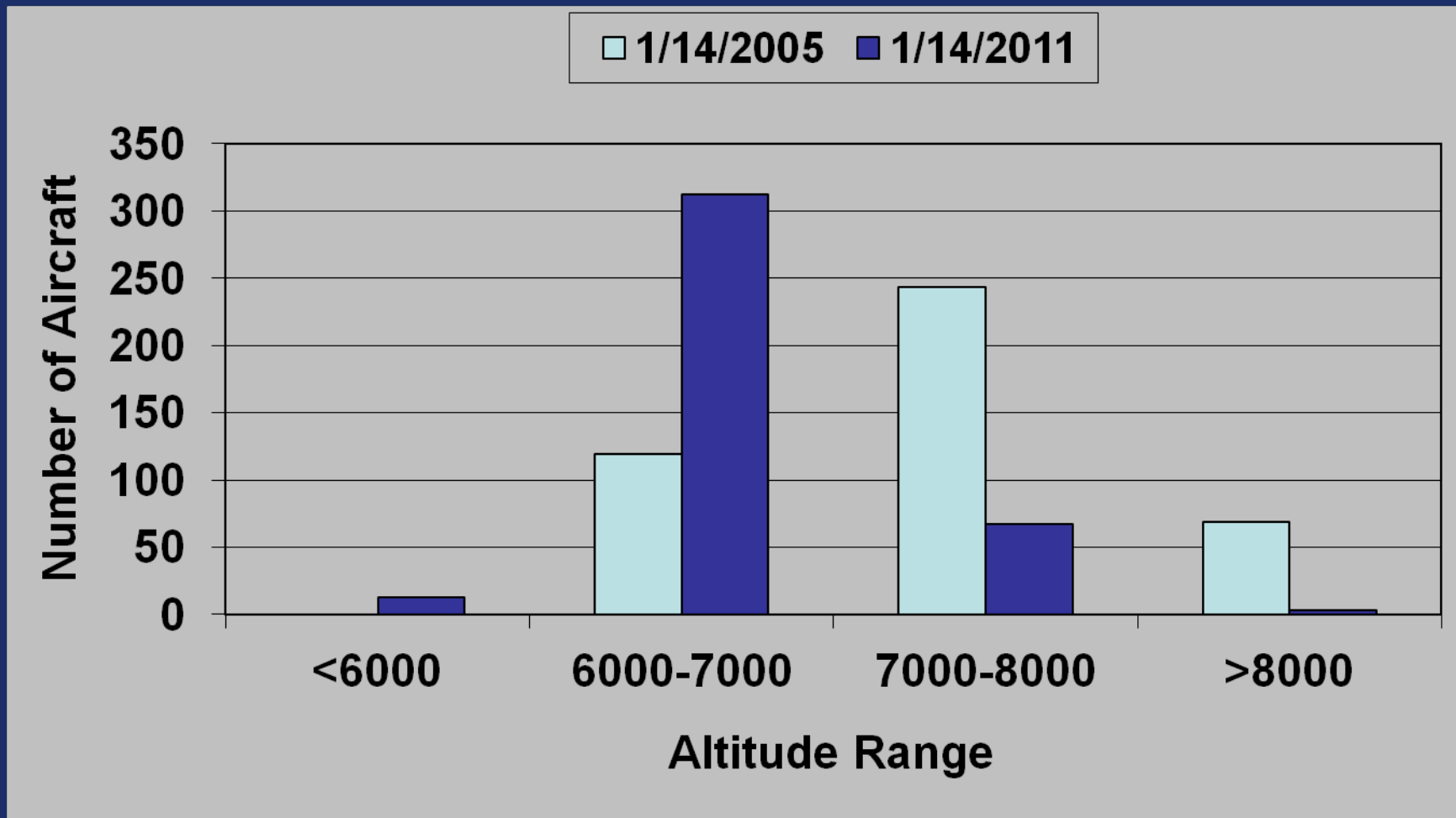
Arrival Altitude Comparison

- One day (January 14) from 2005 and 2011
- Average altitude in 2005 was 7400 ft. MSL
- Average altitude in 2011 was 6600 ft. MSL
- Arrivals originating from nearby airports such as ONT and PSP are not included due to level flight over La Habra Heights
- Altitudes recorded may vary as much as 200 ft. from actual aircraft altitude (*FAA Order JO 7110.65, 5-2-17*)



Arrival Altitude Comparison

Arrivals from nearby airports (ONT, PSP) not included



Altitude Comparison Analysis

- Flight altitude gradient for east arrivals is lower in 2011 compared with 2005
- In 2005, the minimum crossing altitude on arrival procedures was lowered from 8000 to 7000 at FUELR as arrivals were consistently too high when acquiring the glide slope (*SAFETY ISSUE*)
- There has been **NO CHANGE** to the glide slope angle of 3°



Altitude Comparison Conclusions

- **Fleet mix in 2011 has a higher percentage of quieter aircraft vs. 2005**
- **More aircraft today are equipped and capable of automated power off descents**



27th International Congress of the Aeronautical Sciences (2010)

- The following slides contain excerpts from the report '*Environmental Benefits of New Continuous Descent Operations at Los Angeles International Airport*' by Sandy Liu, Walter White, Richard Nehl, and John-Paul Clarke



Continuous Descent Arrival (CDA)

- **The first publicly-charted CDA in the US was implemented at LAX on Dec. 20, 2007 called the LAX RIIVR RNAV STAR (Standard Terminal Arrival Route)**
- **A CDA provides an advantage over conventional arrival profiles by reducing ground noise along the flight path, saving flight time and, more importantly, fuel**



CDA (Continued)

- **Environmental benefits were computed by the FAA's Aviation Environmental Design Tool (AEDT)**
- **This CDA implementation has been estimated to save an average 25 gallons of jet fuel per flight, or annually saves approximately 2 million gallons of jet fuel, which is equivalent to mitigation of 41 million pounds of Carbon Dioxide (CO₂)**



NOISE-REDUCING APPROACH

Aircraft making a long, steady approach create less noise when close to the ground

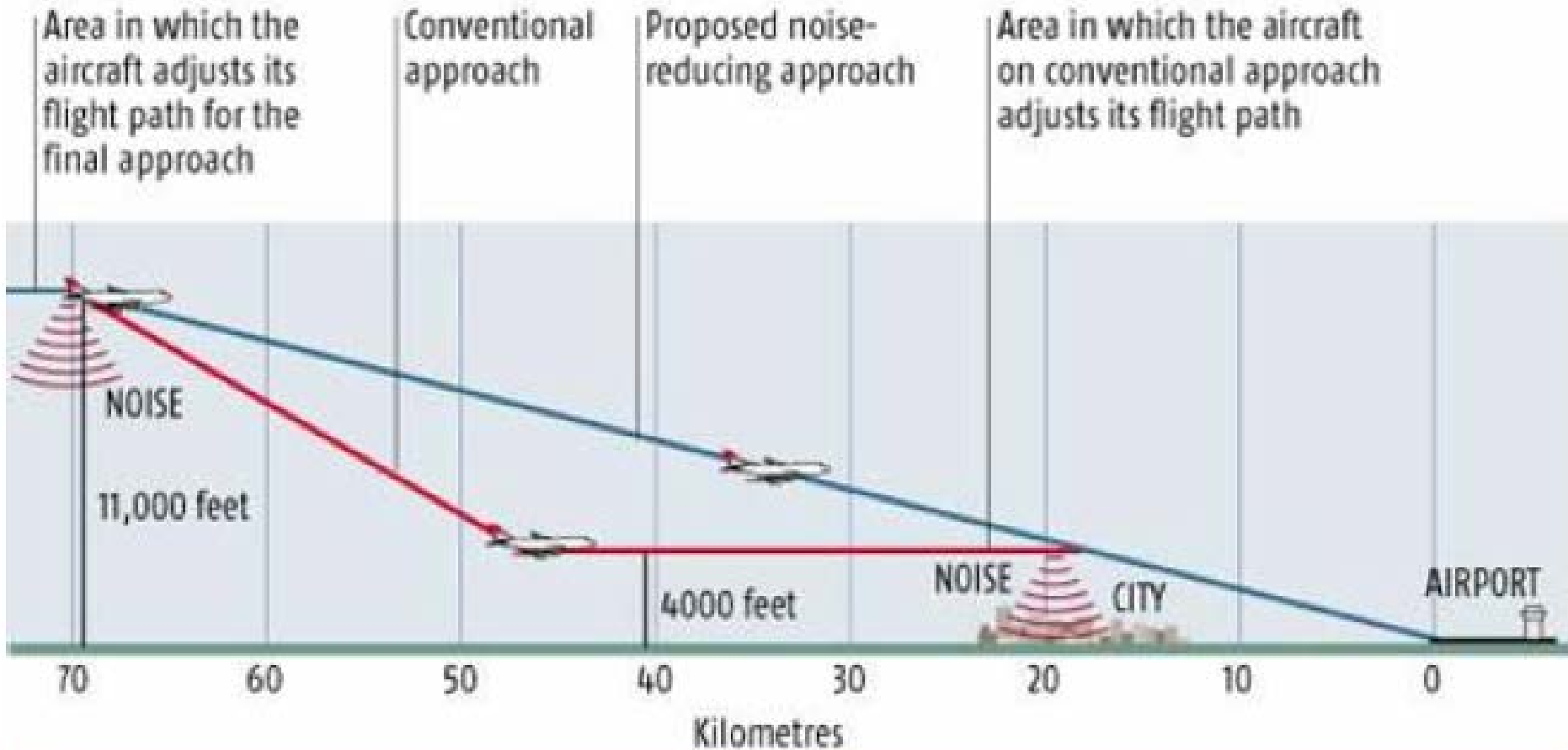


Fig. 1. Conventional Approach versus the Continuous Descent Approach (CDA)

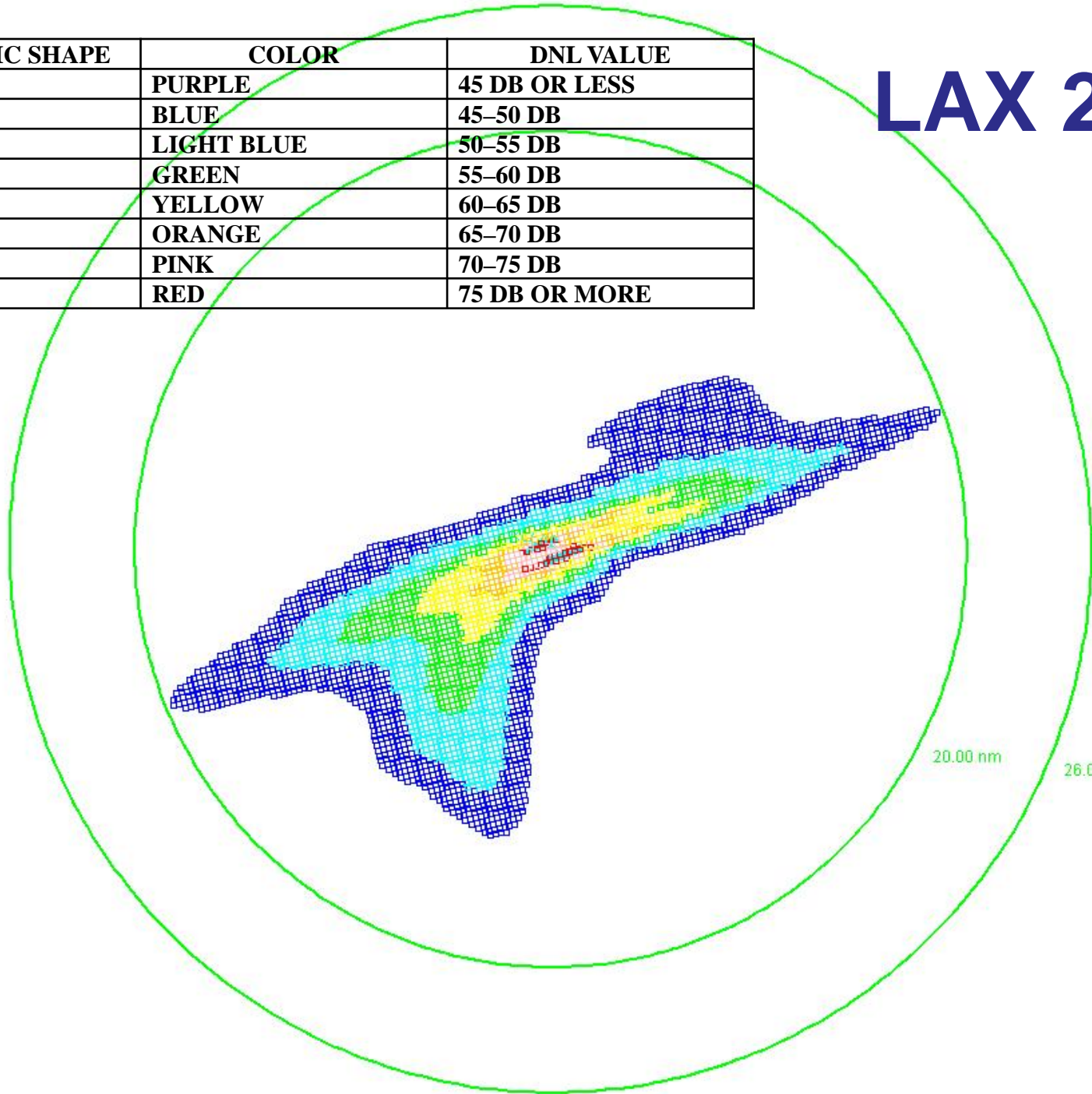
LAX 2010 Noise Footprint

- **Baseline traffic using a week in January, April, July and October**
- **Four weeks of data is approx. 37,000 tracks analyzed**
- **Range rings are based on center of airport so La Habra lies at approx. 21 NM range ring**



LAX 2010

GEOMETRIC SHAPE	COLOR	DNL VALUE
SQUARE	PURPLE	45 DB OR LESS
SQUARE	BLUE	45-50 DB
SQUARE	LIGHT BLUE	50-55 DB
SQUARE	GREEN	55-60 DB
SQUARE	YELLOW	60-65 DB
SQUARE	ORANGE	65-70 DB
SQUARE	PINK	70-75 DB
SQUARE	RED	75 DB OR MORE



CATEX

- **CATEX (December 2007) was a modification to existing RIIVR TWO STAR, not original RIIVR ONE**
- **Removed runway transitions and published each transition on its associated approach**
- **No ground track change**
- **Modification had no impact to National Parks or local scenic resources**
- **CATEX for establishing RIIVR ONE STAR – attempting to locate**

2008 Updates

- **The following slides are from an operational analysis by The MITRE Corporation and are included to show the evolution to the current procedures**
- **Changes implemented on Sept 25, 2008 were made at distances greater than 45 NM from the runway to optimize descent profiles and improve fuel burn and emissions when transitioning from the enroute phase of flight**





LAX Pre-Implementation Procedure

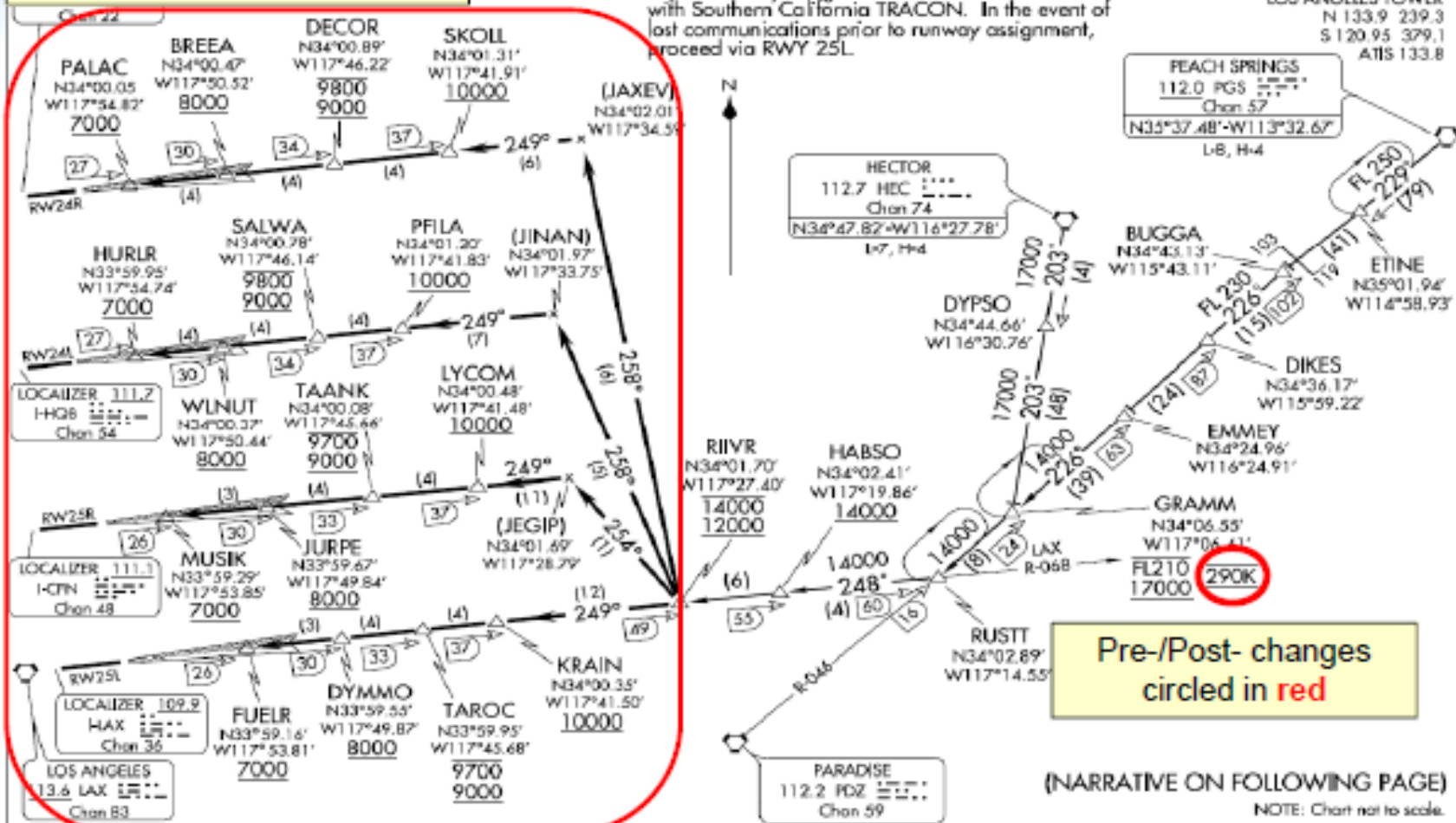
RIIVR ONE Arrival

These become four separate approaches

NOTE: DME or RADAR required.

NOTE: Expect runway assignment on initial contact with Southern California TRACON. In the event of lost communications prior to runway assignment, proceed via RWY 25L.

SOCAL APP CON
124.9 269.0
LOS ANGELES TOWER
N 133.9 239.3
S 120.95 329.1
ATIS 133.8



Pre-/Post- changes circled in red
(NARRATIVE ON FOLLOWING PAGE)
NOTE: Chart not to scale.

(RIIVR, RIIVR1) 07298
RIIVR ONE ARRIVAL

ST-237 (PA)

LOS ANGELES INTL
LOS ANGELES, CALIFORNIA

SW-3, 08 MAY 2008 to 05 JUN 2008



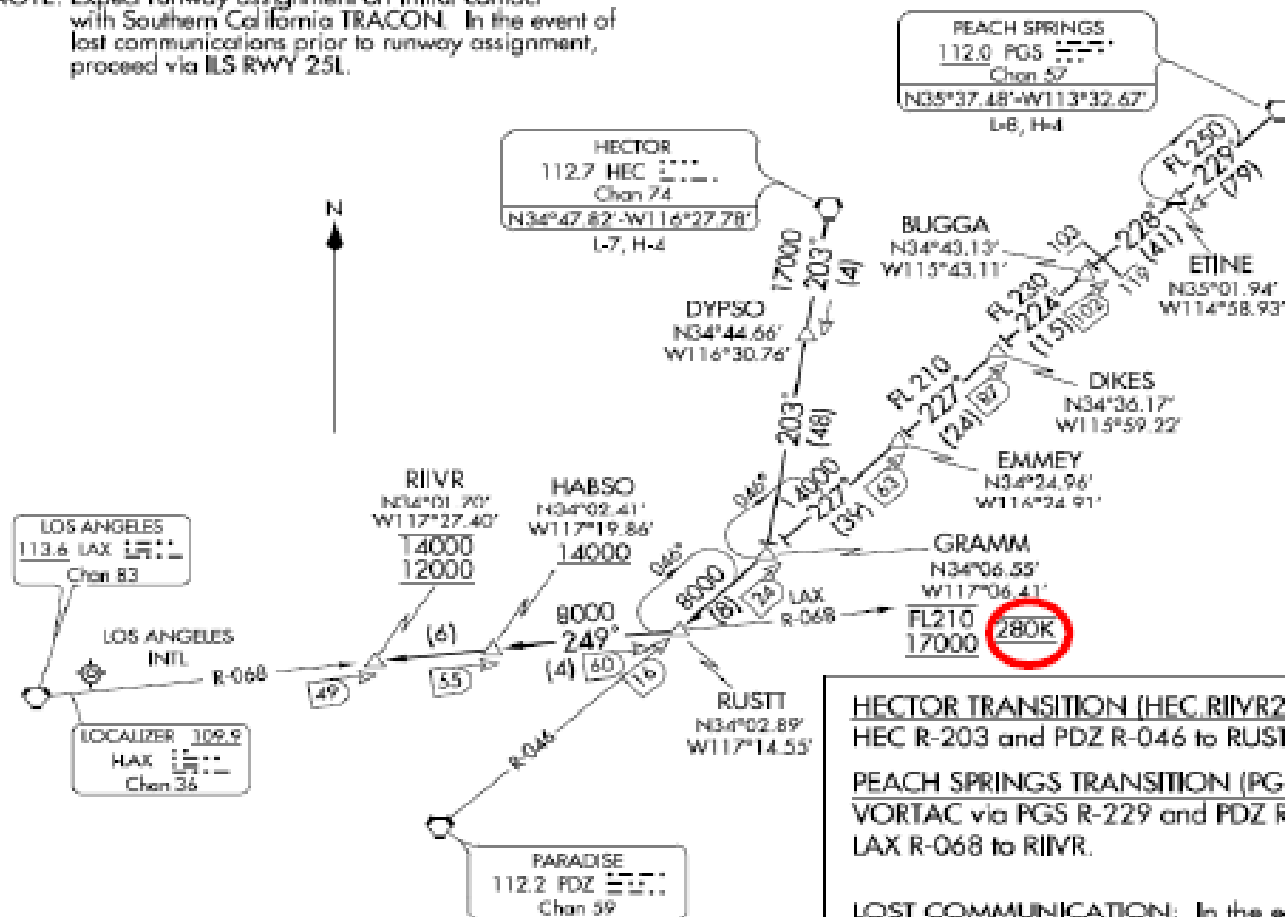
LAX Post-Implementation Procedure

RIIVR TWO Arrival

NOTE: DME or RADAR required.

NOTE: Expect runway assignment on initial contact with Southern California TRACON. In the event of lost communications prior to runway assignment, proceed via ILS RWY 25L.

SOCAL APP CON
124.9 269.0
LOS ANGELES TOWER
N 133.9 239.3
S 120.95 379.1
ATIS 133.8



NOTE: Chart not to scale.

HECTOR TRANSITION (HEC.RIIVR2): From over HEC VORTAC via HEC R-203 and PDZ R-046 to RUSTT, then via LAX R-068 to RIIVR.

PEACH SPRINGS TRANSITION (PGS.RIIVR2): From over PGS VORTAC via PGS R-229 and PDZ R-046 to RUSTT, then via LAX R-068 to RIIVR.

LOST COMMUNICATION: In the event of lost communications prior to runway assignment proceed via ILS Rwy 25L.

(RIIVR.RIIVR2) 08289
RIIVR TWO ARRIVAL

SI-227 (FAA)

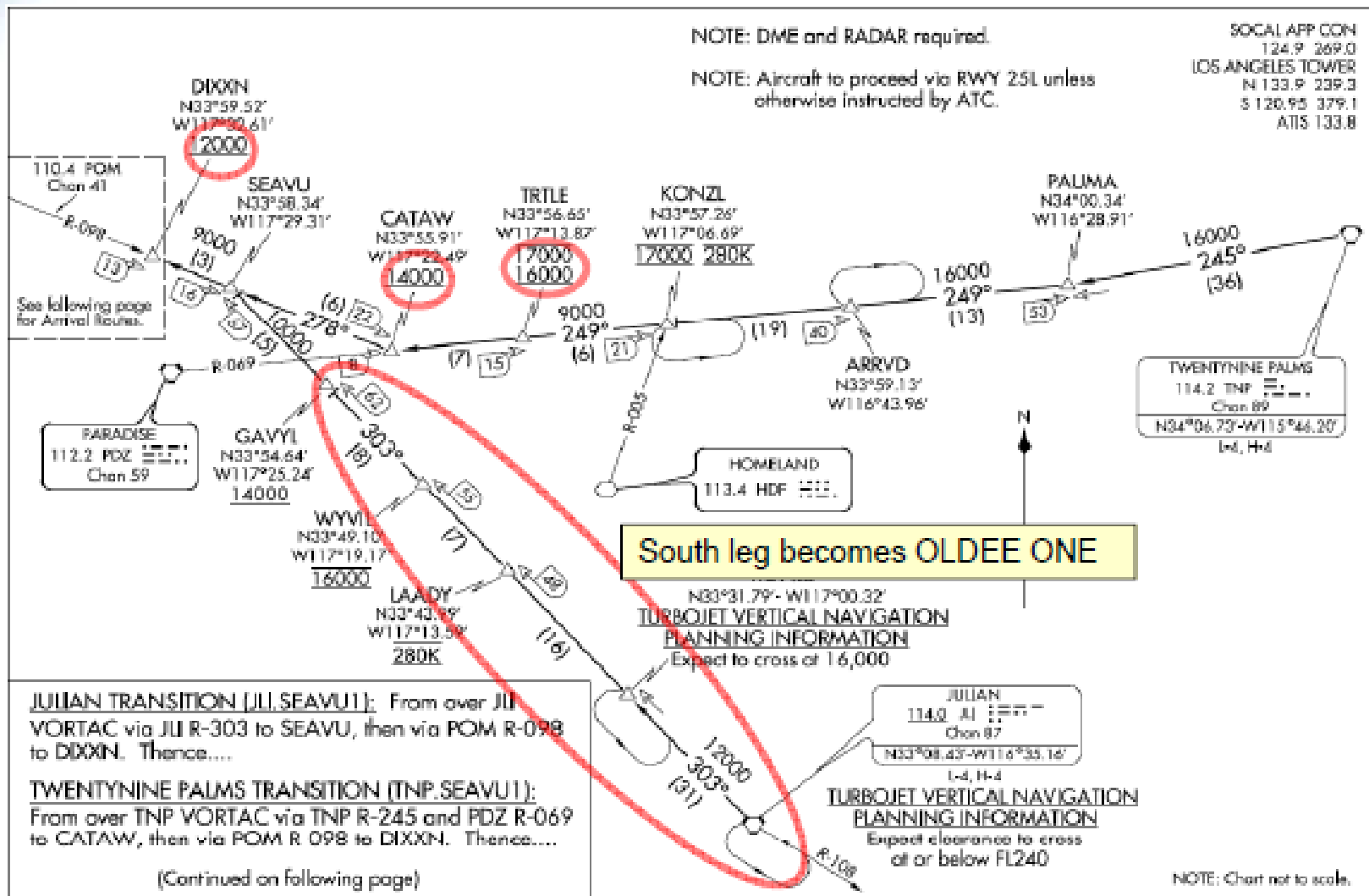
LOS ANGELES INTL
LOS ANGELES, CALIFORNIA

SW-3, 30 JUL 2009 to 27 AUG 2009



LAX Pre-Implementation Procedure

North SEAVU ONE Arrival



LOS ANGELES INTL
LOS ANGELES, CALIFORNIA

JULIAN TRANSITION (JLI, SEAVU1): From over JLI VORTAC via JLI R-303 to SEAVU, then via POM R-098 to DIXXN. Thence....

TWENTYNINE PALMS TRANSITION (TNP, SEAVU1): From over TNP VORTAC via TNP R-245 and PDZ R-069 to CATAW, then via POM R-098 to DIXXN. Thence....

(Continued on following page)

SW-3, 08 MAY 2008 to 05 JUN 2008

NOTE: Chart not to scale.

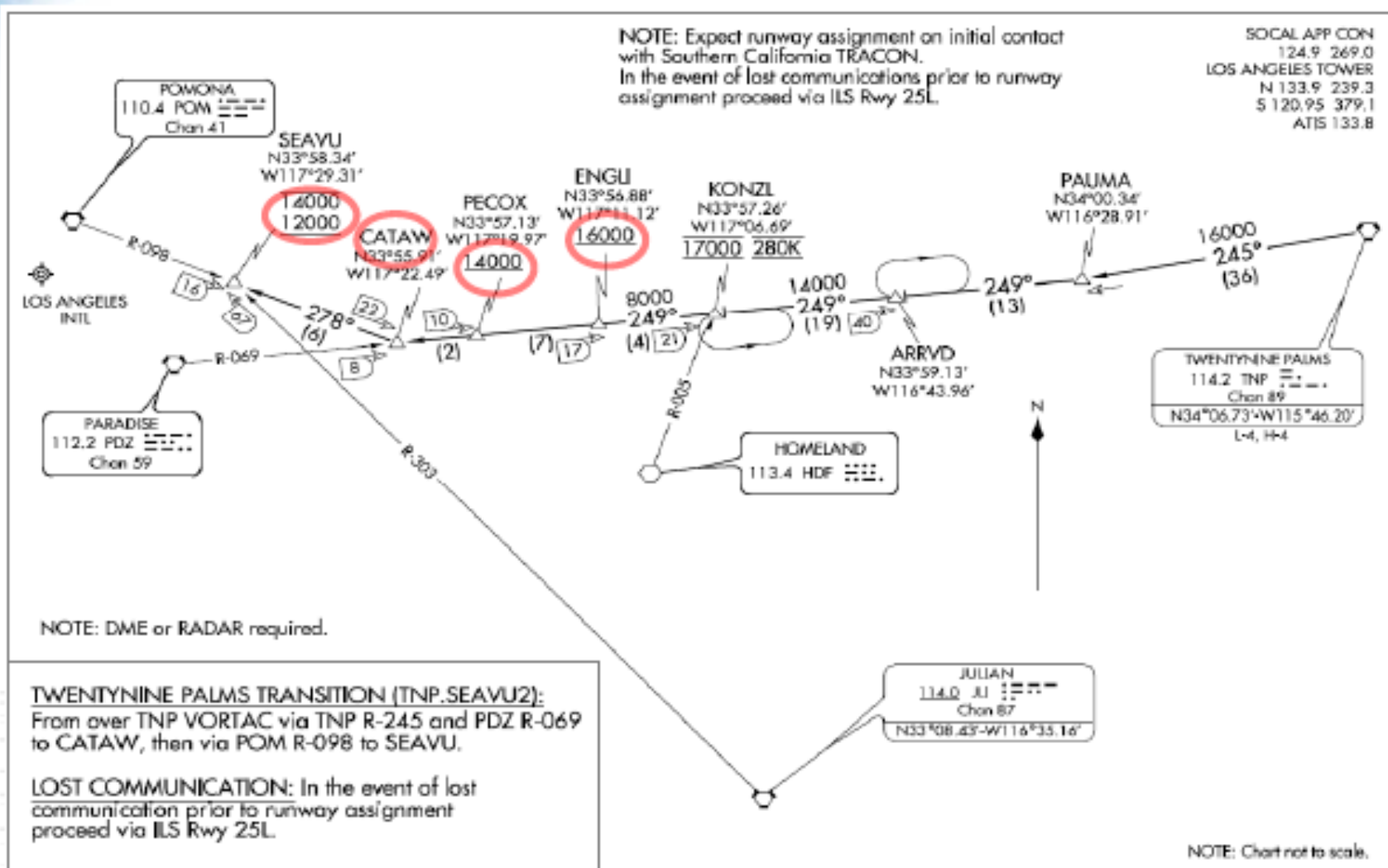


LAX Post-Implementation Procedure

SEAVU TWO Arrival

NOTE: Expect runway assignment on initial contact with Southern California TRACON. In the event of lost communications prior to runway assignment proceed via ILS Rwy 25L.

SOCAL APP CON
124.9 269.0
LOS ANGELES TOWER
N 133.9 239.3
S 120.95 379.1
ATIS 133.8



NOTE: DME or RADAR required.

TWENTYNINE PALMS TRANSITION (TNP.SEAVU2):
From over TNP VORTAC via TNP R-245 and PDZ R-069 to CATAW, then via POM R-098 to SEAVU.

LOST COMMUNICATION: In the event of lost communication prior to runway assignment proceed via ILS Rwy 25L.

NOTE: Chart not to scale.

(SEAVU SEAVU2) 08269
SEAVU TWO ARRIVAL

ST-237 (FAM)

LOS ANGELES INTL
LOS ANGELES, CALIFORNIA

SW-3, 30 JUL 2009 to 27 AUG 2009

Current Flight Procedures

- **RIIVR TWO ARRIVAL**
- **SEAVU TWO ARRIVAL**
- **ILS or LOC RWY 25L**
- **ILS or LOC RWY 25R**
- **ILS or LOC RWY 24L**
- **ILS or LOC RWY 24R**



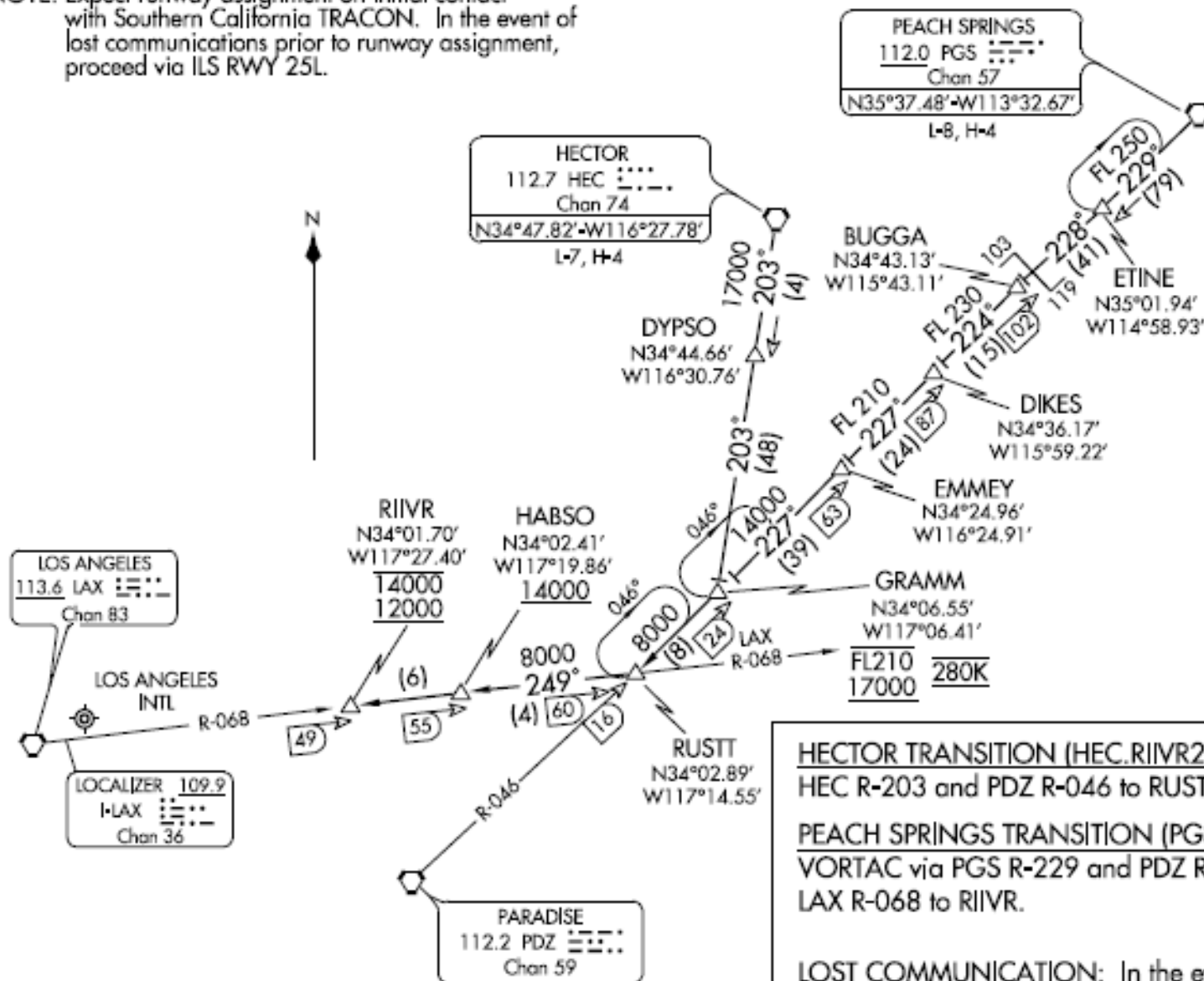
RIIVR TWO ARRIVAL

LOS ANGELES INTL

SOCAL APP CON
124.05 353.775
LOS ANGELES TOWER
N 133.9 239.3
S 120.95 379.1
ATIS 133.8

NOTE: DME or RADAR required.

NOTE: Expect runway assignment on initial contact with Southern California TRACON. In the event of lost communications prior to runway assignment, proceed via ILS RWY 25L.



NOTE: Chart not to scale.

HECTOR TRANSITION (HEC.RIIVR2): From over HEC VORTAC via HEC R-203 and PDZ R-046 to RUSTT, then via LAX R-068 to RIIVR.

PEACH SPRINGS TRANSITION (PGS.RIIVR2): From over PGS VORTAC via PGS R-229 and PDZ R-046 to RUSTT, then via LAX R-068 to RIIVR.

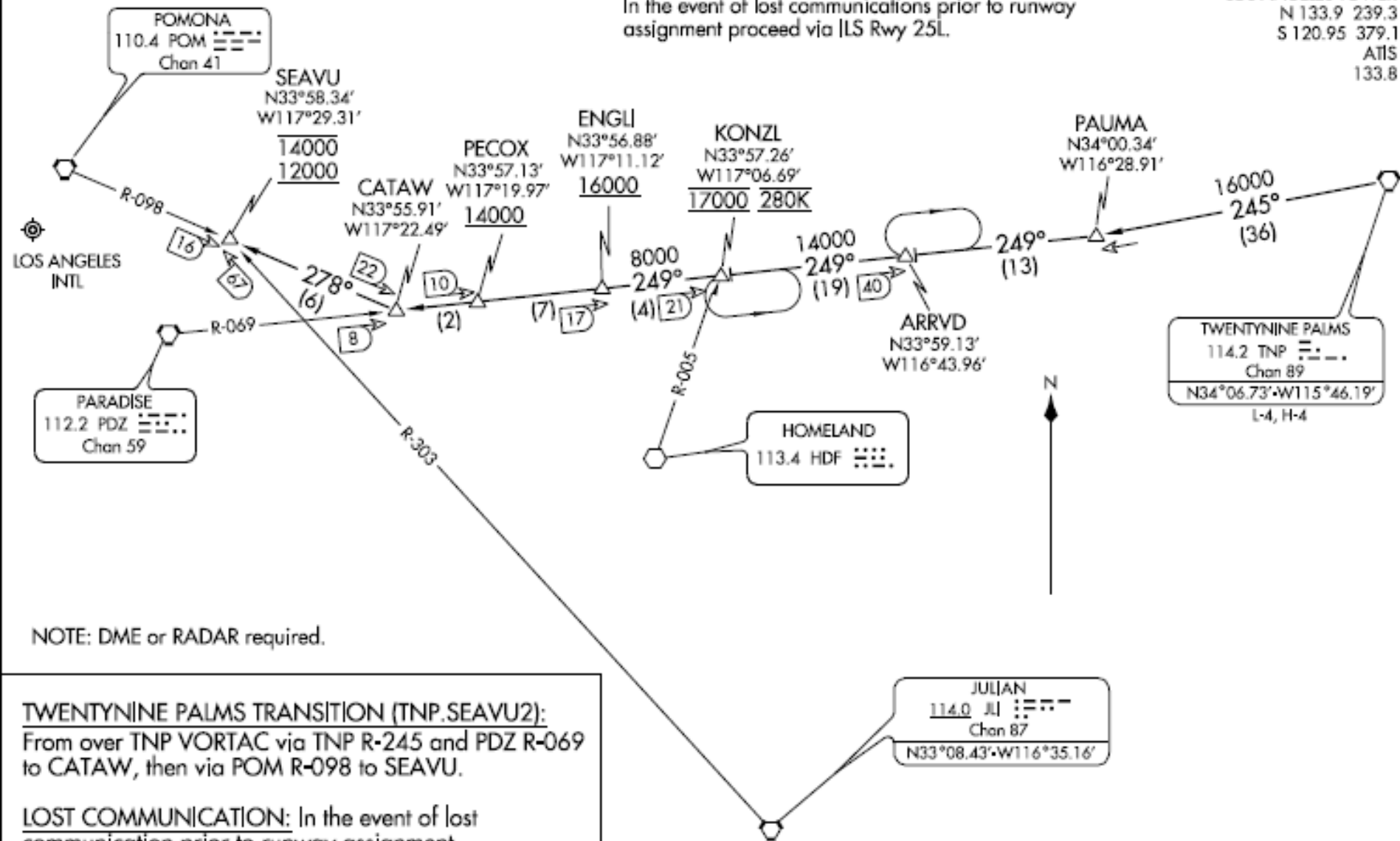
LOST COMMUNICATION: In the event of lost communications prior to runway assignment proceed via ILS Rwy 25L.

SEAVU TWO ARRIVAL

LOS ANGELES INTL

NOTE: Expect runway assignment on initial contact with Southern California TRACON. In the event of lost communications prior to runway assignment proceed via ILS Rwy 25L.

SOCAL APP CON
124.05 353.775
LOS ANGELES TOWER
N 133.9 239.3
S 120.95 379.1
ATIS
133.8



NOTE: DME or RADAR required.

TWENTYNINE PALMS TRANSITION (TNP.SEAVU2):
From over TNP VORTAC via TNP R-245 and PDZ R-069 to CATAW, then via POM R-098 to SEAVU.

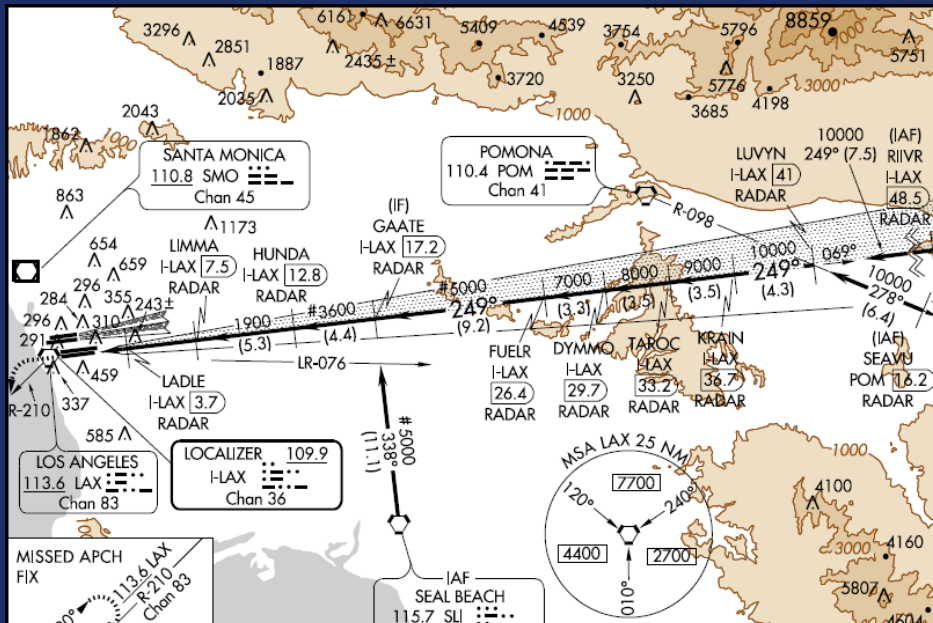
LOST COMMUNICATION: In the event of lost communication prior to runway assignment proceed via ILS Rwy 25L.

JULIAN
114.0 MHz Chan 87
N33°08.43' W116°35.16'

NOTE: Chart not to scale.

ILS 25L/25R

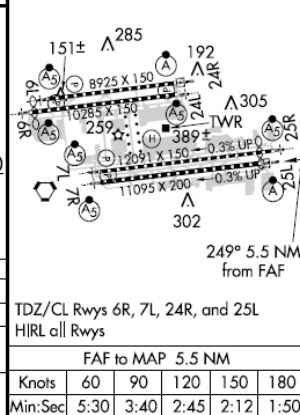
LOS ANGELES INTL



LOS ANGELES 113.6 LAX Chan 83
LOCALIZER 109.9 I-LAX Chan 36
SEAL BEACH 115.7 SLI Chan 104
Procedure NA for arrivals at SLI VORTAC on V459-597 southbound.
DME or RADAR REQUIRED

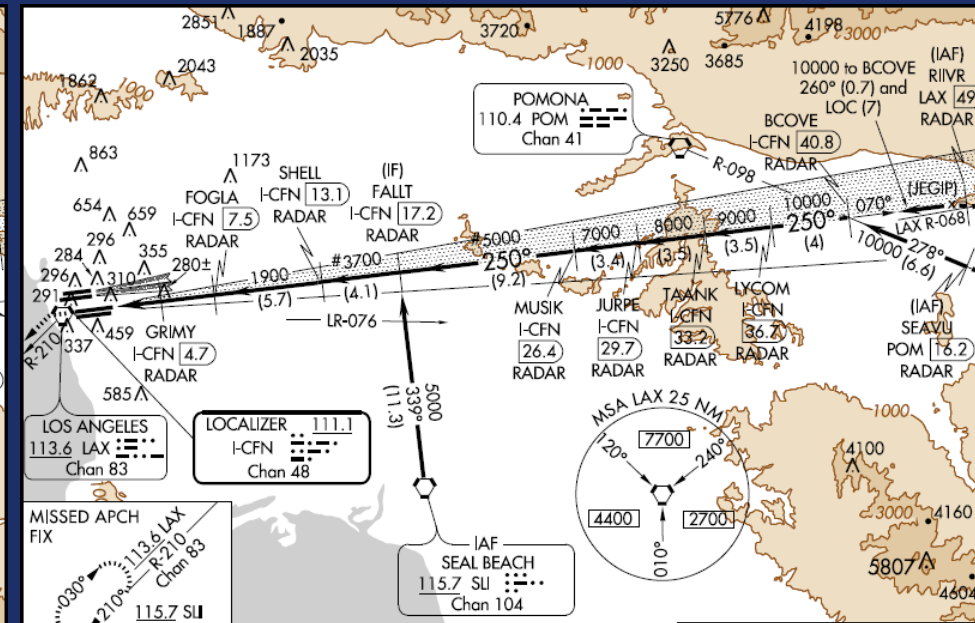
800 2000	LAX R-210	CATLY INT	# When assigned by ATC, intercept glidepath at 3600 or 5000. *LOC only						
			TAROC DYMMO	KRAIN H-LAX	LUYVYN H-LAX	H-LAX H-LAX			
LADLE H-LAX	LIMMA H-LAX	HUNDA H-LAX	GAATE H-LAX	FUELR H-LAX	DYMMO H-LAX	TAROC H-LAX	KRAIN H-LAX	LUYVYN H-LAX	H-LAX H-LAX
700*	1900	3600#	5000#	7000	8000	9000	10000	10000	10000
1.7 NM	3.8 NM	5.3 NM	4.4 NM	9.2 NM	3.3 NM	3.5 NM	3.5 NM	4.3 NM	4.3 NM
CATEGORY	A		B	C	D				
S-ILS 25L	298/18				200 (200-1/2)				
S-LOC 25L	540/24	442 (500-1/2)	540/45		442 (500-3/4)				
SIDESTEP 25R	700/50	606 (600-1)	700/60	700-1/2		606 (600-1 1/4)			

ELEV 126	THRE 25L 98	THRE 25R 94
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LOS ANGELES INTL (LAX)
ILS or LOC RWY 25L
Knots 60 90 120 150 180
Min:Sec 5:30 3:40 2:45 2:12 1:50

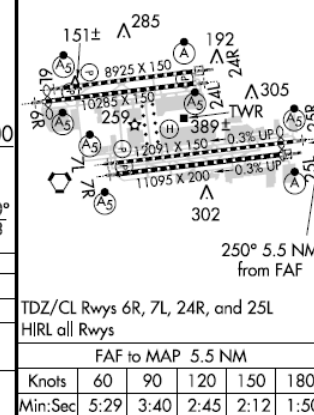
LOS ANGELES, CALIFORNIA
Amdt 12 30JUN11
33°57'N-118°24'W



LOS ANGELES 113.6 LAX Chan 83
LOCALIZER 111.1 I-CFN Chan 48
SEAL BEACH 115.7 SLI Chan 104
Procedure NA for arrival at SLI VORTAC via V459-597 southbound.
DME or RADAR REQUIRED

800 2000	LAX R-210	CATLY INT	# When assigned by ATC, intercept glidepath at 3700 or 5000.						
			FOGLA GRIMY	SHELL I-CFN	FALLT I-CFN	MUSIK I-CFN	JURPE I-CFN	TAANK I-CFN	LYCOM I-CFN
I-CFN R-210	I-CFN R-210	I-CFN R-210	I-CFN R-210	I-CFN R-210	I-CFN R-210	I-CFN R-210	I-CFN R-210	I-CFN R-210	I-CFN R-210
3700*	1900	3700#	5000#	7000	8000	9000	10000	10000	10000
1.3 NM	1.4 NM	2.8 NM	5.7 NM	4.1 NM	9.2 NM	3.4 NM	3.5 NM	3.5 NM	4 NM
CATEGORY	A		B	C		D			
S-ILS 25R	** 294/24				200 (200-1/2)				
S-LOC 25R	560/24	466 (500-1/2)	560/50		466 (500-1)				
SIDESTEP 25L	720/50	622 (600-1)	720-1 3/8		622 (600-1 3/8)				

ELEV 126	THRE 25R 94	THRE 25L 98
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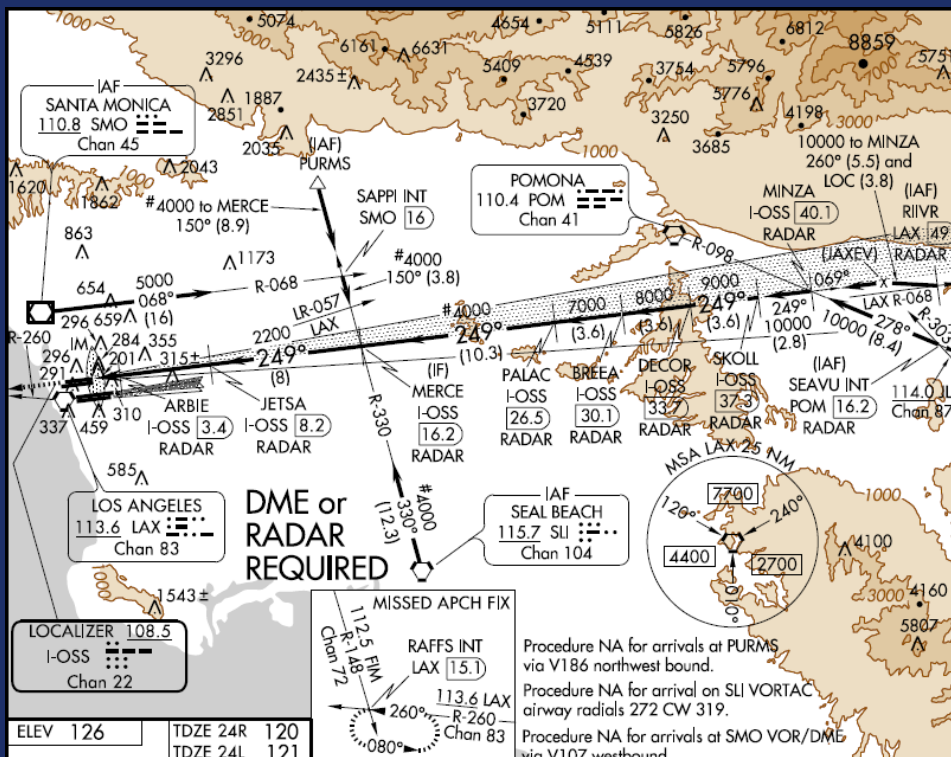
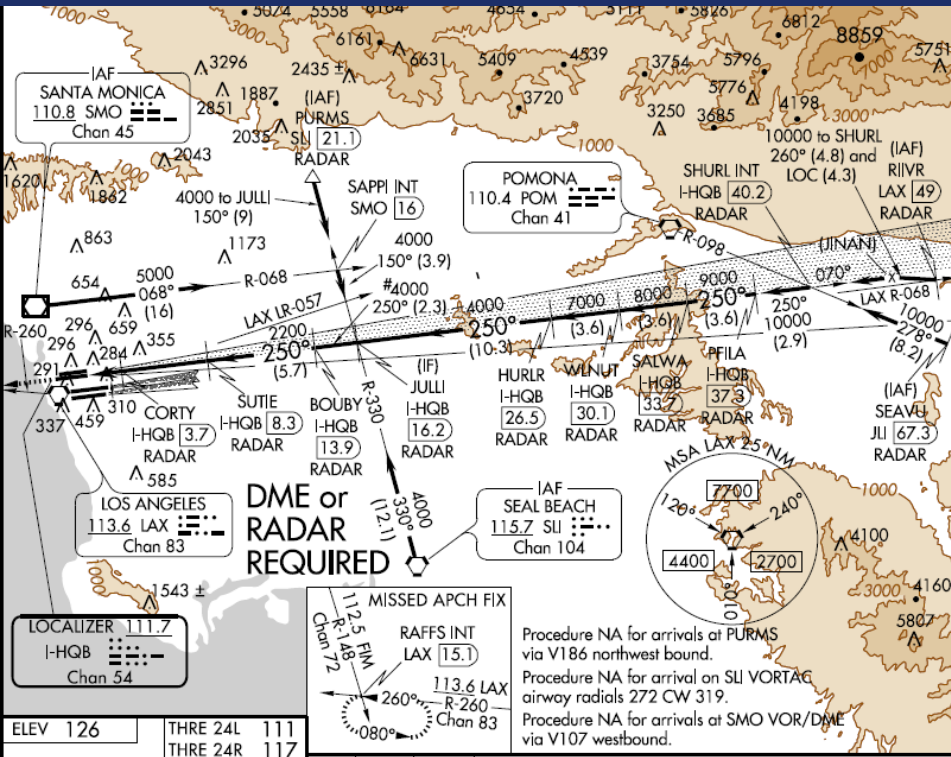


LOS ANGELES INTL (LAX)
ILS or LOC RWY 25R
Knots 60 90 120 150 180
Min:Sec 5:29 3:40 2:45 2:12 1:50

LOS ANGELES, CALIFORNIA
Amdt 17 30JUN11
33°57'N-118°24'W

ILS 24L/24R

LOS ANGELES INTL



ELEV 126	THRE 24L 111	THRE 24R 117	
<p>250° 6.4 NM from FAF</p>			
<p># When assigned by ATC, intercept glidepath at 4000. VGSI and ILS glidepath not coincident (VGSI Angle 3.00/TCH 79).</p>			
LAX R-260	RAFFS INT LAX [15.1]	PFILA I-HQB [37.3] RADAR	
CORTY I-HQB [3.7] RADAR	SUTIE I-HQB [8.3] RADAR	BOUBY I-HQB [13.9] RADAR	
JULLI I-HQB [16.2] RADAR	HURRL I-HQB [26.5] RADAR	WLNUT I-HQB [30.1] RADAR	
SALWA I-HQB [33.7] RADAR	SEAVU JLI [67.3] RADAR		
LOC only	I-HQB [1.9]	I-HQB [2.9]	
	2200	2200	
	4000	4000	
	7000	8000	
	9000	10000	
	GS 3.00°	TCH 59	
CATEGORY	A	B C D	
S-ILS 24L	311/24 200 (200-½)		
S-LOC 24L	500/24	389 (400-¼)	500/35 389 (400-¾)
SIDESTEP 24R	700/55	583 (600-1¼)	700-1¼ 583 (600-1¼)
TDZ/CL Rwy 6R, 7L, 24R, and 25L	HIRL all Rwys		
FAF to MAP 6.4 NM			
Knots	60	90	120 150 180
Min:Sec	6:24	4:16	3:12 2:34 2:08

ELEV 126	TDZE 24R 120	TDZE 24L 121	
<p>249° 6.3 NM from FAF</p>			
<p># When assigned by ATC, intercept glidepath at 4000.</p>			
LAX R-260	RAFFS INT LAX [15.1]	SKOLL I-OSS [37.3] RADAR	
JETSA I-OSS [8.2] RADAR	MERCE I-OSS [16.2] RADAR	BREA I-OSS [30.1] RADAR	
PALAC I-OSS [26.5] RADAR	ARBIE I-OSS [3.4] RADAR	DECOR I-OSS [33.7] RADAR	
LOC only	I-OSS [2]	I-OSS [2.8]	
	2200	2200	
	4000	4000	
	7000	8000	
	9000	10000	
	GS 3.00°	TCH 59	
CATEGORY	A	B C D	
S-ILS 24R	320/18 200 (200-½)		
S-LOC 24R	460/24	340 (400-½)	460/40 340 (400-¾)
SIDESTEP RWY 24L	580/50	459 (500-1)	580-1½ 459 (500-1½)
TDZ/CL Rwy 6R, 7L, 24R, and 25L	HIRL all Rwys		
FAF to MAP 6.3 NM			
Knots	60	90	120 150 180
Min:Sec	6:18	4:12	3:09 2:31 2:06

Partner Airlines' Opinion

- For LAX, the RIIVR and SEAVU STARS are a huge benefit for the residents of the LA Basin. These procedures are considered Optimized Profile Descents providing the customers of LAX with fuel savings while reducing the noise footprint for LAX arrivals.
- Below 17,000', both the RIIVR and SEAVU are an idle descent until approximately 4 miles from runway 25L and 24R. At 4 miles from these runways the pilots must configure the aircraft for landing. These procedures are used as an example throughout the U.S. on how to design and use arrivals into airports. If we can design and place into use procedures that allow the pilots to leave the throttles at idle, noise is significantly reduced. The RIIVR and SEAVU arrivals provide pilots with the necessary tools to reduce the noise for the residents of the LA basin.

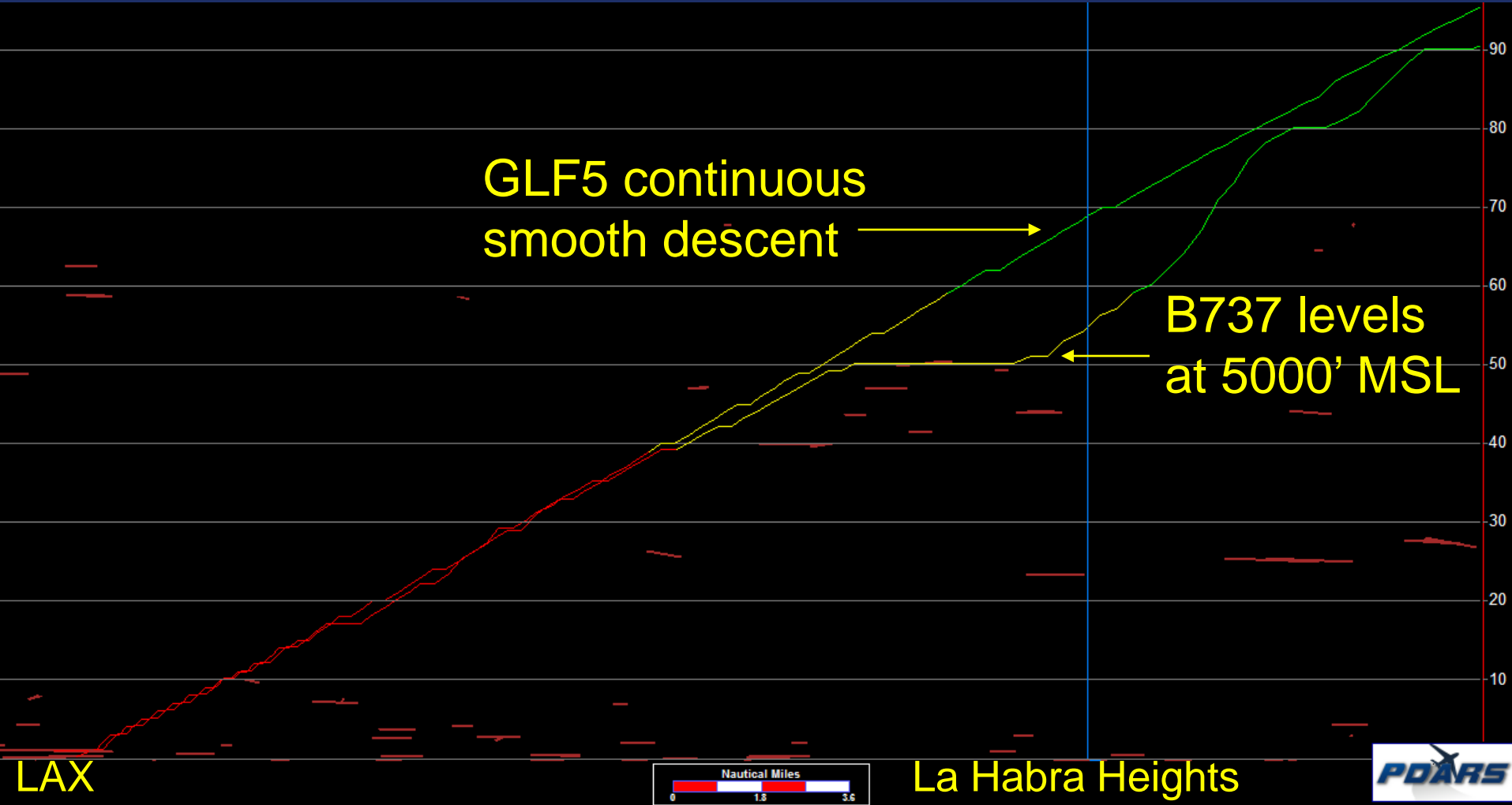


Flight Profile Comparison 2005/2011

- **Examples from 2005 and 2011:**
 1. aircraft making a smooth continuous descent
 2. aircraft leveling at 5000' for one or more miles and then continuing descent
- **Side profile of flight tracks for both years**
- **Animation of each sample flight**
 - Click in black area of slide to start animation



Flight Profile Comparison 1/13-14/2005 ~ B737 & GLF5



LAX



La Habra Heights



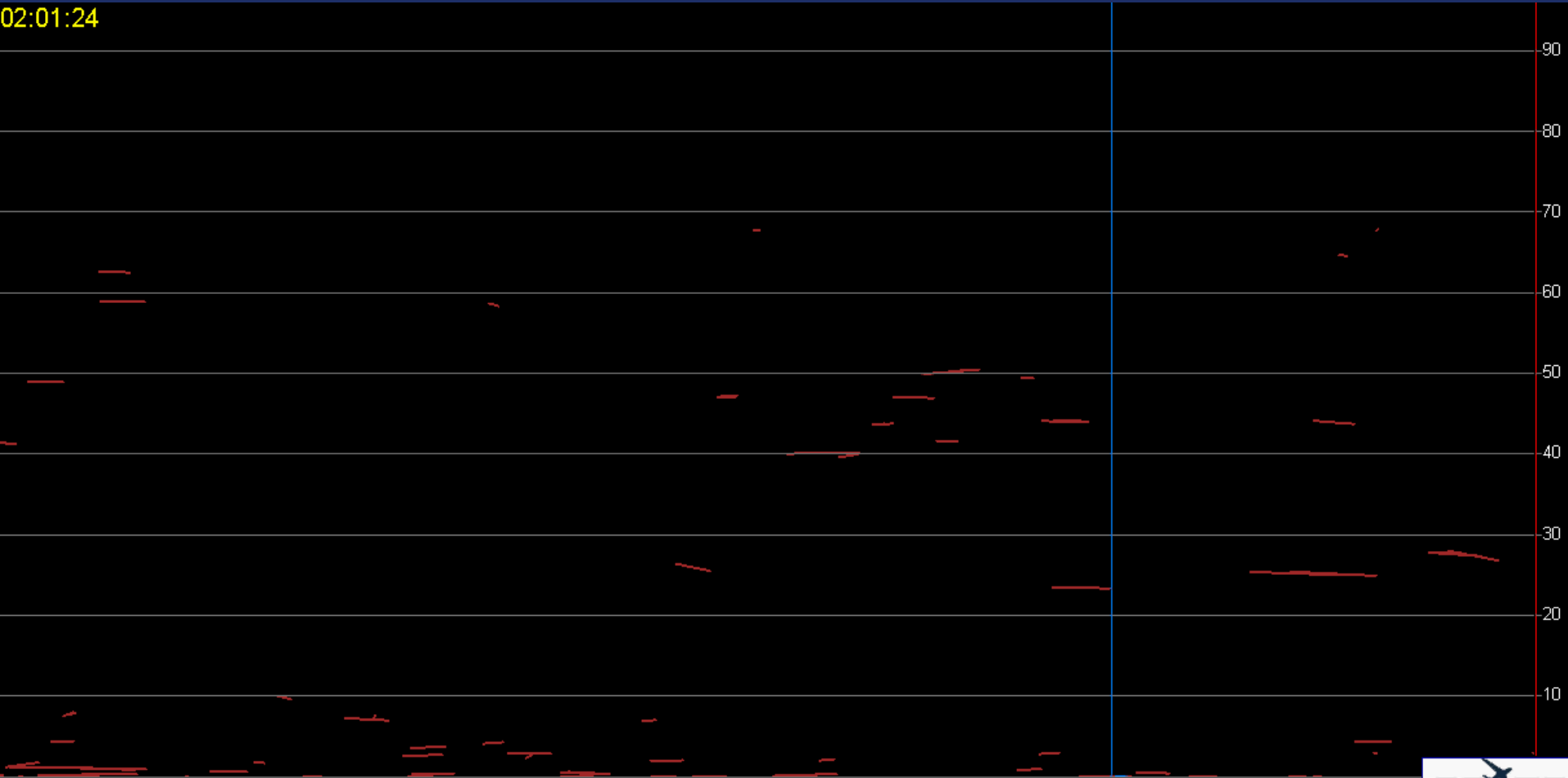
LAX Arrivals near La Habra Heights
DATE: January 11, 2012



Federal Aviation
Administration

B737 – “Dive & Drive” Descent January 13, 2005 (Animation)

02:01:24



LAX



La Habra Heights

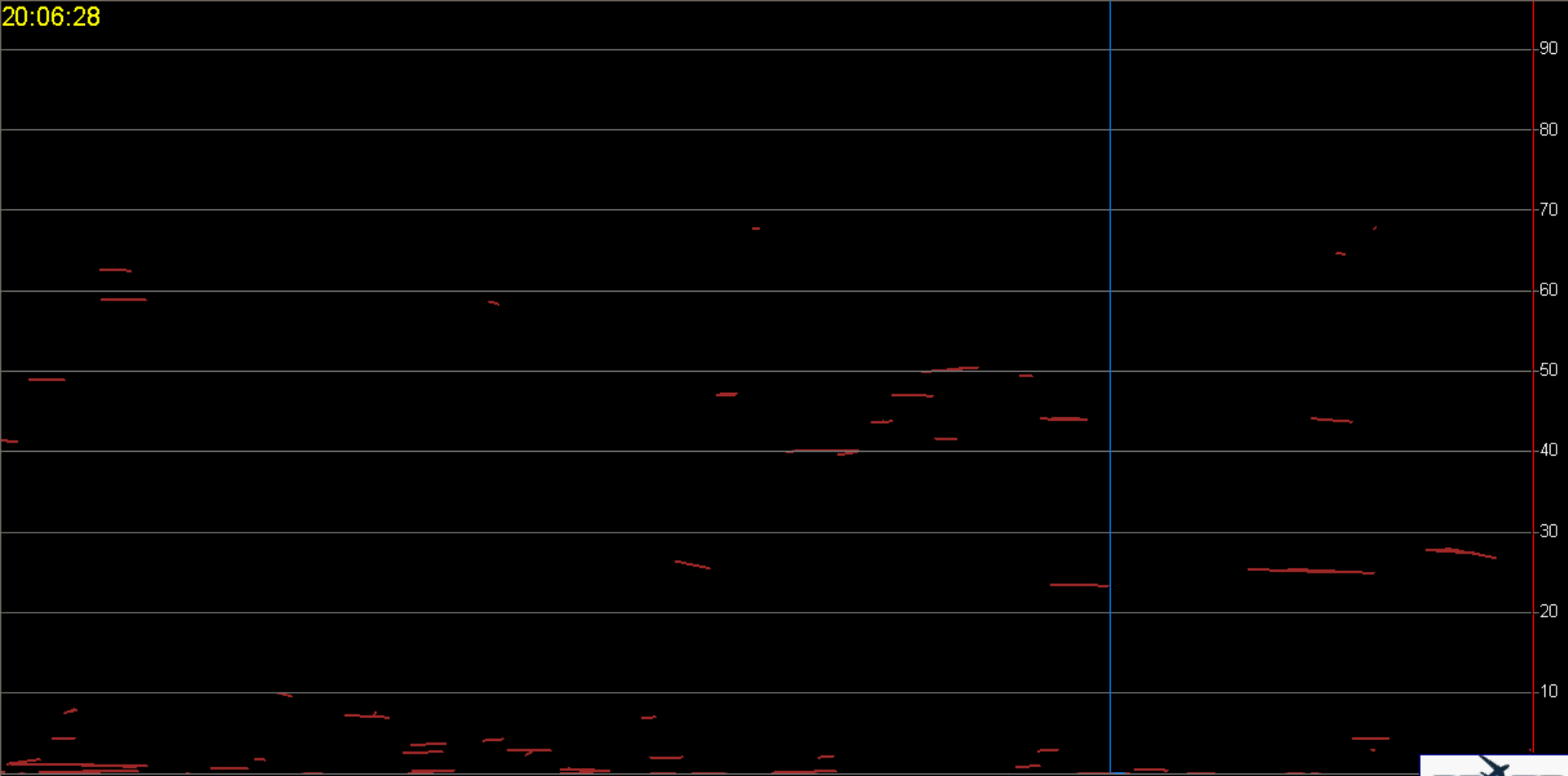
LAX Arrivals near La Habra Heights
DATE: January 11, 2012



Federal Aviation
Administration

GLF5 – Continuous Descent January 14, 2005 (Animation)

20:06:28



LAX



La Habra Heights



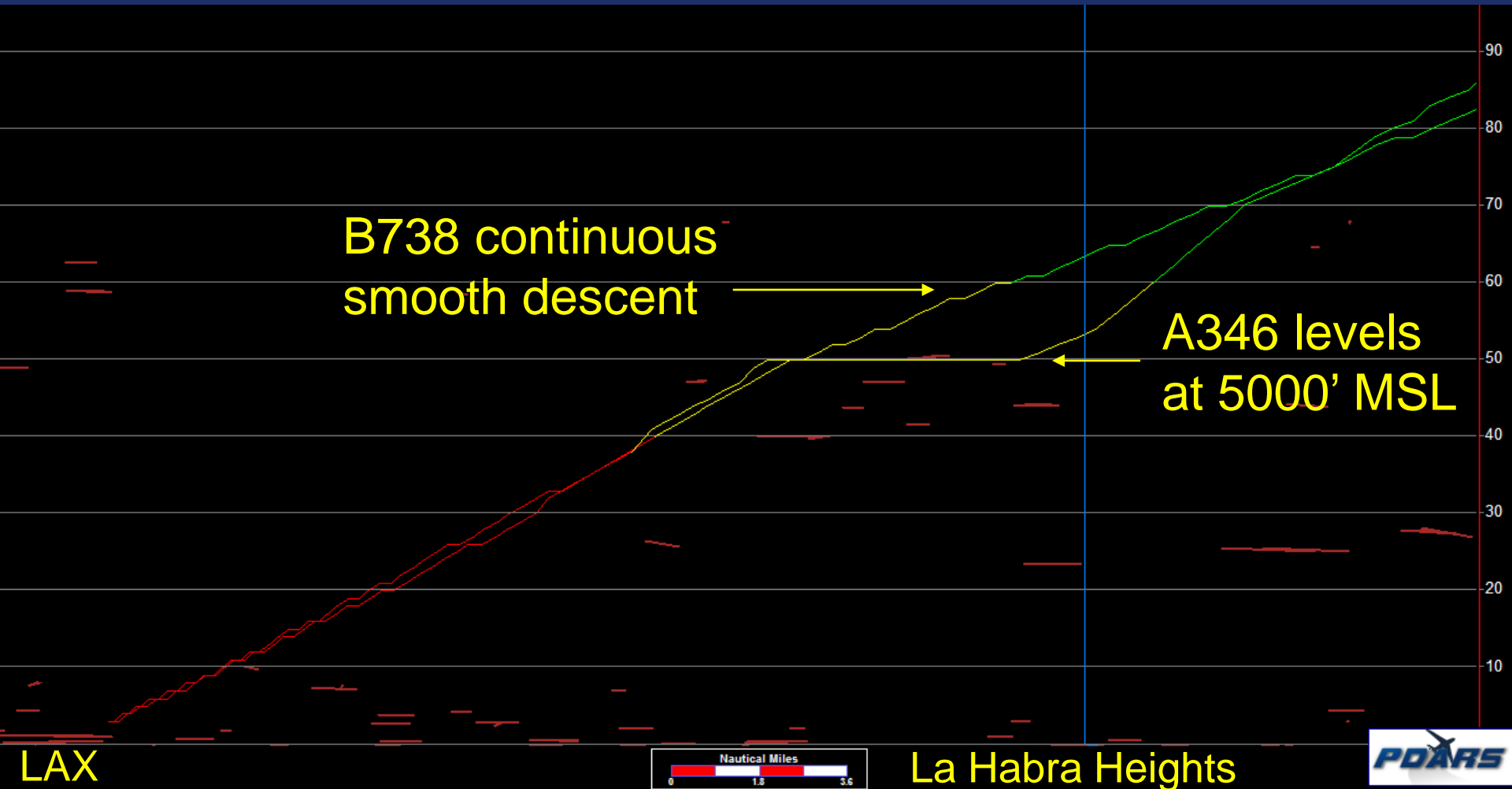
LAX Arrivals near La Habra Heights
DATE: January 11, 2012



Federal Aviation
Administration

Flight Profile Comparison

January 14, 2011 ~ A346 & B738



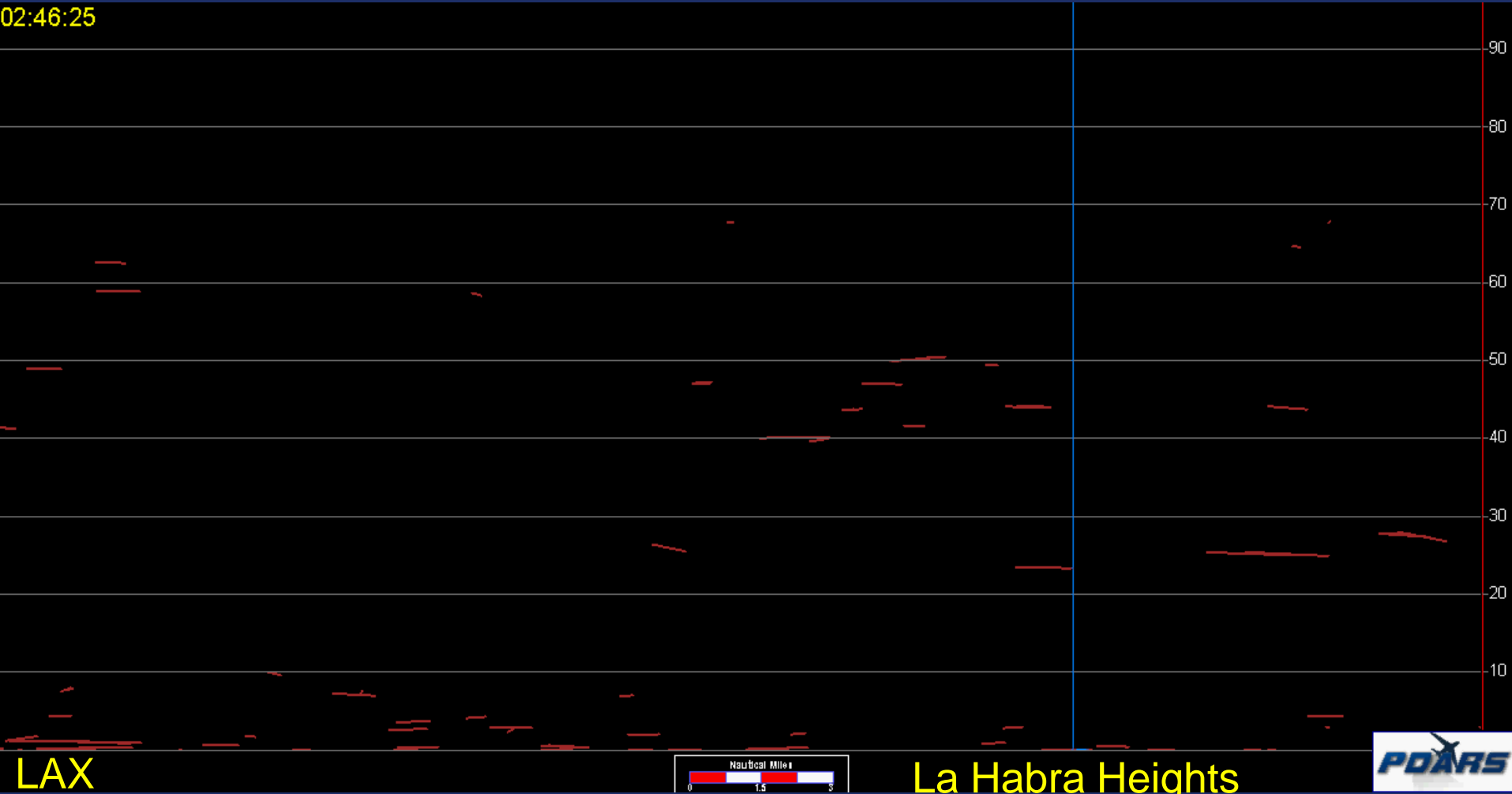
LAX Arrivals near La Habra Heights
DATE: January 11, 2012



Federal Aviation
Administration

A346 – “Dive & Drive” Descent January 14, 2011 (Animation)

02:46:25



LAX

Nautical Mile
0 1.5 3

La Habra Heights



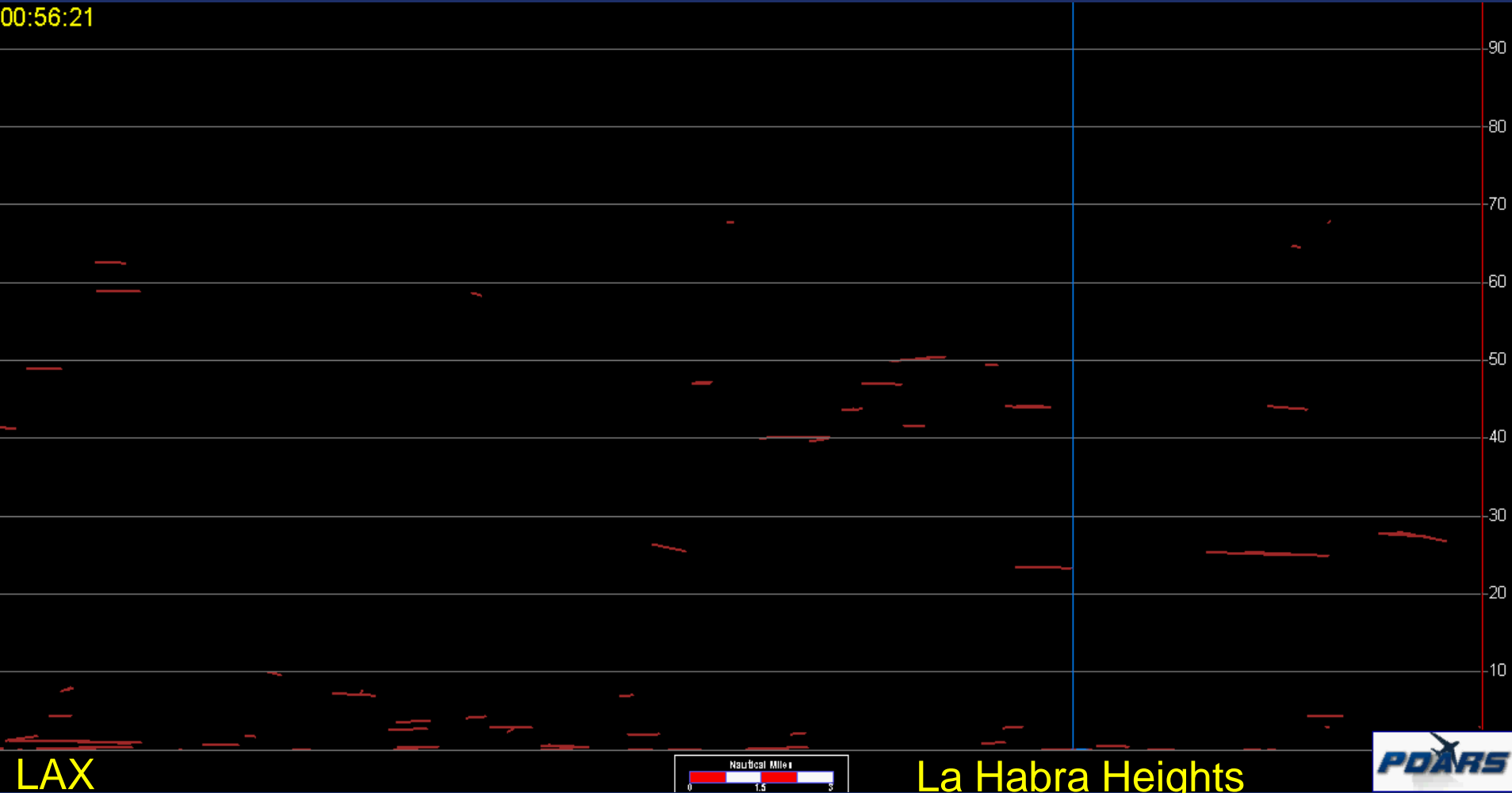
LAX Arrivals near La Habra Heights
DATE: January 11, 2012



Federal Aviation
Administration

B738 – Continuous Descent January 14, 2011 (Animation)

00:56:21



LAX

Nautical Miles
0 1.5 3

La Habra Heights



LAX Arrivals near La Habra Heights
DATE: January 11, 2012



Federal Aviation
Administration

Arrival flow from west

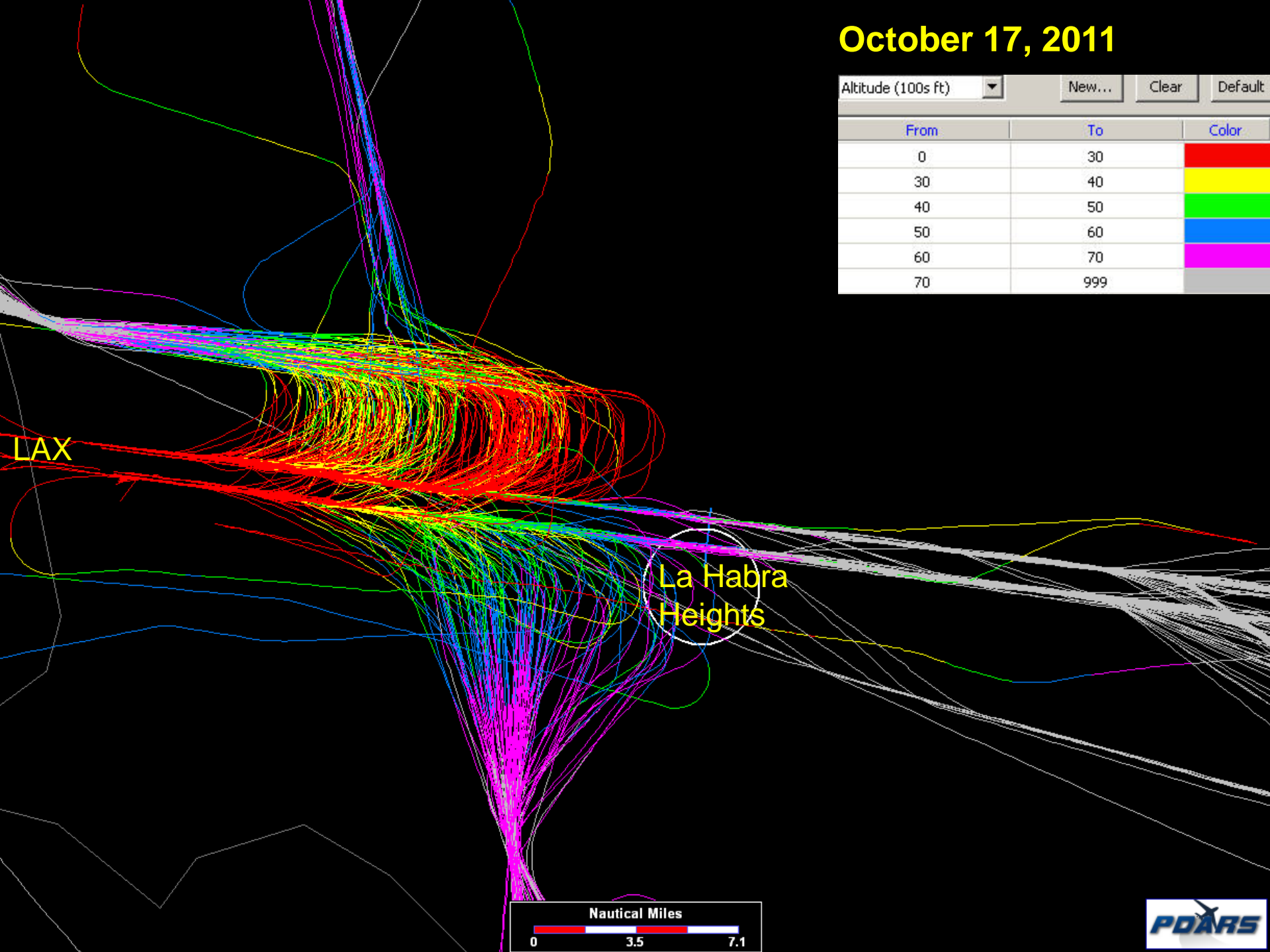
- **Next slide depicts downwind arrival traffic inbound over Fillmore (FIM) and Ventura (VTU) VORTACS**
- **Downwind traffic is not on CDA's**
- **Downwind traffic is turned to final approach course inside of La Habra**



October 17, 2011

Altitude (100s ft)

From	To	Color
0	30	Red
30	40	Yellow
40	50	Green
50	60	Blue
60	70	Magenta
70	999	Grey



LAX

La Habra Heights



Conclusions

- **Currently most LAX arrivals from the east are on a profile descent (SEAVU2 or RIIVR2 Arrival) that allows for a transition to RWY 24/25 ILS approaches**
- **Standard operating procedure for arrivals is to be cleared for ILS approach no later than 35 nautical miles (NM) out from runway**
 - The aircraft then meet the “at or above” descent altitudes until capturing the glide slope
- **La Habra Heights is approx. 20 NM from runway**
- **The glide slope is normally usable out to 10 NM from runway**
- **Different aircraft may have variable descent rates depending on pilot technique and the onboard navigation capabilities of each aircraft**



Questions?

