



WESTSIDE SUBWAY EXTENSION PROJECT

Technical Report Summarizing the Results of the Forecasted Alternatives



March, 2012

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1.0 INTRODUCTION

This report documents the travel forecasting evolution and results of two options for the Locally Preferred Alternative (LPA) in the Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) phase of the Westside Subway Extension Project. To support the environmental process, a number of model runs were made to help refine assessment of the LPA, to address changes since the Draft EIS/EIR phase, and provide the magnitude of difference if a change was made. The first section describes the refinement and testing that was made and the second section describes and compares the results for two variations of the LPA.

1.1 Definition of Locally Preferred Alternative (LPA)

In October 2010, the Metro Board approved the Draft EIS/EIR and selected Alternative 2 as the LPA. The LPA would extend heavy rail transit (HRT), in subway, from the existing Metro Purple Line Wilshire/Western Station to a Westwood/VA Hospital Station. The extension would be nearly nine miles and would include a total of seven new stations:

- Wilshire/La Brea
- Wilshire/Fairfax
- Wilshire/La Cienega
- Wilshire/Rodeo
- Century City (Santa Monica Boulevard or Constellation Boulevard)
- Westwood/UCLA (On-Street or Off-Street)
- Westwood/VA Hospital (South of Wilshire Boulevard or North of Wilshire Boulevard)

Based on this approval, the Metro Board authorized preparation of the Final EIS/EIR to further evaluate the LPA. Refinement to travel forecasting effort focuses on the station accessibility and to a lesser extent the change in operating plans from the refinement in engineering at the Century City Station location. The two LPA options analyzed are:

- LPA Century City/Santa Monica Option
- LPA Century City/Constellation Option

In the Draft EIS/EIR phase, variations of Alternative 2 with either the Century City/Santa Monica Option and or the Century City/Constellation Option were studied and named Alternative 2B and Alternative 2E respectively (both of which excluded the Wilshire/Crenshaw Station). Their travel forecasting results were not included in the Draft EIS/EIR. However, the New Starts Template submission to FTA was based on the travel forecasting results of Alternative 2E (Century City/Constellation Option).

The travel forecasting horizon year is 2035 in the Final EIS/EIR, same as in the Draft EIS/EIR phase.

1.2 Model Runs for Alternative Refinement

More than ten model runs were conducted to respond to changes, perform additional analysis, and answer questions that were raised during the project development process in the Final EIS/EIR phase. The test runs analyzed the impact on the Purple Line ridership and project trips. The main types of refinement included feeder bus service, balanced headways and some coding refinement, to determine what changes should be included in the Final EIS/EIR model runs.

1.2.1 Feeder Bus Service

The buses that serve the Century City Stations were reviewed to check consistency between the Century City/Santa Monica Option and Century City/Constellation Option. During the initial refinements to the travel forecasts for the LPA, the Century City Station in the Century City/Santa Monica Option was located in the proximity of Santa Monica Boulevard and Avenue of the Stars. (This was before the project team requested to move the station to Santa Monica/Century Park East, as discussed in Section 1.2.4). In the Century City/Constellation Option, the station is in the proximity of Constellation Boulevard and Avenue of the Stars. Table 1-1 displays which bus routes are connected to each proposed Century City Station option, and could potentially act as feeder service to the station. In both the Century City options there are eight routes connected to each rail station. Six of the ten routes are common to both options; Metro Routes 4 and 704 are only connected to the Century City Station in the Santa Monica Option, and Santa Monica Big Bus Route 5 and Culver City Route 3 are only connected to the Century City Station in the Constellation Option.

Table 1-1: Bus Routes Connected to Proposed Century City Station

Transit Agency	Route	Alt2B Santa Monica	Alt2E Constellation
LA Metro	4	Connected	
LA Metro	704	Connected	
LA Metro	28	Connected	Connected
LA Metro	728	Connected	Connected
LADOT Commuter Express	534	Connected	Connected
LADOT Commuter Express	573	Connected	Connected
Santa Clarita Transit	792	Connected	Connected
Santa Clarita Transit	797	Connected	Connected
Santa Monica Big Blue Bus	5		Connected
Culver City Transit	3		Connected

Several model runs were made to determine if changes should be made in the feeder bus service. The first test was to verify if routing Metro local bus Route 4 to connect the Century City Station in the Constellation Option would provide an increase in ridership on the Purple Line. The results show that detouring Route 4 to Constellation Boulevard/Avenue of Stars only added approximately 100 daily boardings to the Century City Station. In further testing both, Metro local bus Route 4 and rapid bus Route 704 were re-routed to the Century City Station in the Constellation Option and the service frequency of Culver City bus Route 3 and Santa Monica bus Route 5 were doubled. The daily boardings at the Century City Station did increase but there was an equal or greater reduction at the other extension stations, resulting in boardings on the Purple Line extension having minimal

change. The increase in frequency on Culver City bus Route 3 and Santa Monica bus Route 5 did result in more ridership on those bus routes but not the boarding on the Purple Line Extension.

The feeder bus service test runs demonstrated that the cost of additional feeder bus service is not worth the minimal increase in boardings at the Century City Station. This is mainly because the Century City area is a destination, not necessarily a transfer point. Therefore, feeder bus service improvement is not justified to be incorporated in the build alternatives in the Final EIS/EIR phase.

1.2.2 Coding Refinement for Century City Station Location Options

With cooperation of Metro Modeling staff, the coding of the Century City Station in the Santa Monica Option and the Constellation Option was refined after carefully studying the land use, streets, and traffic analysis zone (TAZ) structure around Century City. The refinement best represents the location of the Century City Station relative to the development in the main TAZ representing Century City (TAZ 738) in the Santa Monica Option and the Constellation Option. In the Constellation Option, the Station is located at Constellation Boulevard/Avenue of Stars, the walk time between the central point (centroid) of zone 738 and the Century City Station platform is three minutes.

In the Santa Monica Option, the Century City Station was in the proximity of Santa Monica Boulevard/Avenue of Stars. The walk time between TAZ 738's centroid location and the Century City Subway Station platform is eight minutes, which is five minutes longer than the walking time between TAZ 738's centroid and Century City/Constellation Option's Station location. The detailed coded time between the main TAZ and the access to transit for the two options is displayed in Figure 1-1 and Table 1-3.

Figure 1-1: Refined Coding of Century City Station Location Options

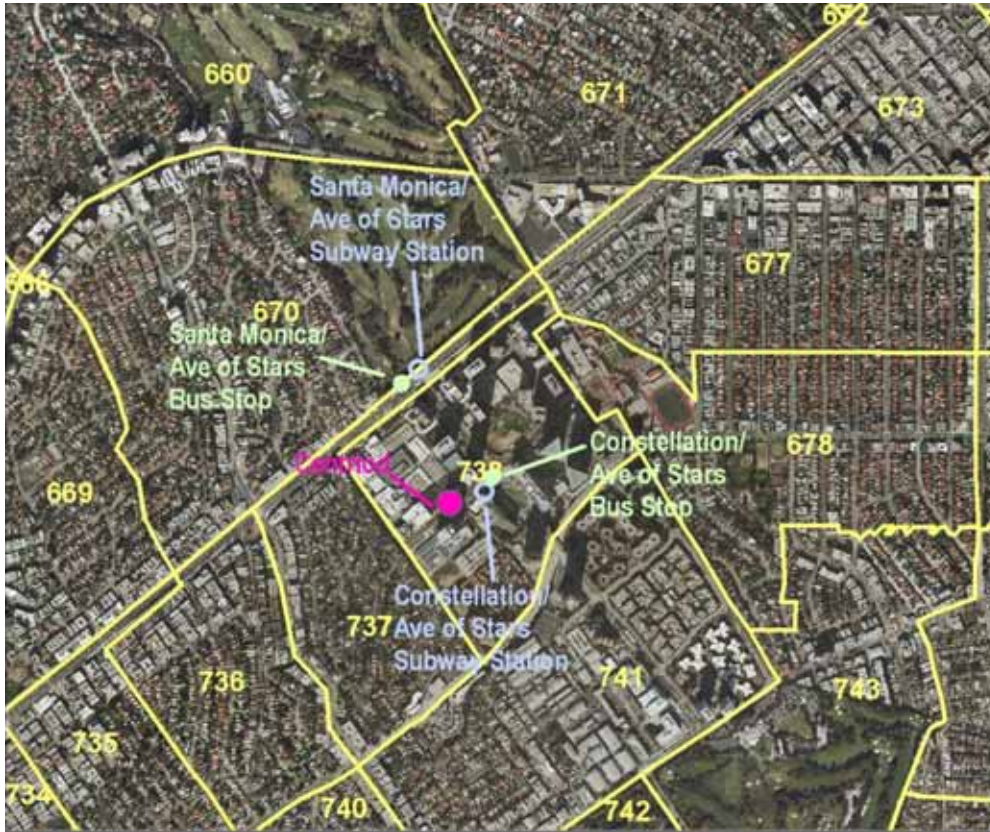


Table 1-2: Refined Coding of Century City Station Location Options – Walk Times

Century City/Constellation Option					
From	To	Centroid 738	Constellation/Ave of Stars Subway Station Platform	Bus Stop Constellation/Ave of Stars	Bus Stop Santa Monica/Ave of Stars
Centroid 738			3	2	7
Constellation/Ave of Stars Subway Station Platform		3		1	6
Bus Stop Constellation/Ave of Stars		2	1		5
Bus Stop Santa Monica/Ave of Stars		7	6	5	
Century City/Santa Monica Option					
From	To	Centroid 738	Santa Monica/Ave of Stars Subway Station Platform	Bus Stop Constellation/Ave of Stars	Bus Stop Santa Monica/Ave of Stars
Centroid 738			8	2	7
Santa Monica/Ave of Stars Subway Station Platform		8		6	1
Bus Stop Constellation/Ave of Stars		2	6		5
Bus Stop Santa Monica/Ave of Stars		7	1	5	

1.2.3 Balanced Headways

The Westside Project team requested a model run with “balanced headways” on the Purple and Red Lines to analyze the impact on boardings if the headways on these two lines are both changed to four minutes in the peak period. In the Draft EIS/EIR, the peak period headway on the Purple Line and the Red Line was 3.3 minutes and five minutes, respectively.

As a result, the estimated Purple Line daily boardings decrease to approximately 114,700, or 6.8 percent less than the Draft EIS/EIR estimate of approximately 123,100. The estimated Red Line daily boardings increase to approximately 137,300, or six percent more than the Draft EIS/EIR boardings of approximately 128,800. The estimated combined daily boardings on the Red and Purple Lines are approximately 252,000, or 0.1 percent more than the Draft EIS/EIR boardings. As expected with the

less frequent headway the estimated Purple Line Extension Project Trips are approximately 76,700, or 2.5 percent less than the Draft EIS/EIR estimate of 78,700.

In addition to the refinements discussed above, there are two additional changes in the transit network as described in the following sections.

1.2.4 Updated Westside Subway Extension Operating Plan

The station-to-station distance and running time simulated for the Westside Subway Extension in the Draft EIS/EIR phase was based on the general alignment and reflects basic speed calculations. In the Final EIS/EIR, the alignments of the Century City/Santa Monica Option and the Century City/Constellation Option have been refined. The distance and running time calculations reflect more engineering details such as vertical and horizontal curves and are better estimates of travel time.

During preparation of the Final EIS/EIR, further geotechnical investigations were conducted to better define the location of the Santa Monica Fault. Based on the results of these studies, the station box for the Century City Santa Monica Station shifted to the east to avoid locating the station box on the Santa Monica Fault. The station box would extend from just west of Moreno Drive to just west of Century Park East. This new location of the Century City Station on Santa Monica Boulevard increases the walk time between zone 738, the core of Century City business area, to the Century City Station platform from 8 minutes to 13 minutes, compared with the three minutes walk time in the Constellation Option.

Compared with the Draft EIS/EIR phase, the running time on the subway extension between Wilshire/Western and Westwood/VA Hospital is about one and a half minutes longer. The operating plans for the two options in the Final EIS/EIR are listed in Table 1-3 and

Table 1-4, respectively. The station-to-station running time and distance is identical between the two options on most of the extension except the segment between Wilshire/Rodeo and Westwood/UCLA. In the Santa Monica Option, the running time between Wilshire/Rodeo and Westwood/UCLA is 3.8 minutes. In the Century City Option, the alignment is further south to the location of Constellation Boulevard/Avenue of the Stars. Therefore, the running time between Wilshire/Rodeo and Westwood/UCLA is 4.3 minutes, half a minute longer than the Santa Monica Option.

Table 1-3: Operating Plan, Westside Century City/Constellation Option in Final EIS/EIR Phase

Station			Draft EIS/EIR		Final EIS/EIR		
			Distance (miles)	Time (mins)	Distance (miles)	Time (mins)	
						WB	EB
1	Union Station	Existing					
2	Civic Center	Existing	0.84	2.0	0.84	2.0	2.0
3	Pershing Square	Existing	0.46	1.0	0.46	1.0	1.0
4	7th/Metro	Existing	0.54	2.0	0.54	2.0	2.0
5	Westlake	Existing	1.11	2.0	1.11	2.0	2.0
6	Wilshire/Vermont	Existing	0.97	2.0	0.97	2.0	2.0
7	Wilshire/Normandie	Existing	0.60	2.0	0.60	2.0	2.0
8	Wilshire/Western	Existing	0.50	2.0	0.50	2.0	2.0
10	Wilshire/La Brea	Extension	2.01	2.5	2.00	2.7	2.7
11	Wilshire/Fairfax	Extension	1.00	1.6	1.00	1.8	1.9
12	Wilshire/La Cienega	Extension	0.85	1.5	0.80	1.7	1.7
13	Wilshire/Rodeo	Extension	1.29	1.9	1.40	2.2	2.2
14	Century City/Constellation	Extension	1.21	1.8	1.28	2.4	2.4
15	Westwood/UCLA	Extension	1.99	2.5	1.79	2.8	2.8
16	Westwood/VA Hospital	Extension	0.53	1.3	0.53	1.2	1.2
	Total		13.90	26.2	13.82	27.8	27.7
	Extension		8.88	13.2	8.80	14.8	14.7

Table 1-4: Operating Plan, Westside Century City/Santa Monica Option in Final EIS/EIR Phase

Station			Draft EIS/EIR		Final EIS/EIR		
			Distance (miles)	Time (mins)	Distance (miles)	Time (mins)	
						WB	EB
1	Union Station	Existing					
2	Civic Center	Existing	0.84	2.0	0.84	2.0	2.0
3	Pershing Square	Existing	0.46	1.0	0.46	1.0	1.0
4	7th/Metro	Existing	0.54	2.0	0.54	2.0	2.0
5	Westlake	Existing	1.11	2.0	1.11	2.0	2.0
6	Wilshire/Vermont	Existing	0.97	2.0	0.97	2.0	2.0
7	Wilshire/Normandie	Existing	0.60	2.0	0.60	2.0	2.0
8	Wilshire/Western	Existing	0.50	2.0	0.50	2.0	2.0
10	Wilshire/La Brea	Extension	2.01	2.5	2.00	2.7	2.7
11	Wilshire/Fairfax	Extension	1.00	1.6	1.00	1.8	1.9
12	Wilshire/La Cienega	Extension	0.85	1.5	0.80	1.7	1.7
13	Wilshire/Rodeo	Extension	1.29	1.9	1.40	2.2	2.2
14	Century City/Santa Monica Blvd/Century Park East*	Extension	1.29	1.9	1.03	2.1	2.1
15	Westwood/UCLA	Extension	1.81	2.3	1.80	2.7	2.7
16	Westwood/VA Hospital	Extension	0.53	1.3	0.53	1.2	1.2
	Total		13.80	26.1	13.58	27.5	27.4
	Extension		8.78	13.1	8.56	14.5	14.4

*Note the Century City Station in the Santa Monica Option in the Draft EIS/EIR was located at Santa Monica Blvd. and Avenue of the Stars.

1.2.5 Incorporating Regional Connector LPA Alignment

In the Westside Draft EIS/EIR phase, the Regional Connector in the transit network reflected the proposed alignment at that time. Since then, the LPA of the Regional Connector has been updated. Therefore, the latest LPA alignment for the Regional Connector was incorporated in the transit network for the Westside FEIS phase, which now includes three stations versus four previously.

1.3 Final Build Alternative and Baseline in Final EIS/EIR

Given the model runs and changes discussed above, five refinements/updates were made to the LPA Options in the Final EIS/EIR phase:

- Refine the coding of the Century City/Constellation Option that best represents the location of the Century City Station relative to the development in the traffic analysis zone (TAZ 738).
- Move the location of Century City Station in the Santa Monica Option to Santa Monica Boulevard/Century Park East.
- Change the peak period headway of the Purple Line from 3.3 minutes to four minutes and change the peak period headway of the Red Line from five minutes to four minutes.
- Use the updated travel time from the May 11, 2011 operating plan that reflected the engineering details at that point in time.

- Incorporate the Regional Connector LPA alignment.

To be consistent between the Build Alternatives and the Baseline which is used in the development of user benefits, the coding refinements in the Build Alternatives was applied to the Baseline Alternative. Additionally, the headway of the Red Line and the Purple Line in the Baseline Alternative was changed to four minutes in the peak period and the latest Regional Connector LPA alignment was incorporated.

Although many model runs were made, Table 1-4 summarizes the station and line boardings of the Red/Purple Lines for three sets of runs to provide a sense of the magnitude of change: 1) the Draft EIS/EIR for comparison purposes, 2) the balanced headways run because it had the greatest overall impact on ridership, and 3) the Final EIS/EIR which includes the culmination of the changes made for this phase of work. The results for the Final EIS/EIR runs will be discussed in detail in the next section.

Table 1-5: Station and Line Boardings of Purple/Red Lines - Draft EIS/EIR, Operating Plan Refinement and Final EIS/EIR Model Runs

Station	Draft EIS/EIR Phase				4 Minute Headways on both Red/Purple Lines		Final EIS/EIR Phase		
	No Build	Baseline	Alt2B	Alt2E	Baseline	Alt2E	Baseline with RC LPA	Alt2B - Final Operation Plan with RC LPA	Alt2E - Final Operation Plan with RC LPA
Purple Line									
Wilshire/VA Hospital	n/a	n/a	8,116	8,198	n/a	8,010	n/a	7,631	7,806
Wilshire/Westwood	n/a	n/a	12,922	12,882	n/a	12,438	n/a	11,926	11,967
Century City	n/a	n/a	6,556	6,685	n/a	6,573	n/a	5,492	8,566
Wilshire/Rodeo	n/a	n/a	4,612	4,640	n/a	4,561	n/a	4,436	4,241
Wilshire/La Cienega	n/a	n/a	6,703	6,959	n/a	6,829	n/a	6,425	6,530
Wilshire/Fairfax	n/a	n/a	6,436	6,456	n/a	6,314	n/a	6,125	6,183
Wilshire/La Brea	n/a	n/a	4,135	4,163	n/a	4,026	n/a	3,954	4,047
Wilshire/Western	3,751	3,766	6,081	6,092	6,984	5,854	6,959	5,743	5,852
Wilshire/Normandie	3,420	3,486	6,066	6,079	4,780	5,873	4,770	5,747	5,838
Wilshire/Vermont	2,821	2,997	11,135	11,231	5,587	9,967	5,687	9,760	10,105
Westlake	2,112	2,128	4,372	4,367	3,061	3,776	3,199	3,860	3,891
7th/Metro	5,181	5,260	16,670	16,677	9,468	15,023	10,058	17,790	18,133
Pershing Square	3,256	3,274	6,243	6,242	4,715	5,480	4,821	5,557	5,575
Civic Center	1,088	1,094	2,433	2,432	1,667	2,134	1,797	2,241	2,250
Union Station	6,404	6,259	19,897	19,982	11,775	17,853	9,682	12,820	13,058
TOTAL	28,031	28,263	122,373	123,082	48,035	114,707	46,971	109,502	114,038
Red Line									
North Hollywood	24,677	24,657	25,308	25,355	25,255	25,902	25,329	25,844	25,989
Universal City	12,410	12,396	12,697	12,725	12,719	13,038	12,748	13,001	13,075
Hollywood/Highland	6,797	6,661	5,146	5,178	6,807	5,345	6,843	5,326	5,381
Hollywood/Vine	4,776	4,729	4,521	4,541	4,825	4,656	4,845	4,634	4,670
Hollywood/Western	4,640	4,598	4,497	4,508	4,620	4,645	4,592	4,594	4,619
Sunset/Vermont	4,463	4,464	4,564	4,570	4,567	4,679	4,573	4,668	4,694
Santa Monica/Vermont	7,612	7,614	7,388	7,423	7,659	7,609	7,689	7,587	7,648
Beverly Vernont	6,565	6,491	5,202	5,208	5,556	5,472	5,610	5,496	5,514
Wilshire/Vermont	11,126	11,664	10,082	10,175	8,835	11,412	8,850	11,157	11,486
Westlake	5,451	5,426	3,967	3,964	4,701	4,524	4,828	4,646	4,649
7th/Metro	28,085	28,133	23,342	23,352	27,001	25,299	29,319	27,545	27,583
Pershing Square	7,570	7,569	5,803	5,804	6,627	6,521	6,696	6,588	6,595
Civic Center	2,966	2,965	2,284	2,286	2,604	2,558	2,722	2,673	2,671
Union Station	18,785	18,993	13,680	13,691	16,377	15,649	12,773	12,154	12,164
TOTAL	145,922	146,355	128,478	128,776	138,149	137,307	137,416	135,908	136,735
Red Line + Purple Line	173,953	174,618	250,851	251,858	186,184	252,014	184,387	245,410	250,773
Total New Stations	n/a	n/a	49,478	49,981	n/a	48,749	n/a	45,986	49,339
Total Urban Rail Lines	563,594	564,132	634,604	635,736	575,325	636,763	577,415	633,706	639,692

Note: RC means the LA Metro Regional Connector Project

2.0 RESULTS FROM THE REFINED LPA OPTIONS AND THE BASELINE ALTERNATIVE

As discussed in the previous section, two LPA options (Century City/Santa Monica Option and Century City/Constellation Option) and the Baseline Alternative were refined. The travel forecasting results are presented and discussed in this section.

2.1 Urban Rail Line Boardings

As displayed in Table 2-1 the estimated daily boardings on the Purple Line in the Century City/Santa Monica Option and the Century City/Constellation Option are approximately 109,500 and 114,000 respectively. The Purple Line boardings in the Constellation Option is approximately 4,500 or four percent more than the Santa Monica Option. The estimated daily boardings on the Red Line in the Constellation Option are approximately 136,700, about 0.6 percent more than the Santa Monica Option. The overall daily urban rail boardings of the Constellation Option is estimated at approximately 639,700, or about 6,000 additional boardings which is nearly one percent more than the Santa Monica Option.

The daily boardings on the other urban rail lines are estimated to have a very minor difference between these two LPA options. The North-South Line has approximately 0.4 percent more daily boardings in the Constellation Option than in the Santa Monica Option, the largest difference among all the other urban rail lines. Since the North-South Line is connected to the Purple Line at the 7th/Metro Station, the higher ridership in the Constellation Option has a larger impact on the ridership on the North-South Line than on the other Urban Rail Lines.

Table 2-1: Urban Rail Boardings by Line, Santa Monica Option vs. Constellation Option

Rail Line	Santa Monica Option	Constellation Option	Constellation Option minus Santa Monica Option	Constellation Option minus Santa Monica Option Pct Diff
Purple Line (Union Sta. - VA Hospital)	109,502	114,038	4,536	4.1%
Red Line (Union Sta. - North Hollywood)	135,908	136,735	827	0.6%
Green Line (Norwalk-Torrance)	29,697	29,760	63	0.2%
Green Line (Norwalk-LAX)	25,939	25,971	32	0.1%
LAX People Mover (Lot C)	3,650	3,656	6	0.2%
LAX People Mover (Century/Aviation)	3,779	3,782	3	0.1%
Crenshaw Line (Expo - Torrance)	25,500	25,437	-63	-0.2%
North-South Line (Citrus - Long Beach)	100,207	100,496	289	0.3%
North-South Line (SMV - Long Beach)	76,077	76,377	300	0.4%
East-West Line (East LA - Santa Monica)	123,447	123,440	-7	0.0%
Total Urban Rail Lines	633,706	639,692	5,986	0.9%

2.2 Purple Line Station Boardings

Table 2-2 compares the estimated Purple Line station boardings between the two LPA options. The largest difference occurs for the Century City Station. The station boardings for the Constellation Option are approximately 8,600, over 3,000 more than that for the Santa Monica Option. This is mainly because the Century City Station location in the Constellation Option is much closer to the core of the Century City business district than the station location in the Santa Monica Option at Santa Monica Boulevard and Century Park East.

Table 2-2: Purple Line Station Boardings, Santa Monica Option vs. Constellation Option

	Santa Monica Option	Constellation Option	Constellation Option minus Santa Monica Option	Constellation Option minus Santa Monica Option Pct Diff
Westwood/VA Hospital	7,631	7,806	175	2.3%
Westwood/UCLA	11,926	11,967	41	0.3%
Century City	5,492	8,566	3,075	56.0%
Wilshire/Rodeo	4,436	4,241	-195	-4.4%
Wilshire/La Cienega	6,425	6,530	106	1.6%
Wilshire/Fairfax	6,125	6,183	59	1.0%
Wilshire/La Brea	3,954	4,047	93	2.4%
Wilshire/Western	5,743	5,852	109	1.9%
Wilshire/Normandie	5,747	5,838	91	1.6%
Wilshire/Vermont	9,760	10,105	346	3.5%
Westlake	3,860	3,891	31	0.8%
7th/Metro	17,790	18,133	343	1.9%
Pershing Square	5,557	5,575	18	0.3%
Civic Center	2,241	2,250	9	0.4%
Union Station	12,820	13,058	238	1.9%
Existing Stations	63,516	64,699	1,183	1.9%
Extension Stations	45,986	49,339	3,353	7.3%
TOTAL	109,502	114,038	4,536	4.1%

Among the extension stations in the two LPA options, the Westwood/UCLA Station is the busiest with approximately 12,000 daily boardings. This is more than the boardings on the Wilshire/Vermont Station where the passengers could transfer between the Red Line and the Purple Line but fewer than the 7th/Metro Center Station and Union Station which are the two main urban rail hubs in the Los Angeles Metro urban rail system. The Century City Station is the second busiest station among all the extension stations, followed by the Westwood/VA Hospital Station, the terminus of the Purple Line extension.

The difference in the station boardings between the two LPA options at other Purple Line Stations is minor. The Constellation Option has approximately 3.5 percent more boardings than the Santa Monica Option at the Wilshire/Vermont Station, approximately 2.4 percent more at the Wilshire/La Brea station and approximately 2.3 percent more at the Westwood/VA Hospital Station. The boardings at the extension stations in the Constellation Option are approximately 49,300, about 3,350

or 7.3 percent more than for the Santa Monica Option. The Constellation Option also has slightly more boardings at the existing stations with approximately 64,700 daily boardings versus 63,500 in the Santa Monica Option, a difference of 1,200 additional boardings or 1.9 percent.

The only Purple Line station that has fewer boardings in the Constellation Option than in the Santa Monica Option is the Wilshire/Rodeo Station. There are approximately 200, or 4 percent fewer boardings at this station in the Constellation Option. This is mainly because the Rodeo Station is the closest station to the Century City Station and there is some competition between these two stations. The more boardings at the Century City Station, the fewer boardings at the Rodeo Station.

2.3 Purple Line Extension Station Mode of Access

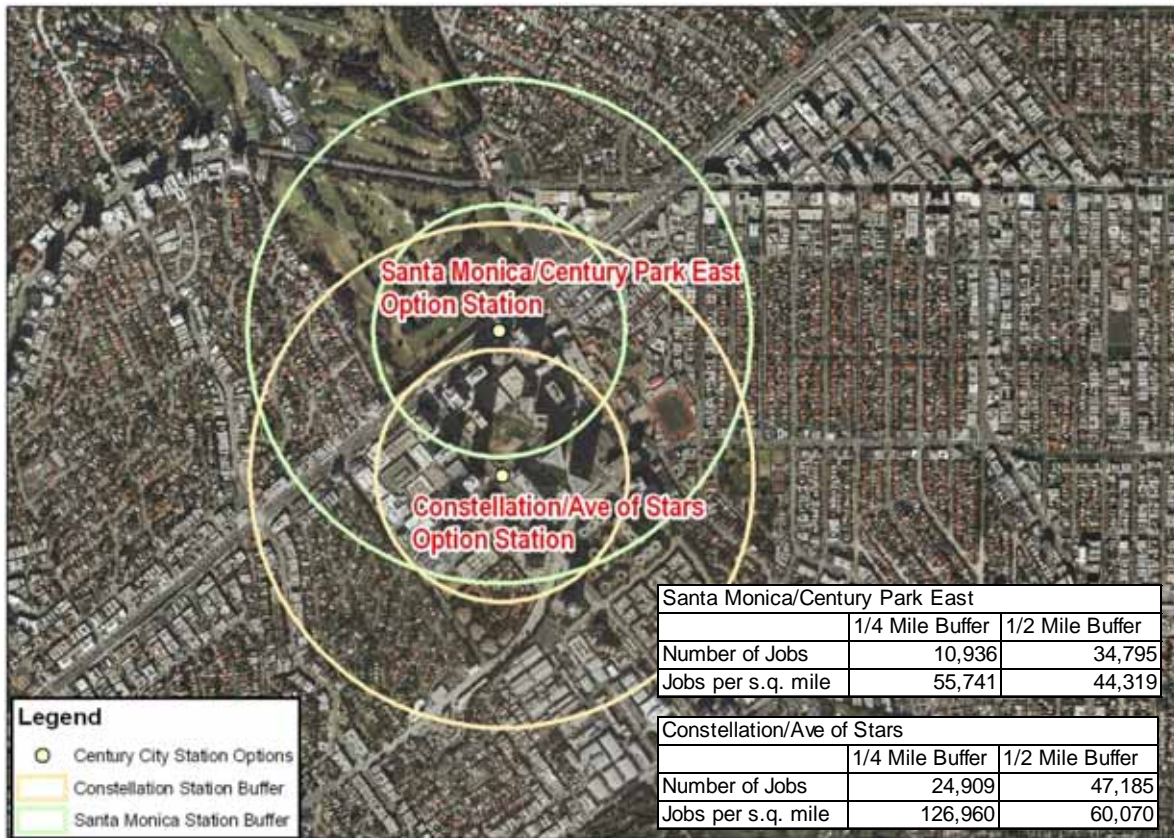
Table 2-3 lists the mode of access estimates for the extension stations in both LPA Options. It reveals that the main difference in boardings at the Century City Station is the increased walk access trips in the Constellation Option over the Santa Monica Option. The walking time between the TAZ 738 (Century City)’s centroid node and the Century City subway station is 3 minutes in the Constellation Option and 13 minutes in the Santa Monica Option.

Table 2-3: Purple Line Extension Station Mode of Access, Santa Monica Option vs. Constellation Option

Station	Santa Monica Option				Constellation Option			
	Walk Access	Bus Access	KNR Access	Total Access	Walk Access	Bus Access	KNR Access	Total Access
Wilshire/La Brea	2,454	1,040	175	3,668	2,507	1,065	188	3,760
Wilshire/Fairfax	4,125	1,420	154	5,698	4,133	1,454	166	5,752
Wilshire/La Cienega	5,278	617	130	6,024	5,052	873	139	6,063
Wilshire/Rodeo	3,786	247	97	4,130	3,436	322	105	3,862
Century City	1,834	2,884	78	4,795	6,736	957	76	7,769
Westwood/UCLA	5,196	5,398	102	10,696	5,274	5,377	114	10,764
Westwood/VA Hospital	4,609	2,333	206	7,148	4,733	2,339	235	7,307

Figure 2-1 illustrates why there are more walk access trips to the Century City Station in the Constellation Option than in the Santa Monica Option. The number of jobs and jobs per square mile in the ¼ mile and ½ mile area around the Century City Stations is much higher in the Constellation Option than in the Santa Monica Option.

Figure 2-1: Century City Station Options Year 2035 Jobs within ¼ Mile and ½ Mile Catchment Areas around Stations



Data Source: SCAG RTP08 Socio-economic Data, converted by LA Metro to Metro zone structure

2.4 Purple Line Westside Extension Project Trips

Project trips are another element that the Federal Transit Administration (FTA) reviews. Project trips are defined as trips using any part of the project, either getting on at one of the project (extension) stations or getting off at one of the project stations or both getting on and off at the project stations.

Table 2-4 shows the project trips for the two LPA options. The Constellation Option has approximately 76,800 project trips, about 4,550 or 6.3 percent more than the Santa Monica Option. Given the Constellation Option has the most boardings between the two options it is logical that it has the most project trips.

Table 2-4: Purple Line Westside Extension Project Trips, Santa Monica Option vs. Constellation Option

	Santa Monica Option	Constellation Option	Constellation Option minus Santa Monica Option	Constellation Option minus Santa Monica Option Pct Diff
Purple Line Westside Extension	72,252	76,806	4,554	6.3%

2.5 Project Line Peak Hour and Peak Direction Volumes

In the Baseline Alternative, the peak hour peak load point on the Purple Line is eastbound, between Civic Center and Union Station, with approximately 2,730 passengers. It is equivalent to about 180 people per train. The location of the peak hour load point, direction and passenger load changes from the Baseline to the two LPA options.

In the Santa Monica Option, the peak hour peak load point on the Purple Line is between the Wilshire/Normandie Station and the Wilshire/Western Station in the westbound direction. The maximum load is approximately 5,300 or 350 per train. The peak hour peak load point on the Red Line is between the Beverly/Vermont Station and the Wilshire/Vermont Station with approximately 6,450 passengers in the inbound direction. It is equivalent to approximately 430 passengers per train.

The peak hour peak load point of the Purple Line in the Constellation Option is between the Wilshire/La Brea Station and the Wilshire/Fairfax Station in the westbound direction. The maximum load is approximately 5,700 or 380 per train. The peak hour peak load point on the Red Line like in the Santa Monica Option is between the Beverly/Vermont Station and the Wilshire/Vermont Station with approximately 6,550 passengers in the inbound direction. It is equivalent to approximately 440 passengers per train.

2.6 User Benefits

User benefits are similar to travel time savings, but more comprehensive, as user benefits include the time savings for new riders as well as existing riders. User benefits are reported for FTA's New Starts projects and compare the benefits between two alternatives, generally the baseline versus the build. The calculation of user benefits is based on the micro-economic principles of consumer surplus. User benefits (or dis-benefits) are assumed to arise because of changes in mobility for individual travelers that result from a transportation project or policy and are measured in hours of travel time and aggregated over all travelers in a region. The procedures that were applied to estimate the total change in user benefits for all travelers, trip purposes and modes, are based on those developed for the FTA and applied within the travel forecasting model using the FTA Summit software.

The daily user benefits of the Century City/Constellation Option versus the Baseline Alternative is approximately 31,650 hours, about 44 percent of which is attributed to the Home-Based Work peak purpose. The daily new transit trips for the Constellation Option over the Baseline Alternative are approximately 24,600. The detailed user benefits and new transit trips by purpose and by time period are displayed in Table 2-5.

Table 2-5: User benefits by Purpose and Time Period, Baseline Alternative vs. Constellation Option

		Transit Trips		User Benefits
		Baseline	Constellation Option	in Minutes
Peak Period	Home Based Work	708,707	719,524	830,831
	Home Base University	87,050	87,877	64,771
	Home Base Other	267,869	270,230	219,472
	Non Home Based	90,151	92,914	181,312
	TOTAL PEAK	1,153,777	1,170,545	1,296,386
Off-peak Period	Home Based Work	297,805	301,920	331,290
	Home Base University	59,203	59,667	26,570
	Home Base Other	213,068	214,447	120,614
	Non Home Based	65,358	67,209	124,542
	TOTAL OFFPEAK	635,434	643,243	603,016
Daily	Total	1,789,211	1,813,788	1,899,402
	Hours of User Benefit	31,657		
	New Trips	24,577		

The daily user benefits of the Century City/Santa Monica Option versus the Baseline Alternative is approximately 27,900 hours, about 42 percent of which is attributed to the Home-Based Work peak purpose. The daily new transit trips for the Santa Monica Option over the Baseline Alternative are approximately 21,700. The detailed user benefits and new transit trips by purpose and by time period are shown in Table 2-6.

Table 2-6: User benefits by Purpose and Time Period, Baseline Alternative vs. Santa Monica Option

		Transit Trips		User Benefits
		Baseline	Santa Monica Option	in Minutes
Peak Period	Home Based Work	708,707	717,928	701,785
	Home Base University	87,050	87,884	65,541
	Home Base Other	267,869	269,984	196,529
	Non Home Based	90,151	92,408	149,087
	TOTAL PEAK	1,153,777	1,168,204	1,112,942
Off-peak Period	Home Based Work	297,805	301,680	312,204
	Home Base University	59,203	59,668	26,498
	Home Base Other	213,068	214,372	114,064
	Non Home Based	65,358	66,984	109,507
	TOTAL OFFPEAK	635,434	642,704	562,273
Daily	Total	1,789,211	1,810,908	1,675,215
	Hours of User Benefit	27,920		
	New Trips	21,697		

Comparing the information in Tables 2-5 and 2-6 and shown in Table 2-7, the Constellation Option has approximately 13 percent more user benefits and new transit trips than the Santa Monica Option

over the Baseline Alternative. This is not only because the Constellation Option has more boardings (4.1%) and project trips (6.3%) than the Santa Monica Option, but also because the average user benefits per trip is higher in the Constellation Option.

Table 2-7: User Benefits and New Trips over the Baseline Alternative, Santa Monica Option vs. Constellation Option

	Santa Monica Option	Constellation Option	Constellation Option minus Santa Monica Option	Constellation Option minus Santa Monica Option Pct Diff
Daily User Benefits	27,920	31,657	3,737	13.4%
Daily New Transit Trips	21,697	24,577	2,880	13.3%

Table 2-8 compares the existing and new riders with user benefits over the Baseline between the Santa Monica Option and the Constellation Option. The Constellation Option has slightly fewer existing riders with user benefits than the Santa Monica Option. However, the minutes of user benefits per existing rider is 12.6 percent higher in the Constellation Option than in the Santa Monica Option. The Constellation Option has approximately 26,850 new riders, which is 12 percent more than the Santa Monica Option. The minutes of user benefits per new rider in the Constellation Option are about 12 minutes, or 10.5 percent more than the Santa Monica Option. This is mainly because the walk access time from the core of Century City to the subway station is ten minutes less in the Constellation Option than in the Santa Monica Option, as discussed in section 1.2.4.

Table 2-8: Daily User Benefits over the Baseline Alternative for Existing and New Riders, Santa Monica Option vs. Constellation Option

	Description	Santa Monica Option	Constellation Option	Percentage Difference
Existing Riders	Number of Riders with UB	365,465	365,228	-0.1%
	Benefits(hours)	24,702	27,797	12.5%
	Minutes of User Benefit Per Existing Rider	4.06	4.57	12.6%
New Riders	Number*	23,982	26,849	12.0%
	Benefits(hours)	4,353	5,387	23.8%
	Minutes of User Benefit Per New Rider	10.89	12.04	10.5%
Percentage of New Riders of Total Trips with UB		6.2%	6.8%	

Note: The difference between the number of new riders and the number of new transit trips in Table 2-7 is the lost transit trips (transit trips in the Baseline and shifted to auto trips in LPA)

Please note that the number of new riders in Table 2-8 does not necessarily match the number of new transit trips in Table 2-7. For example, as shown in Table 2-8, the Santa Monica Option has 23,982 new riders, which are 2,285 more than the number of new transit trips (21,697) in Table 2-7. The 2,285 trips are transit trips in the Baseline but shift back to the auto modes in the LPA mainly due to the lower frequency of Route 720 in the LPA than in the Baseline.

To better understand and visualize why the Constellation Option is better; a Summit run comparing the two LPA options was made. As shown in Table 2-9, the Constellation Option has approximately 2,900 new transit trips and 4,100 user benefits over the Santa Monica Option on the daily basis. Please note that the calculation of user-benefits is complicated. The user-benefits of the Constellation Option over the Santa Monica Option is 4,123, which is not simply the difference between the options' user-benefits over the Baseline (27,920 vs. 31,657 in Table 2-7).

Table 2-9: Daily User Benefits and New Transit Trips, Santa Monica Option vs. Constellation Option

	Santa Monica Option	Constellation Option
Total Transit Trips	1,810,908	1,813,788
New Trips (Difference)		+2,880
Hours of User Benefit (Difference)		+4,123

Thematic maps were created as shown in Figure 2-2 and Figure 2-3. Figure 2-2 displays the Home-based Work peak trip purpose production end of the trip; and Figure 2-3 displays the attraction end of the trip. For both maps, green indicates where the Constellation Option is better and the red indicates where the Santa Monica Option is better.

The difference between the two options is the location of the Century City Stations. As discussed in section 1.2.4, the walk time between the centroid node of zone 738, the core of Century City business area, and the Century City Station is 3 minutes and 13 minutes in the Constellation Option and the Santa Monica Option, respectively. As shown in Figure 2-2, the zones in the study area and along the fixed-guideway transit lines producing trips to Century City would save 10 minutes of walk time and demonstrate positive user benefits in Green in the production map.

However, not everyone is better off in the Constellation Option. Section 1.2.4 explains that the running time between Wilshire/Rodeo and Westwood/UCLA is half a minute longer in the Constellation Option than in the Santa Monica Option. The passengers taking the Purple Line extension through the segment between Wilshire/Rodeo and Westwood/UCLA would experience a slightly longer ride and their user-benefits will be negative.

In most cases, the overall user-benefits of the zones that produce this kind of longer ride trips could still be positive because the positive user benefits from the trips they generate to Century City is enough to offset the negative user-benefits. This is why most zones in the production map are in green.

For the zones in the west portion of the study area, their overall attracted user-benefits are negative, which is shown in red in Figure 2-3, the attraction map. This is because these zones have many jobs and leisure destinations. They attract many trips from east of Century City and accumulate sizable negative user-benefits by the longer-ride between Rodeo and UCLA. On the other side, these zones attract very few trips from Century City. Therefore, there would be no positive user-benefits to offset the negative ones.

Figure 2-2: User Benefits Distribution, Santa Monica Option vs. Constellation Option, Home-based Work Peak Purpose, for Trip Production

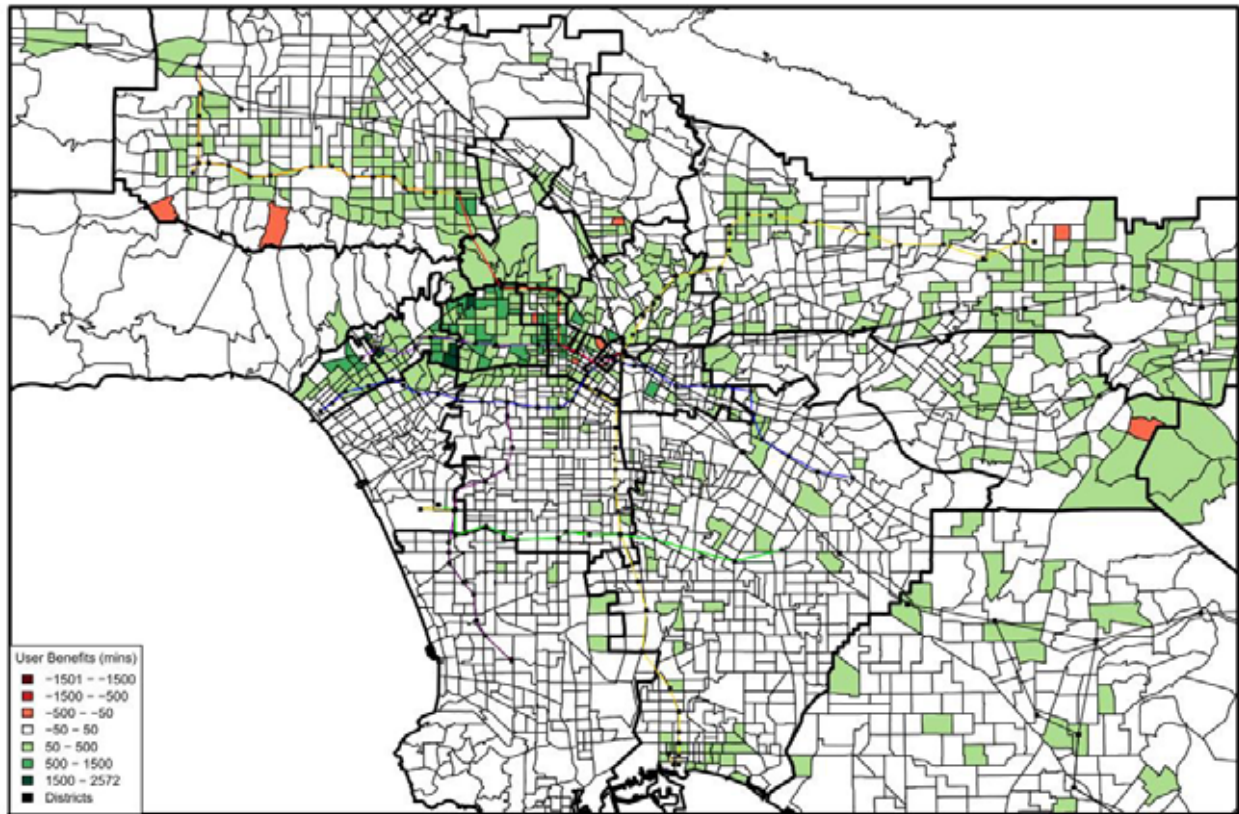
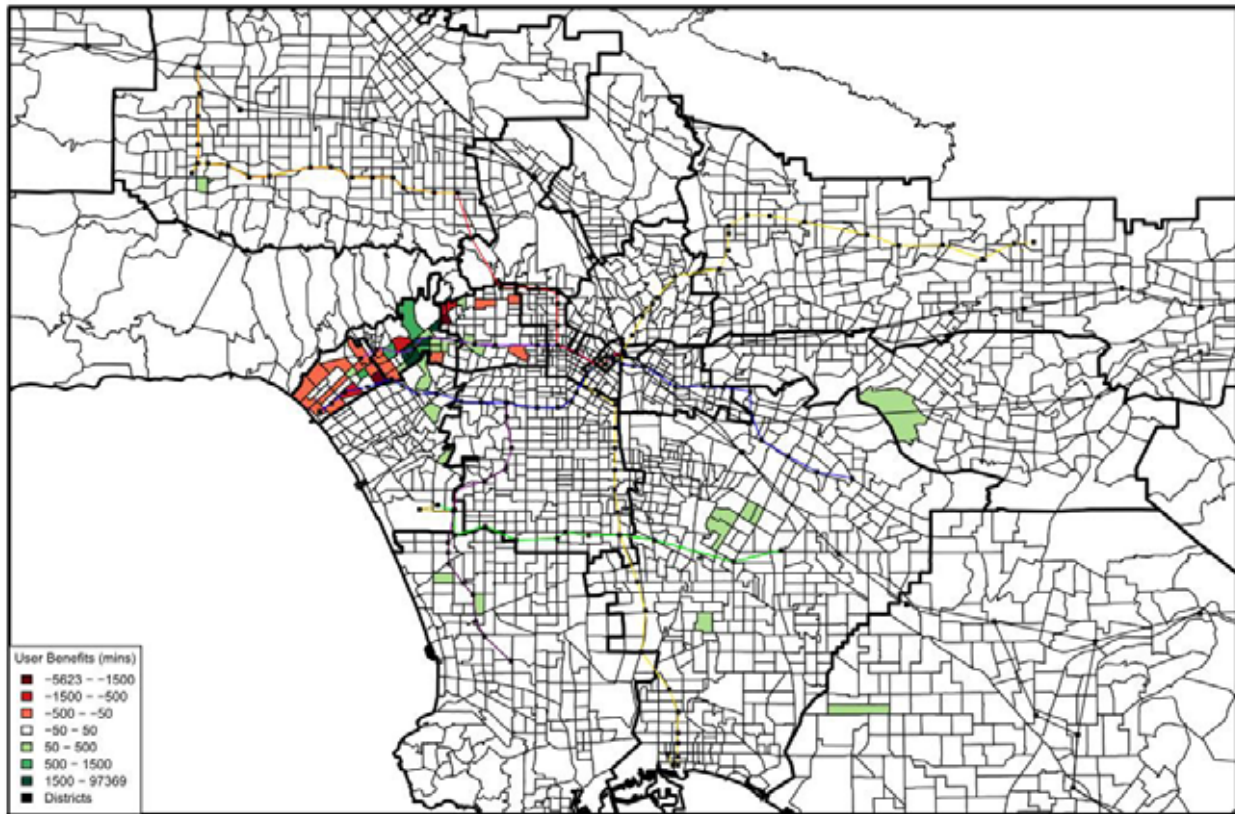


Figure 2-3: User Benefits Distribution, Santa Monica Option vs. Constellation Option, Home-based Work Peak Purpose, for Trip Attraction



The remaining portion of this section discusses the thematic maps developed by using Summit in the standard manner of comparing the Baseline and Build Alternative. The user benefits pattern of the Baseline Alternative versus the two LPA options is very similar. The user benefits maps for the Baseline Alternative vs. the Constellation Option are included in this section. The maps for the Baseline vs. the Santa Monica Option are included in the Appendix. Two user benefit maps are developed for each trip purpose, one with the benefits at the production (start) end of the trip and one at the attraction end of the trip. In the production maps the benefits are aggregated (and displayed) for the traffic analysis zone (TAZ) where the trip began and in the attraction map the benefits are aggregated (and displayed) for the TAZ where the trip ended. Given the Home-Based Work trip purpose has the greatest number of user benefits those maps are included to provide some insight as to where the greatest benefits occur. Additionally, maps of the summation of the daily (total) user benefits are provided.

As shown in Figure 2-4, the production zones with user benefits are concentrated in the Westside Corridor and along the urban rail lines (Red Line and North-South Line), BRT (Metro Orange) and Metrolink lines (San Bernardino Line and Riverside Line). Additionally the figure shows the Westside study area is the direct beneficiary of the Purple Line Extension. The project brings user benefits to transit riders using the Purple Line as part of their travel all over the region. The Westside is a job rich area that attracts many work trips from outside the study area, as well as inside the study area. The people working in the Westside and living in areas with walk or bus access to fixed

guideway transit service, including urban rail, commuter rail and BRT can utilize the Purple Line Extension and benefit from savings in travel time.

Figure 2-4: User benefits Distribution, Baseline Alternative vs. the Constellation Option, Home-Based Work Peak Purpose, for Trip Productions

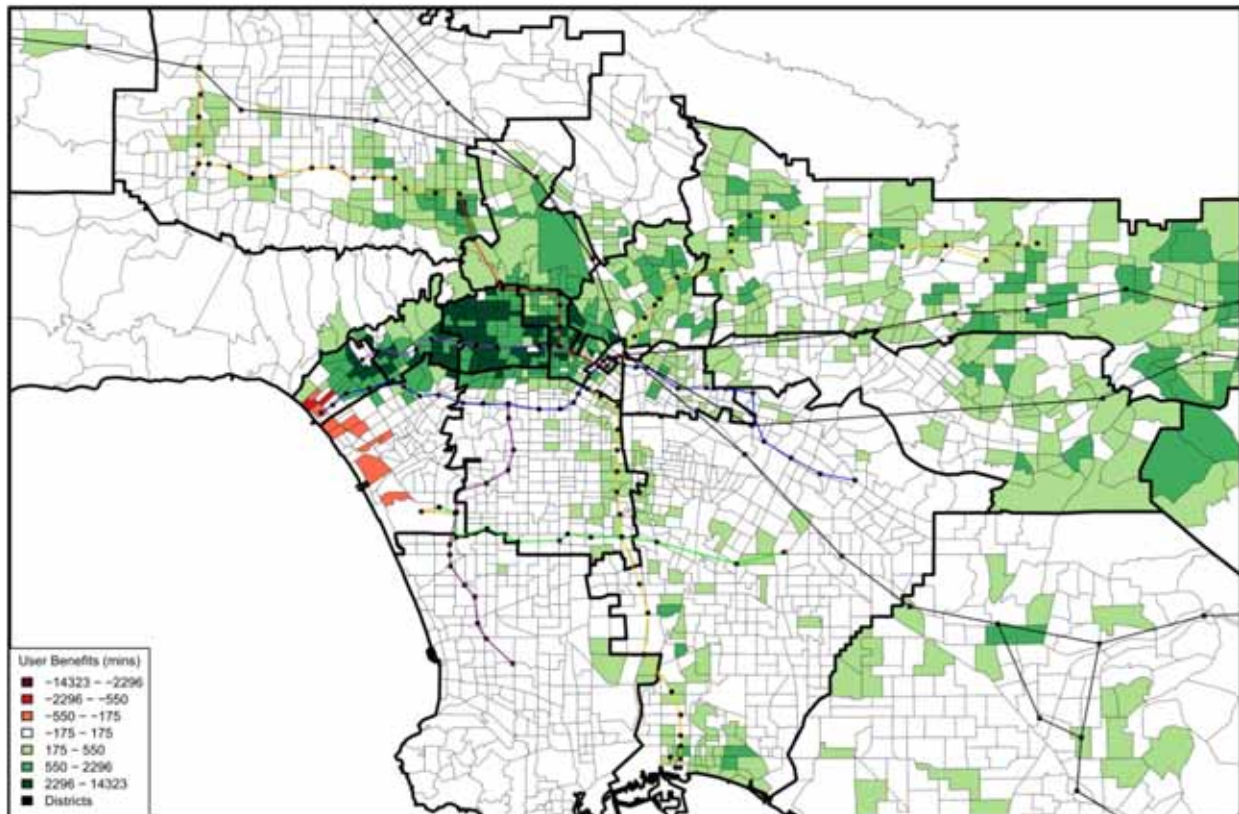


Figure 2-5 illustrates the distribution of the Peak Home-Based Work user benefits from the attraction side. The user benefits are highly concentrated in the Westside Corridor, especially around the proposed extension stations. The TAZ attracting the most user benefits encompasses the Century City Station. Century City is an important business center and regarded as the second central business district (CBD) in Los Angeles. Although the number of TAZs colored with benefits attracted to the study area is much less than the number of TAZ with benefits produced, the magnitude of benefits is much greater.

There are several zones in the Santa Monica area with negative user benefits in both the production map and the attraction map. This is because of the more frequent service on the Metro Rapid Bus Route 720 in the Baseline Alternative. Route 720 runs between Santa Monica and Wilshire/Vermont along Wilshire Boulevard. In the Century City/Constellation Option, the peak period headway of Route 720 is five minutes in the westbound direction and ten minutes in the eastbound direction. In the Baseline Alternative, the peak period Route 720 headway is four minutes in both directions. The Purple Line Extension in the LPA options terminates at the Westwood/VA Hospital and does not serve the Santa Monica area. Therefore, the transit service serving Santa Monica is slightly better in the Baseline Alternative than in the LPA options and generates some negative user benefits in that area.

Figure 2-5: User benefits Distribution, Baseline Alternative vs. the Constellation Option, Home-Based Work Peak Purpose, for Trip Attractions

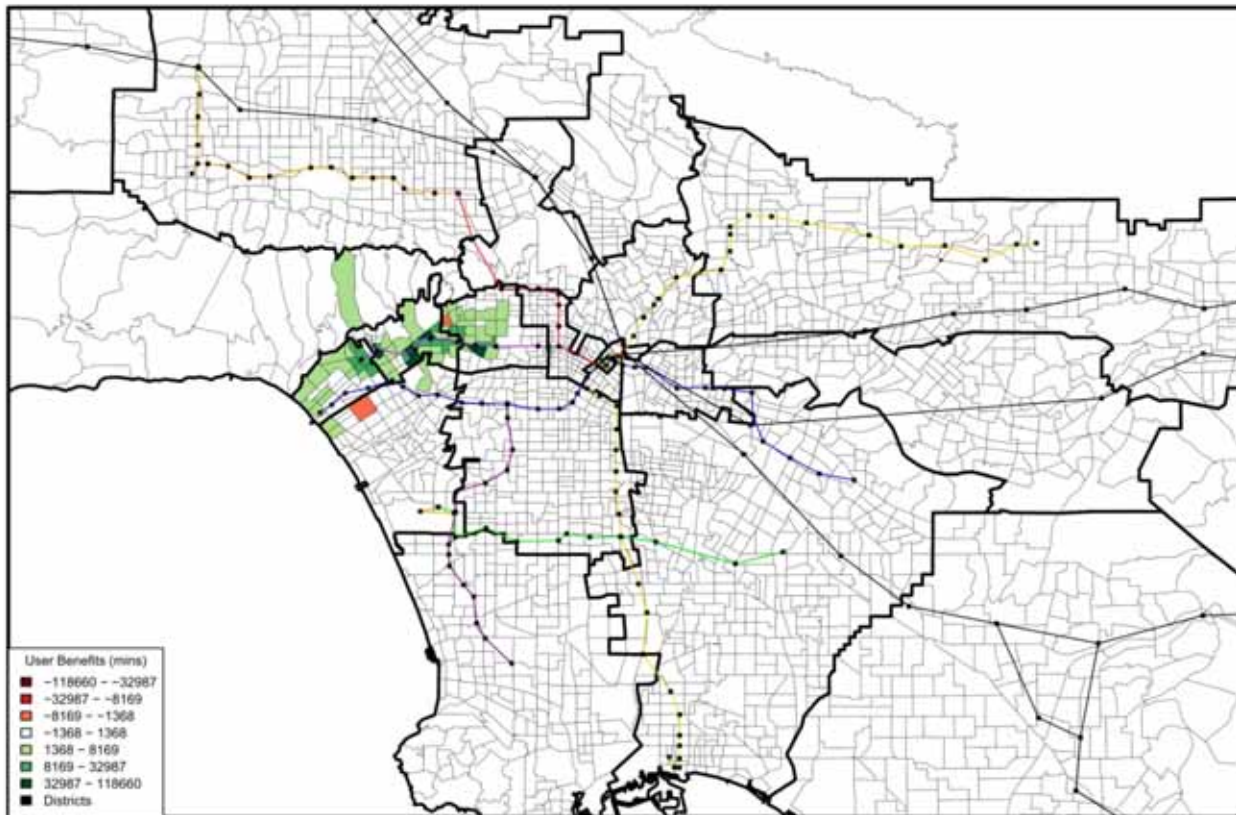


Figure 2-6 and Figure 2-7 show the daily user benefit thematic maps. The pattern on the daily user benefit thematic maps is similar to that of the Home-Based Work peak user benefit thematic maps. The trips produced by the majority of the Westside corridor accumulate a substantial amount of user benefits. Trip production zones with large amounts of user benefits are generally located along the Red Line, North-South Line, East-West Line (Gold Line Eastside portion), Metrolink San Bernardino Line and Metrolink Riverside Line. In the map presenting daily user benefits for the attraction end of the trip, the zones with the largest benefits are located in the Westside Study Area, especially along the proposed Purple Line extension stations at Wilshire/Fairfax, Wilshire/La Cienega, Wilshire/Rodeo and Century City.

Figure 2-6: User Benefits Distribution, Baseline Alternative vs. the Constellation Option, Daily All Purposes, for Trip Production

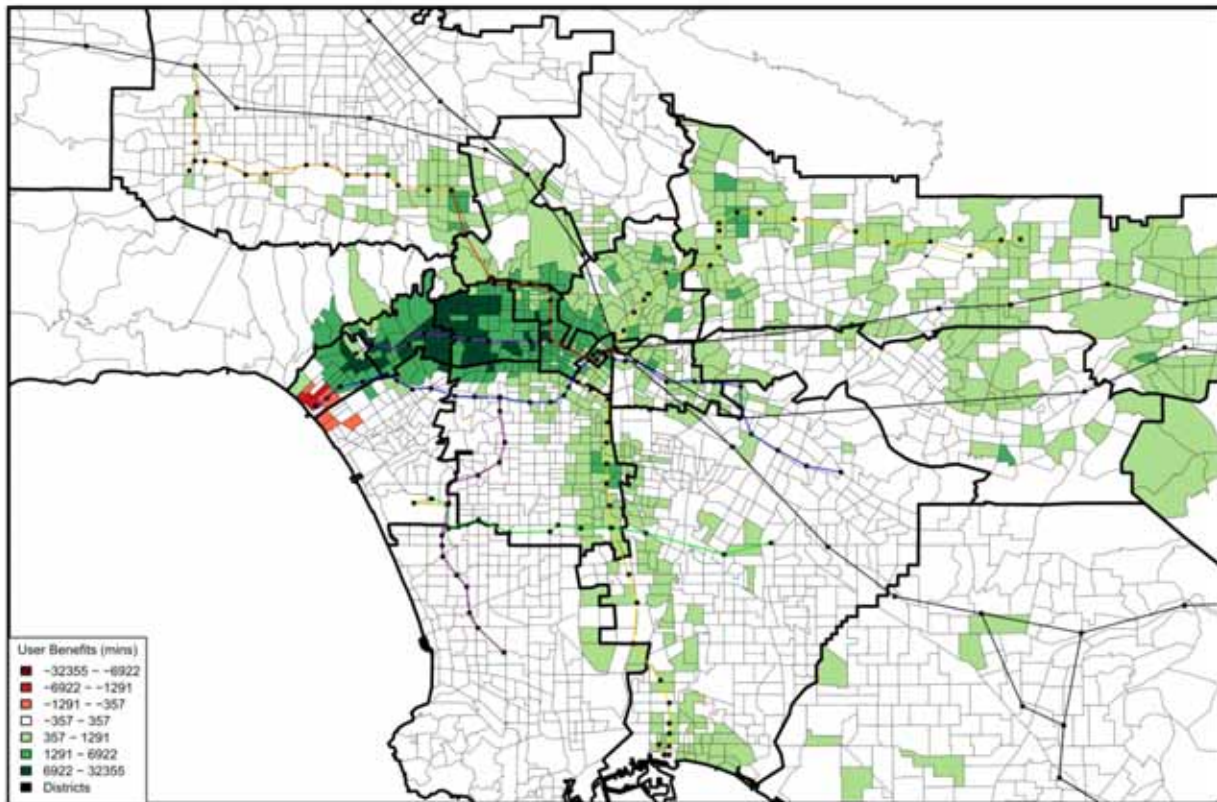
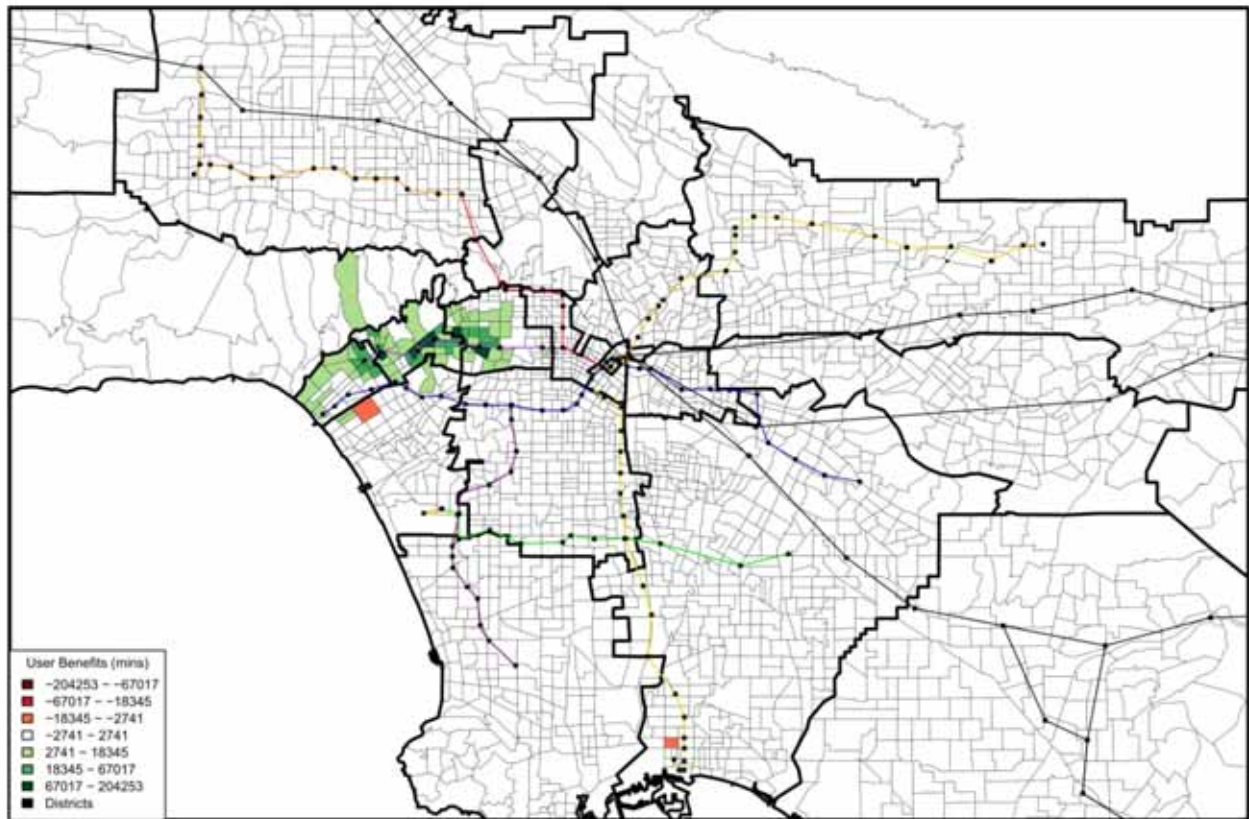


Figure 2-7: User Benefits Distribution, Baseline Alternative vs. the Constellation Option, Daily All Purposes, for Trip Attraction



3.0 PHASING OF ALTERNATIVES

Metro is currently looking at two options for constructing the Westside Extension. The LPA could either be constructed as a single phase or as three consecutive phases. The transit ridership is not projected to differ by 2035 whether the LPA is constructed in a single phase or as three sequential phases. This analysis looks at the ridership for the year 2035 for comparison purposes, however if the extension was constructed in phases, La Cienega would likely open by 2020 and the extension to Century City by 2026.

Table 3-1 presents the daily station boarding for the stations along the LPA. Under the LPA in Phase 3 total boardings will range from approximately 46,000 to 49,300 per day (as shown previously in table 1-5). With the Century City Constellation Station option, higher ridership is estimated to occur as compared to the Century City Santa Monica Station option. However, what is more interesting is what happens in phasing along the way. For Phase 1 alone, the 2035 total daily station boardings are estimated to be approximately 19,800. With the addition of Phase 2, the 2035 total daily station boardings are estimated to range from 30,000 to 31,700. In addition, Phase 1 and Phase 2 will generate varying levels of boardings at stations and mode of access patterns during periods when they establish an interim terminus at Wilshire/La Cienega Station and Century City Stations.

Table 3-1: 2035 Daily Station Boardings

Station	Phase 1 to La Cienega	Phase 2 - to Century City (with Constellation Option)	Phase 2 - to Century City (with Santa Monica Option)	Phase 3 - to Westwood/VA Hospital (with Constellation Option)	Phase 3 - to Westwood/VA Hospital (with Santa Monica Option)
Wilshire/La Brea	3,636	3,774	3,707	4,047	3,954
Wilshire/Fairfax	6,025	5,767	5,742	6,183	6,125
Wilshire/La Cienega	10,120	6,073	5,942	6,530	6,425
Wilshire/Rodeo	-	8,057	7,411	4,241	4,436
Century City Constellation	-	8,021	-	8,566	-
Century City Santa Monica	-	-	7,157	-	5,492
Westwood/UCLA	-	-	-	11,967	11,926
Westwood/VA Hospital	-	-	-	7,807	7,631
Total Stations Boardings	19,781	31,692	29,959	49,341	45,989

Source: Metro Travel Demand Model (CBM 09)

3.1 Phase 1 to Wilshire/La Cienega

Under Phase 1, the LPA will operate to the Wilshire/La Cienega Station. This is a 3.8 mile extension from the Wilshire/Western Station. The total boardings on the three new Purple Line stations are estimated to be approximately 19,800 per day. Since the Wilshire/La Cienega Station will serve as an interim terminus station, it is estimated to have higher daily boardings than under the full LPA – 10,100 daily boardings under Phase 1 compared to 6,400 to 6,500 daily boardings when the line is built to the Westwood/VA Hospital. It is typical to get an increase in boardings at the end of the line station because riders within the catchment area for the corridor will typically go to the end of the line as their closest station.

3.2 Phase 2 to Century City

Under Phase 2, the LPA will operate to the Century City Station (either Santa Monica or Constellation option). This is an extension of approximately 2.7 miles (depending on which option) from Wilshire/La Cienega. For Phase 2 of the LPA, the total estimated 2035 daily station boardings are approximately 30,000 to 31,700 or 64-65 percent of the daily boardings on the full LPA to the Westwood/VA Hospital. However, the station with the largest increase in ridership for Phase 2 is the Wilshire/Rodeo Station not the Century City Station. The 2035 daily boardings for the Wilshire/Rodeo Station is approximately 7,400 to 8,100 compared to 4,200 to 4,400 under the full build to the Westwood/VA Hospital Station. This is due to the proximity of the Wilshire/Rodeo to the interim terminus location in Century City and the good bus connections provided to the Wilshire/Rodeo Station via Route 720 along Wilshire Boulevard.

At the Century City Station the boardings range from 7,200 to 8,000 when it is the end of the line compared to 5,500 to 8,600 when the rail extends to the Westwood/VA Hospital. Unlike the other stations, when the Century City Station is at Constellation it gets fewer boardings when it is the end of line than when the rail terminates at the Westwood/VA Hospital Station.

Table 3-2: 2035 Comparison of Phase 2 and Phase 3 Urban Rail Boardings and Mode of Access for Century City Stations and Wilshire/Rodeo

Station	Phase 3 - to Westwood/VA Hospital (with Santa Monica Option)	Phase 2 - to Century City (with Santa Monica Option)	Absolute Difference (Phase 2 minus Phase 3)	Percent Difference (Absolute Divided by Phase 3)	Phase 3 - to Westwood/VA Hospital (with Constellation Option)	Phase 2 - to Century City (with Constellation Option)	Absolute Difference (Phase 2 minus Phase 3)	Percent Difference (Absolute Divided by Phase 3)
Century City Urban Rail Boardings	5,492	7,157	1,665	30.3%	8,566	8,021	-545	-6.4%
Century City Walk Access	1,834	1,606	(228)	-12.4%	6,736	5,863	(873)	-13.0%
Century City Bus Access	2,884	4,527	1,643	57.0%	957	1,266	309	32.3%
Century City Walk Plus Bus Access	4,718	6,133	1,415	30.0%	7,693	7,129	-564	-7.3%
Wilshire/Rodeo Urban Rail Boardings	4,436	7,411	2,975	67.1%	4,241	8,057	3,816	90.0%
Wilshire/Rodeo Walk Access	3,786	3,279	(507)	-13.4%	3,436	3,017	(419)	-12.2%
Wilshire/Rodeo Bus Access	247	3,118	2,871	1162.3%	322	3,763	3,441	1068.6%
Wilshire/Rodeo Walk Plus Bus Access	4,033	6,397	2,364	58.6%	3,758	6,780	3,022	80.4%

Source: Metro Travel Demand Model (CBM 09)

To further assess what is occurring at the Wilshire/Rodeo Station and the Century City Stations Table 3-2 displays mode of access information and a comparison between the Phase 2 and Phase 3 station boardings. The daily boardings at the Century City Station for both the Santa Monica and Constellation options are shown in Table 3-2, in the Santa Monica option the Phase 3 boardings are almost 5,500 versus about 7,200 in Phase 2. This increased ridership in Phase 2 can best be explained by looking at the mode of access in Table 3-2. At this station location there are slightly fewer (about 200) walk access boardings in Phase 2 versus Phase 3 however, there is large increase (1,600) in bus access boardings in Phase 2 over Phase 3. The increases in bus access more than off-sets the loss in walk access providing 30 percent more boardings in Phase 2 than Phase 3. An increase in bus access trips is logical and typical at the end of the line, which is the case in Phase 2.

Under the Constellation option the Phase 3 boardings are 8,600 versus 8,000 under Phase 2, although there is a slight increase (about 300) in bus access trips in Phase 2 over Phase 3, there is a greater (almost 900) decrease in walk access trips. The same trend (as at the Santa Monica option) of loss in walk access and gain in bus access occurs at the Constellation location between Phase 2 and Phase 3. But the difference in the Constellation option is the magnitude of change and the magnitude of walk access versus bus access at that location, resulting in a decline of approximately six percent in boardings in Phase 2 versus Phase 3. The location of the station at Constellation provides for a much easier walk to high density designations in the Century City area and a much longer walk to one of the main routes in that area, Route 704 on Santa Monica Boulevard. Which means for trips coming from or going to the west in Phase 2 are at a disadvantage under the Constellation option.

Also, in Table 3-2 is the mode of access and boardings for Wilshire/Rodeo station under Phase 2 and Phase 3 for the station alignments for Century City. The big change in boardings at this station as mentioned previously is the large influx in bus access when Century City is the end of the line. Not only do the boarding increase significantly under both options but the increase is in bus access.

Appendix A USER BENEFITS MAPS FOR BASELINE VS. THE CENTURY CITY/SANTA MONICA OPTION

Figure A-1: User benefits Distribution, Baseline Alternative vs. the Santa Monica Option, Home-Based Work Peak Purpose, for Trip Productions

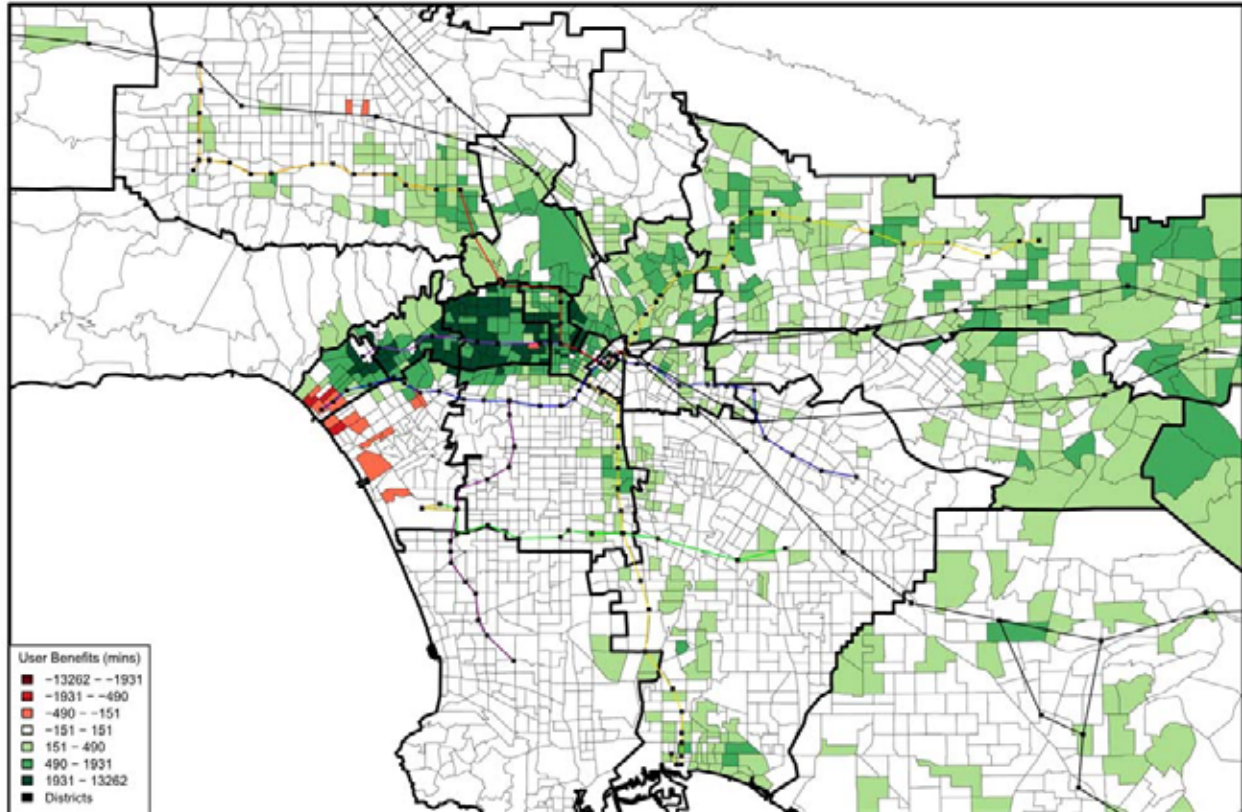


Figure A-2: User benefits Distribution, Baseline Alternative vs. the Santa Monica Option, Home-Based Work Peak Purpose, for Trip Attractions

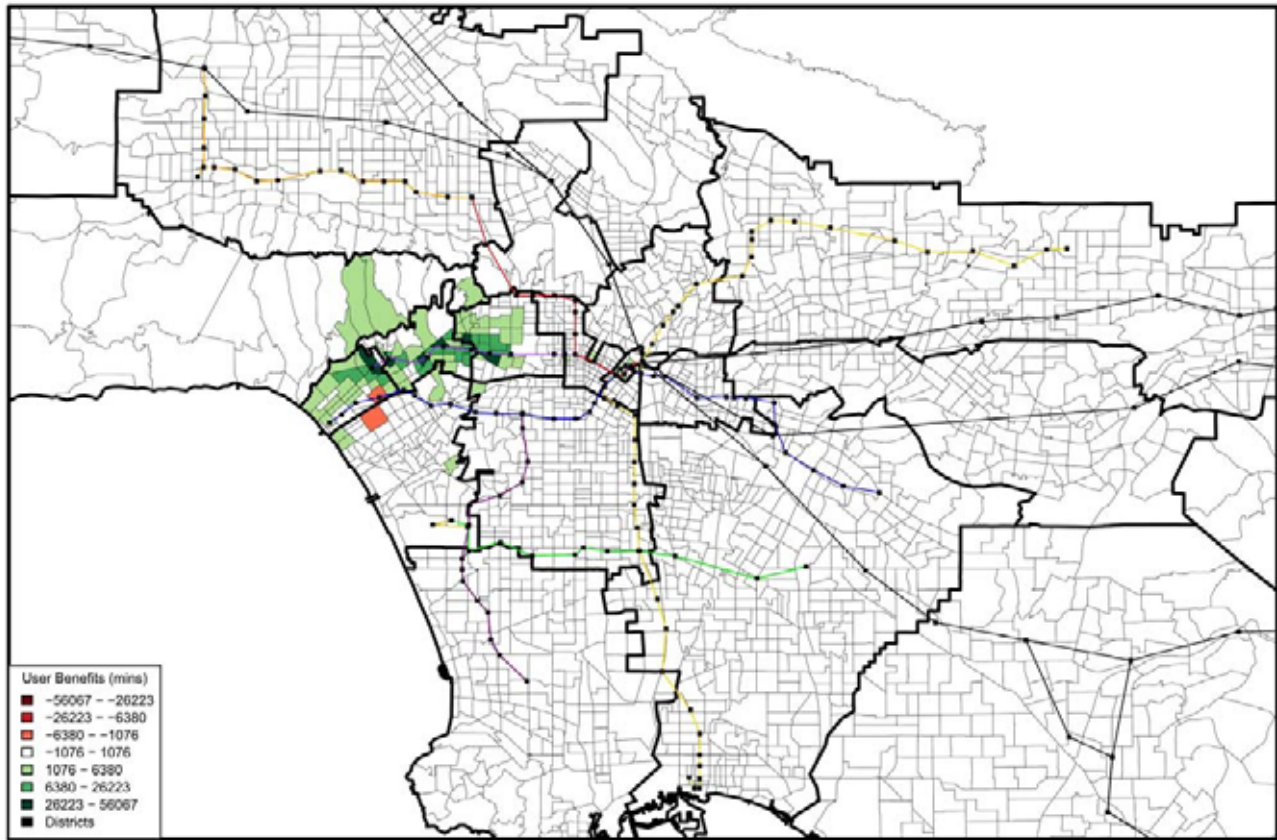


Figure A-3: User benefits Distribution, Baseline Alternative vs. the Santa Monica Option, Daily All Purposes, for Trip Productions

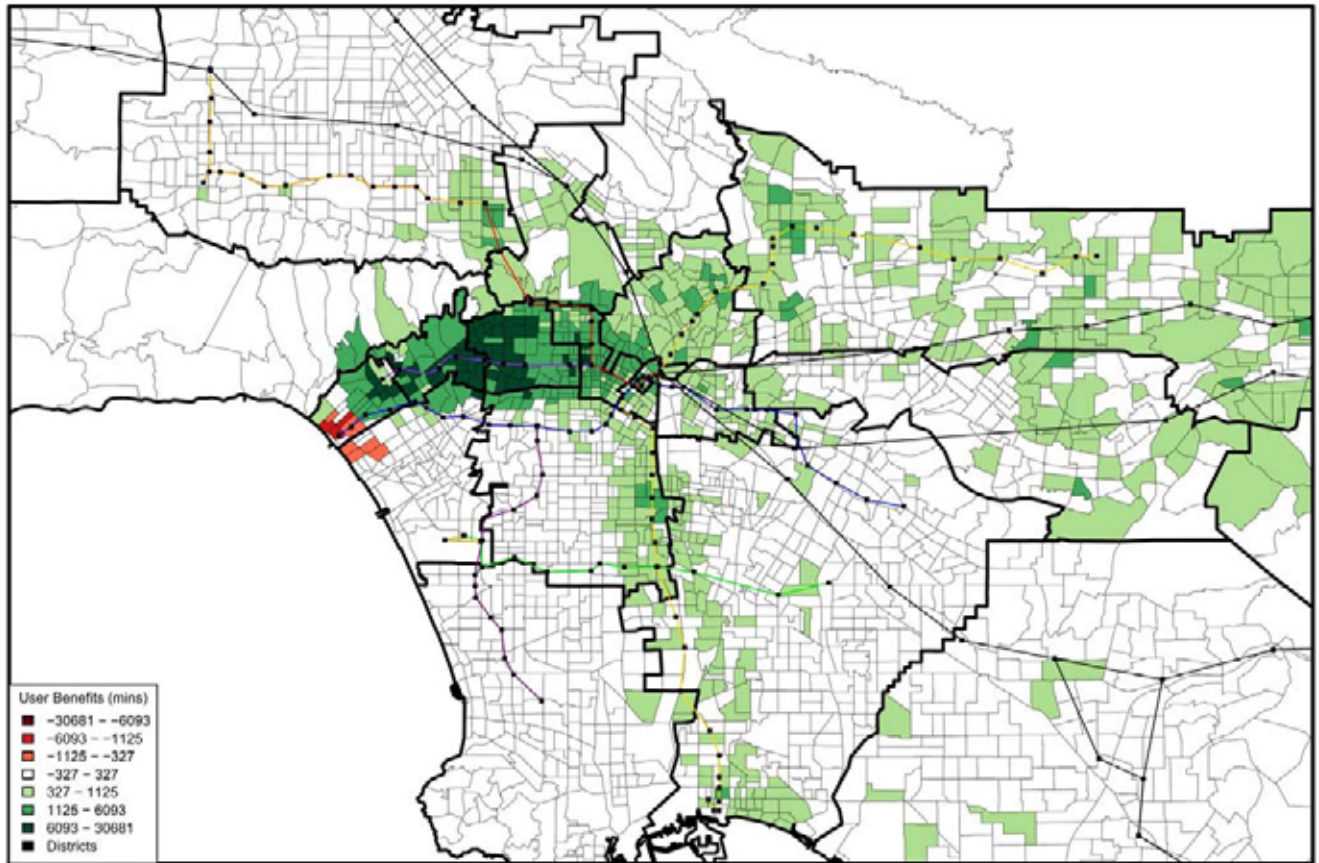


Figure A-4: User benefits Distribution, Baseline Alternative vs. the Santa Monica Option, Daily All Purposes, for Trip Attractions

