

## Low Carbon Transit Operations Program (LCTOP)

### PROJECT DESCRIPTION AND ALLOCATION REQUEST (SUMMARY)

#### **Project Information:**

Lead Agency:	City of Gardena
Project Name:	Line 1X Transit Service
Project Type: <i>See Attachment A</i>	Expand/Enhance Line 1X Transit Service
Description of Project (Short):	This project help continue to fund the increased in bus service frequency while reducing Green House Gases (GHG) in the Disadvantaged Communities (DAC) along freeway I-110 in Los Angeles
Project Location:	Freeway I-110 in Los Angeles County
Project Start Date (anticipated):	March 1, 2016
Project End Date (anticipated):	June 30, 2016

#### **Funding Information:**

Funding Year:	FY 2015 - 16
Requested Amount of PUC 99313:	\$0
Requested Amount of PUC 99314:	\$111,484
Total LCTOP Funding:	\$111,484
Total Project Cost:	\$2,064,278

#### **Project Benefits:**

##### **Greenhouse Gas Benefits (off of worksheet)**

Estimated GHG Reduction:	84.05 (MTCO <sub>2e</sub> )
Project Life:	On-going. Service review every 4 yrs as part of grantee's comprehensive Line-by-Line analysis.
Estimated Total GHG Reduction:	336.2 (84.05 x 4 years)

##### **Disadvantaged Communities (DAC) Benefits:**

Does your service area have a DAC?	Yes. Please refer to DAC map attached.
Does the Project Benefit a DAC?	Yes
Identify the DAC Census Tracts?	Census Tract #: 6037291130 (DAC map attached)
Identify Specific DAC Benefit Criteria? <i>See Attachment B</i>	Projects will achieve GHG reductions by reducing passenger vehicle miles travelled through incentives, infrastructure, or operational improvements (e.g., providing better bus connections to intercity rail, encouraging people to shift from cars to mass transit).
Qualitative Description of DAC Benefit?	The increased in bus service frequency on Line 1X provides additional reliable transit intercity bus/rail services at stations with stops in disadvantaged communities areas.
Describe the DAC Need Project Addresses?	DAC residents along bus and rail stations using Freeway I-110.
Total GGRF \$ Allocated to DAC	\$111,484

##### **Co-benefit**

Critical Air Pollution Reduction:	Approx. 32 Million grams CO <sub>2</sub> reductions (76,978 x 411 grams/mile)
VMT Reduction:	76,978 VMT
Ridership Increase	12,356 (Year One)
Fuel Uses Reduction:	3,564 gallons reduction in fuel consumption
Energy Use Reduction:	n/a

## Low Carbon Transit Operations Program (LCTOP)

### PROJECT DESCRIPTION AND ALLOCATION REQUEST (ALLOCATION)

	<b>Regional Entity:</b>	Los Angeles County MTA
<b>Project Lead:</b> City of Gardena	<b>County:</b>	Los Angeles County
<b>Project Title:</b> Line 1X Transit Service		

**Project Lead:**

I certify the scope, cost, schedule, and benefits as identified in the attached Allocation Request (Request) and attachments are true and accurate and demonstrate a fully funded operable project. I understand the Request is subject to any additional restrictions, limitations or conditions that may be enacted by the State Legislature, including the State's budgetary process and/or auction receipts. In the event the project cannot be completed as originally scoped, scheduled and estimated, or the project is terminated prior to completion, project lead shall, at its own expense, ensure that the project is in a safe and operable condition for the public. I understand this project will be monitored by the California Department of Transportation - Division of Rail and Mass Transportation.

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**Name:** Mitchell G. Lansdell

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**Signature:**

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**Title:** City Manager

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**Agency:** City of Gardena

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**Date:** January 26, 2016 **Amount:** \$111,484

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**Contributing Sponsor(s):**

\*If this project includes funding from more than one project sponsor, the project lead above becomes the "recipient agency" and the additional contributing project sponsor(s) must also sign and state the amount and type of LCTOP funds (PUC Sections 99313 and 99314) contribution. Sign below or **attach a separate officially signed letter providing that information. If there is more than one contributing sponsor, please submit additional page, or a letter from the additional contributors.**

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**Name:** N/A

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**Signature:**

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**Title:**

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**Agency:**

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**Date:** **Amount:**

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## Low Carbon Transit Operations Program (LCTOP)

### PROJECT DESCRIPTION AND ALLOCATION REQUEST (PROJECT)

**Table 3: Type of Project**

See Attachment A for category of project (example: Category 1A Implement new or expanded transit service (for new routes or expansion of existing routes)).

Operations Projects				Capital Projects			
	A1		Ai		B1		Bi
X	A2		Aii		B2		Bii
	A3		Aiii		B3		Bii
	A4		Aiv		B4		
	A5						

**Table 4: Project Summary**

**a) Project Description** - Describe the project in your own words, using comprehensive overall project description regarding improvements to be made, increased level of service and performance goals.

This program will fund expanded low-cost public transportation services to assist disadvantaged communities to get to work in downtown Los Angeles. This can be achieved by expanding bus service frequency on Line 1X which operates on the Los Angeles freeway I-110. With the shared mode, this program will reduce freeway congestions and reduce GHG within the Disadvantaged Communities located around freeway I-110.

**b) Project Location** - Describe the location of the project. Also provide an 8 1/2" X 11" project site map that shows the transit service area and project location. Use link to CalEPA website for information, <http://www.calepa.ca.gov/EnvJustice/GHGInvest/default.htm>.

Bus service provided between Census Tract #6037291130 (96% - 100%) and #6037207400 (91% - 95%). Please refer to DAC map attached.

**c) Project Life** - For capital projects, state the Useful Life of the Project. For operations project state the number of months service will operate.

Capital: n/a

Operations: 3.15 mths. of 12 mths. service

## Low Carbon Transit Operations Program (LCTOP)

### PROJECT DESCRIPTION AND ALLOCATION REQUEST (BENEFITS/OUTCOMES)

**Table 5: Description of Major Benefits/Outcomes**

**a) Greenhouse Gas Reduction** - Describe how this project will reduce greenhouse gases and any assumptions or data that support this description. For example, "The expanded transit service will reduce VMT and greenhouse gas emissions by replacing auto trips with transit trips. Initial estimates indicate that the expansion could add 50 commuter bus riders per day to replace an average auto trip of 10 miles each way." If available, please provide the expected amount of VMT reductions and greenhouse gas reductions.

This project will help fund the increased in bus service frequency, increased in the number of transit trip, and the reduction of Greenhouse Gases in the Disadvantaged Communities along freeway I-110 with a decreased in VMT. FY 2016 LCTOP funding of \$111,484 will provide an additional 787 one-way transit bus trips/year creating a decrease in 12,356 auto trips/year (LCTOP auto calculation listed as as decreased in automobiles on freeway I-110 as 12,356 riders), and a decreased in 76,978 VMT/year (LCTOP table auto calculation listed as displaced 38,966 VMT).

**b) Increased Mode Share** - Describe how this project will directly increase mode share.

This project will help fund the increased in bus service frequency, increased in the number of transit trip, and the reduction of Greenhouse Gases in the Disadvantaged Communities along freeway I-110 with a decreased in 76,978 VMT. An increase riders in mode share of of approximately 12,356 on year one to approximately 13,112 on year four.

**c) Disadvantaged Communities (DAC) Project Criteria**

**See Attachment B** for DAC Criteria to Evaluate Projects (example: Category 1B Project provides transit incentives to residents with a physical address in a disadvantage community (e.g., vouchers, reduced fares, transit passes).

Low Carbon Transportation Projects

	1A		2A
	1B		2B
	1C		2C
	1D		

X	1A
	1B
	1C
	1D
	1E
	1F

Transit Projects

	1G		2E
	1H		2F
	2A		2G
	2B		2H
	2C		2I
	2D		

**d) Disadvantaged Communities (DAC) (if applicable\*)** - Describe how this project will directly benefit the DAC(s) within your service area in your own words. For agencies whose service area includes disadvantaged communities, at least 50 percent of the total moneys received shall be expended on projects that will benefit disadvantaged communities.

100% of the \$111,484 FY 2016 funding will be allocated to increase bus service frequency between census tracks #6037291130 and #6037207400 on the Los Angeles freeway I-110.

## Low Carbon Transit Operations Program (LCTOP)

### PROJECT DESCRIPTION AND ALLOCATION REQUEST (BENEFITS/OUTCOMES)

**Table 5: Description of Major Benefits/Outcomes**

**e) Co-Benefits** - Check all additional Benefits/Outcomes.

<input type="checkbox"/> Improved Safety <input checked="" type="checkbox"/> Improved Public Health <input type="checkbox"/> Reduced Operating/Maintenance Cost <input checked="" type="checkbox"/> Increase System Reliability <input type="checkbox"/> Other Benefits (describe below)	<input type="checkbox"/> Coordination with Educational Institutions <input type="checkbox"/> College/University <input type="checkbox"/> Grades K-12 <input type="checkbox"/> Promotes Active Transportation (walking, biking) <input checked="" type="checkbox"/> Promotes integration with other modes of transportation
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**f) Co-Benefits** - Describe benefits indicated above in d) and any other benefits not listed.

100% of the \$111,484 FY 2016 funding will be allocated to increase bus service frequency between census tracks #6037291130 and #6037207400 on the Los Angeles freeway I-110. Additional service due to increased in service frequency would decreased the load factor and maintain passengers' safety.

**Table 6: Project Schedule**

Capital Projects	
Begin Construction Phase ( <b>Contract Award</b> )	
End Construction Phase ( <b>Contract Acceptance</b> )	
Begin Vehicle/Equipment Order ( <b>Contract Award</b> )	
End Vehicle/Equipment Order ( <b>Contract Acceptance</b> )	
Begin Closeout Phase	
End Closeout Phase	

Operations Projects	
Begin expanded/enhanced transit services	March 1, 2016
End expanded/enhanced transit services	June 30, 2016
Begin Closeout Phase	September 30, 2016
End Closeout Phase	October 30, 2016

**START DATE FOR LCTOP FUNDED PHASES MAY NOT PROCEED PROJECT APPROVAL LETTER.**

*Pre-construction costs (e.g design, environmental and right-a-way) are not eligible to be funded by LCTOP funds, they must be funded by other sources.*

## Low Carbon Transit Operations Program (LCTOP)

### PROJECT DESCRIPTION AND ALLOCATION REQUEST (OPERATIONS DESCRIPTION)

#### Table 7: Operations Project Description

a) Describe the operating plan for this system.

100% of the \$111,484 FY 2016 funding will be allocated on bus services between the DAC census tracks from #6037291130 and #6037207400 on Los Angeles freeway I-110. Total project cost for FY 2016 is anticipated to be \$2,064,278. The purpose of this project is to expand low cost public transportation to assist the disadvantaged communities to get to work in downtown Los Angeles by increasing bus service frequency on Line 1X while reducing GHG on the Los Angeles freeway I-110.

b) Describe the fare structure for this system.

Local Base Fare is \$1.00 - (due to the limited space provide, please refer to the fare information attached)

Transfers \$.40

Seniors age 62 and over\* \$0.35

Disabled Citizens\* \$0.35

Blind Rider\* \$0.35\*

Blind Rider Escort\* Based on Individual Rider\*

Children under age 5

(Maximum of two children under age 5 per adult.)

Students (Valid ID) \$0.70

\*Seniors: Must be at least 62 years of age and show proof of age to board with reduced fare

c) Describe the assumptions and process that were used to develop the ridership projections shown in the request.

Ridership projects derived from several reports submitted to funding agencies and internal Key Performance Indicators (KPI) including the following: 1) FY 2015 National Transit Database (NTD) to the Federal Transit Administration (FTA), 2) FY 2014 Transit Performance Measures (TPM) report to the Los Angeles County Metropolitan Transportation Authority (LACMTA), and 3) FY 2015 Line-by-Line Analysis Report.

d) Describe the assumptions and process for how the operating cost projections were developed.

The operating cost was fomulated using the agency's actual cost per Revenue Service Hour (RSH) reported in FY 2015 National Transit Database (NTD).

City of Gardena

FY 2016 LCTOP Funding Request

Table 7 (b): Describe the Fare Structure for the system

Local Base Fare is \$1.00

Transfers \$.40

Seniors age 62 and over\* \$0.35

Disabled Citizens\* \$0.35

Blind Rider\* \$0.35\*

Blind Rider Escort\* Based on Individual Rider\*

Children under age 5

(Maximum of two children under age 5 per adult.)

Students (Valid ID) \$0.70

\*Seniors: Must be at least 62 years of age and show proof of age to board with reduced fare.

The following identification cards are acceptable: DMV identification card, Medicare card and MTA senior card.

\*Disabled: Passengers must show one of the following identification cards to board with reduced fare:

Medicare card, LACTOA Disabled card, or Access Services Inc. (ASI) card.

The City of Gardena's GTrans has a convenient and affordable transit system that transports citizens all over the City of Gardena. The basic local fare is \$1.00 per person on all lines. Local fare is free for children under the age of 5 years (maximum of two children under five per adult). Seventy (70) cents for students with valid ID, and thirty-five (35) cents for seniors age 62 and over and disabled citizens. Transfers may also be purchased for forty (40) cents.

For more information, contact the City of Gardena's GTrans located at 13999 South Western Avenue, between 8:00 a.m. and 5:00 p.m., Monday through Friday, or call (310) 965-8888.



## Low Carbon Transit Operations Program TOTAL PROJECT COST AND FUNDING PLAN

The following Funding Plan has been reviewed and approved by the undersigned. It includes a complete list of funds for this project and is the total cost of the project, including LCTOP funds.

Person preparing this form (please type or print) <b>Joseph Loh</b>	Phone: <b>(310) 965-8808</b>	Date: <b>January 6, 2016</b>
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Approval Authority: Sign and date	Typed name and phone number: <b>Mitchell G. Lansdell, City Manager (310) 217-9503</b>
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Shaded fields are automatically calculated. Please do not fill these fields.

Proposed Total Project Cost								Project
Component	Prior	FY 2016	FY _____	FY _____	FY _____	FY _____	FY _____	Total
PA&ED	0	0	0	0	0	0	0	0
PS&E	0	0	0	0	0	0	0	0
R/W	0	0	0	0	0	0	0	0
CON	0	0	0	0	0	0	0	0
Veh/Equip Purchase	0	0	0	0	0	0	0	0
Operations/Other	0	2,064,278	0	0	0	0	0	2,064,278
<b>TOTAL</b>	0	2,064,278	0	0	0	0	0	2,064,278

Low Carbon Transit Operations Program (LCTOP)								
Component	Prior	FY 2016	FY _____	FY _____	FY _____	FY _____	FY _____	Total
PA&ED								0
PS&E								0
R/W								0
CON								0
Veh/Equip Purchase								0
Operations/Other		111,484						111,484
<b>TOTAL</b>	0	111,484	0	0	0	0	0	111,484

Funding Source: State STA Fund								
Component	Prior	FY 2016	FY _____	FY _____	FY _____	FY _____	FY _____	Total
PA&ED								0
PS&E								0
R/W								0
CON								0
Veh/Equip Purchase								0
Operations/Other		767,062						767,062
<b>TOTAL</b>	0	767,062	0	0	0	0	0	767,062

Funding Source: Los Angeles County Proposition A 40% Discretionary Fund								
Component	Prior	FY 2016	FY _____	FY _____	FY _____	FY _____	FY _____	Total
PA&ED								0
PS&E								0
R/W								0
CON								0
Veh/Equip Purchase								0
Operations/Other		772,876						772,876
<b>TOTAL</b>	0	772,876	0	0	0	0	0	772,876

Funding Source: Passengers Fares (20%)								
Component	Prior	FY 2016	FY _____	FY _____	FY _____	FY _____	FY _____	Total
PA&ED								0
PS&E								0
R/W								0
CON								0
Veh/Equip Purchase								0
Operations/Other		412,856						412,856
<b>TOTAL</b>	0	412,856	0	0	0	0	0	412,856



## Low Carbon Transit Operations Program TOTAL PROJECT COST AND FUNDING PLAN

Funding Source:								
Component	Prior	FY 2016	FY _____	FY _____	FY _____	FY _____	FY _____	Total
PA&ED								0
PS&E								0
R/W								0
CON								0
Veh/Equip Purchase								0
Operations/Other								0
<b>TOTAL</b>	0	0	0	0	0	0	0	0

Funding Source:								
Component	Prior	FY 2016	FY _____	FY _____	FY _____	FY _____	FY _____	Total
PA&ED								0
PS&E								0
R/W								0
CON								0
Veh/Equip Purchase								0
Operations/Other								0
<b>TOTAL</b>	0	0	0	0	0	0	0	0

Funding Source:								
Component	Prior	FY 2016	FY _____	FY _____	FY _____	FY _____	FY _____	Total
PA&ED								0
PS&E								0
R/W								0
CON								0
Veh/Equip Purchase								0
Operations/Other								0
<b>TOTAL</b>	0	0	0	0	0	0	0	0

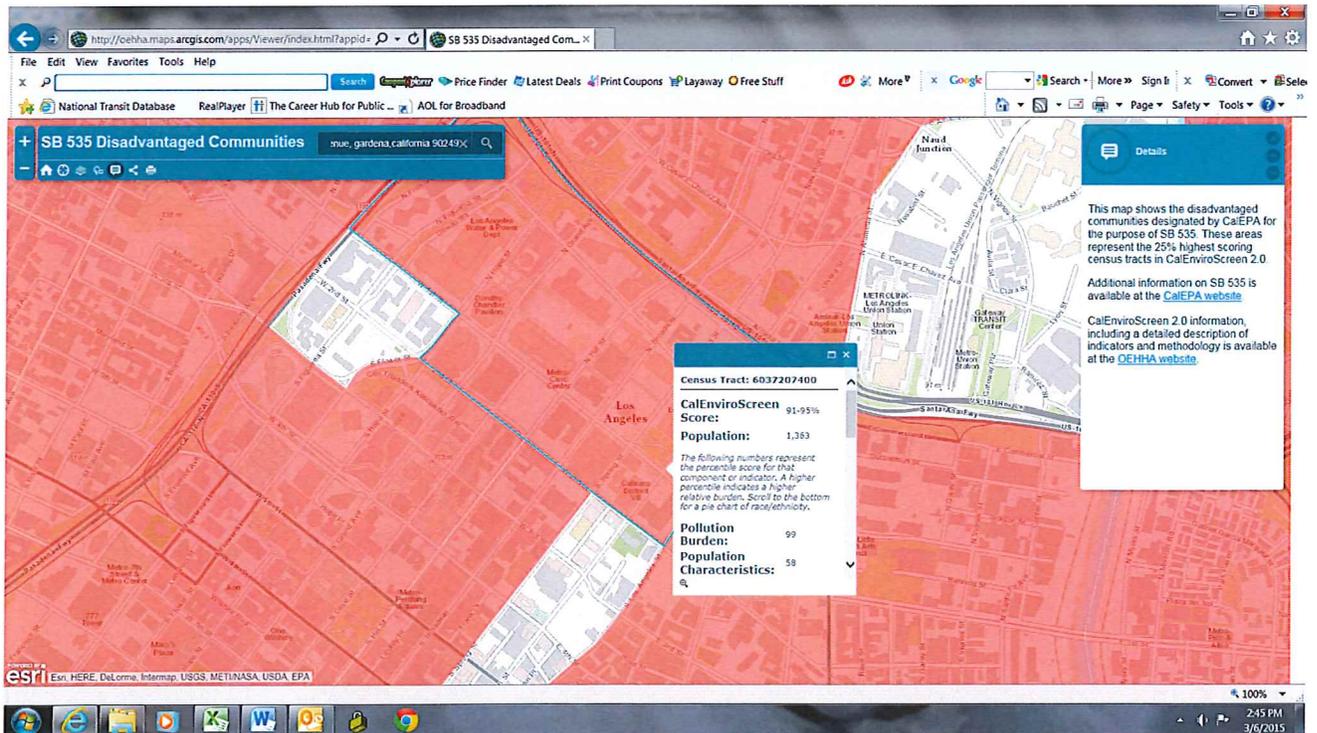
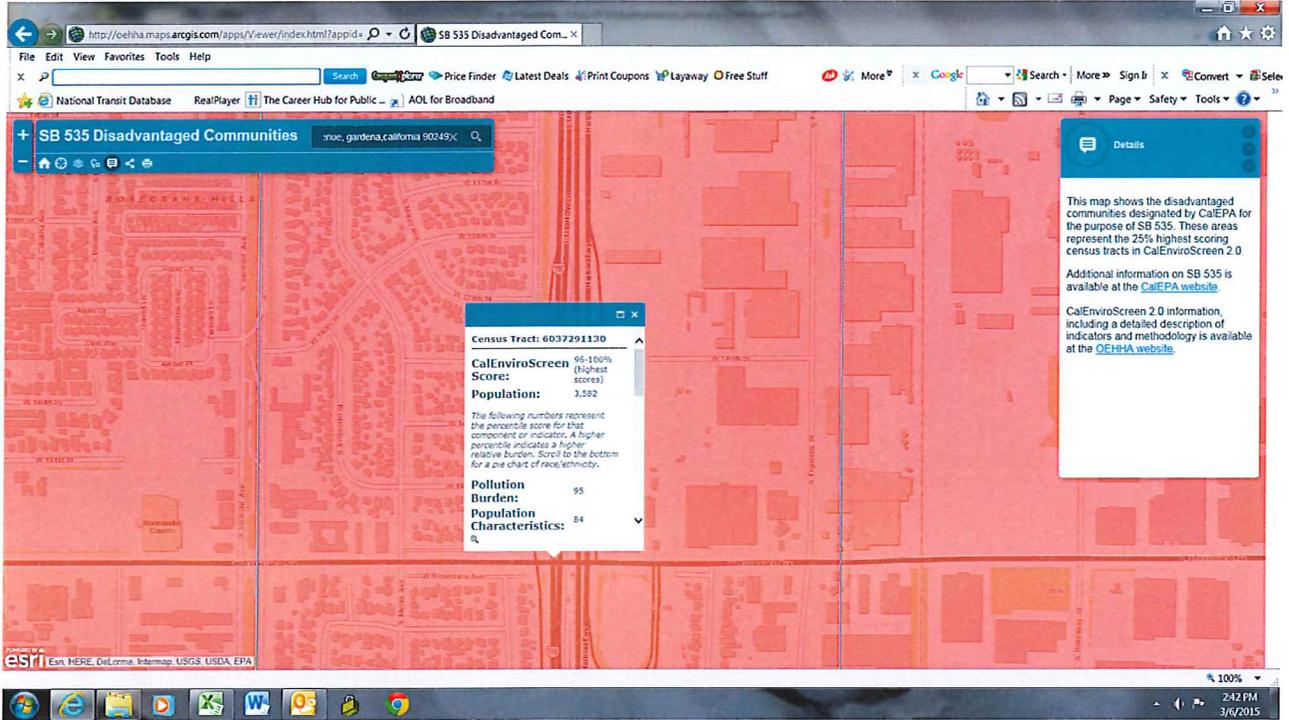
Funding Source:								
Component	Prior	FY 2016	FY _____	FY _____	FY _____	FY _____	FY _____	Total
PA&ED								0
PS&E								0
R/W								0
CON								0
Veh/Equip Purchase								0
Operations/Other								0
<b>TOTAL</b>	0	0	0	0	0	0	0	0

Funding Source:								
Component	Prior	FY 2016	FY _____	FY _____	FY _____	FY _____	FY _____	Total
PA&ED								0
PS&E								0
R/W								0
CON								0
Veh/Equip Purchase								0
Operations/Other								0
<b>TOTAL</b>	0	0	0	0	0	0	0	0

# SB 535 Disadvantage Communities (DAC)

## City of Gardena

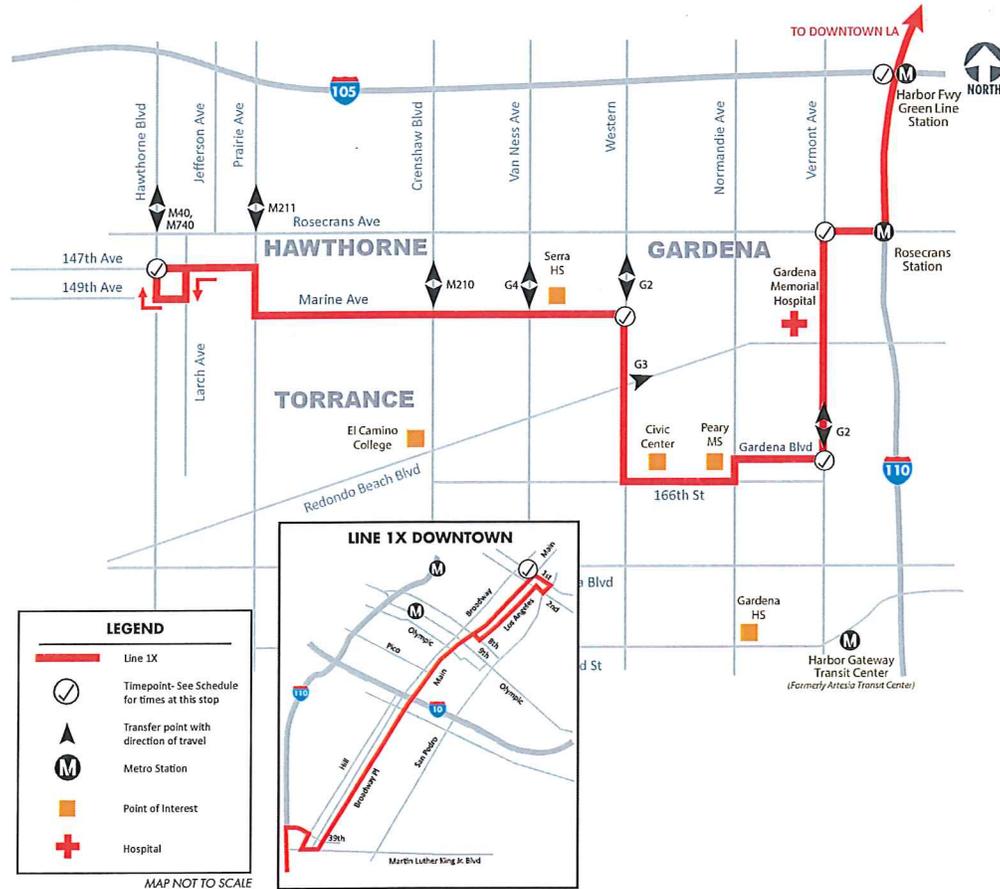
### Project: Bus Operations – Line 1X



# LINE 1X

# GARDENA MUNICIPAL BUS LINES

Light Type = AM Bold Type = PM



**LEGEND**

- Line 1X
- Timepoint- See Schedule for times at this stop
- Transfer point with direction of travel
- Metro Station
- Point of Interest
- Hospital

MAP NOT TO SCALE

## WEEKDAY NORTHBOUND- DOWNTOWN L.A.

147th & Hawthorne	Marine & West-ern	Gardena & Vermont	Vermont & Rosecrans	Harbor Fwy Green Line Station	1st & Main*
5:25	5:35	5:44	5:50	.....	6:25
5:55	6:05	6:14	6:20	.....	6:55
6:25	6:35	6:44	6:55	.....	7:30
6:55	7:05	7:14	7:20	.....	7:55
7:25	7:35	7:44	7:50	.....	8:25
7:55	8:05	8:14	8:20	.....	8:55
8:30	8:40	8:49	8:55	.....	9:30
9:05	9:15	9:24	9:29	9:35	.....
9:40	9:50	9:59	10:04	10:10	.....
10:20	10:30	10:39	10:44	10:50	.....
11:05	11:15	11:24	11:29	11:35	.....
11:50	12:00	12:09	12:14	12:20	.....
12:35	12:45	12:54	12:59	1:05	.....
1:20	1:30	1:39	1:44	1:50	.....
2:05	2:15	2:24	2:29	2:35	.....
2:35	2:45	2:54	3:00	.....	3:35
3:05	3:15	3:24	3:30	.....	4:05
3:35	3:45	3:54	4:00	.....	4:35
4:05	4:15	4:24	4:30	.....	5:05
4:35	4:45	4:54	5:00	.....	5:35
5:05	5:15	5:24	5:30	.....	6:05
5:35	5:45	5:54	6:00	.....	6:35
6:35	6:45	6:54	7:00	.....	7:35
8:10	8:19	8:27	8:32	.....	9:07

\*Northbound **DISCHARGE ONLY** - Broadway Place/Main to 1st and Main

## WEEKDAY SOUTHBOUND- GARDENA

1st & San Pedro	Harbor Fwy Green Line Station	Vermont & Rosecrans	Gardena & Vermont	Western & Marine	147th & Hawthorne
6:30	.....	7:06	7:12	7:22	7:33
7:00	.....	7:36	7:42	7:52	8:03
7:35	.....	8:06	8:12	8:22	8:33
8:00	.....	8:36	8:42	8:52	9:03
8:30	.....	9:06	9:12	9:22	9:33
9:00	.....	9:36	9:42	9:51	10:02
9:45	.....	10:21	10:27	10:36	10:47
.....	11:01	11:06	11:12	11:21	11:32
.....	11:46	11:51	11:57	12:06	12:17
.....	12:31	12:36	12:42	12:51	1:02
.....	1:16	1:21	1:27	1:36	1:47
.....	2:01	2:06	2:12	2:21	2:32
.....	2:46	2:51	2:57	3:09	3:20
.....	3:31	3:36	3:42	3:54	4:05
3:40	.....	4:17	4:23	4:35	4:46
4:10	.....	4:47	4:53	5:05	5:16
4:40	.....	5:23	5:29	5:44	5:57
5:10	.....	5:47	5:53	6:05	6:16
5:40	.....	6:30	6:36	6:48	6:58
6:10	.....	6:47	6:53	7:05	7:16
6:40	.....	7:17	7:23	7:35	7:46
7:40	.....	8:16	8:21	8:30	8:40
9:10	.....	9:46	9:51	10:00	10:10

**DURING MID-DAY ON WEEKDAYS AND ON WEEKENDS LINE 1X WILL TERMINATE AT HARBOR TRANSIT STATION FOR CONNECTIONS TO METRO SERVICE TO DOWNTOWN.**

**DURANTE EL MEDIO DIA LOS DIAS DE SEMANA Y EN LOS FINES DE SEMANA LINEA 1X SE DETIENE EN EL PUERTO DE HARBOR FWY GREEN LINE STATION PARA CONEXIONES CON EL SERVICIO DE METRO HACIA EL CENTRO.**

# LINE 1X

# GARDENA MUNICIPAL BUS LINES

Light Type = AM Bold Type = PM

## WEEKEND NORTHBOUND

	147th & Hawthorne	Marine & Western	Gardena & Vermont	Vermont & Rosecrans	Harbor Fwy Green Line Station
7:40	7:49	7:59	8:05	8:11	
8:25	8:34	8:44	8:50	8:56	
9:10	9:19	9:29	9:35	9:41	
9:55	10:04	10:14	10:20	10:26	
10:40	10:49	10:59	11:05	11:11	
11:25	11:34	11:44	11:50	11:56	
12:10	12:19	12:29	12:35	12:41	
12:55	1:04	1:14	1:20	1:26	
1:40	1:49	1:58	2:04	2:10	
2:25	2:34	2:43	2:49	2:55	
3:10	3:19	3:28	3:34	3:40	
3:55	4:04	4:13	4:19	4:25	
4:40	4:49	4:58	5:04	5:10	
5:25	5:34	5:43	5:49	5:55	

No weekend service to downtown LA. For connections, board at Harbor Green Line (freeway) station.

No hay servicio de fin de semana al centro de Los Angeles. Para las conexiones, a bordo Harbor Fwy Green Line Station (autopista).

## WEEKEND SOUTHBOUND

	Harbor Fwy Green Line Station	Vermont & Rosecrans	Gardena & Vermont	Western & Marine	147th & Hawthorne
8:22	8:28	8:34	8:43	8:52	
9:07	9:13	9:19	9:28	9:37	
9:52	9:58	10:04	10:13	10:22	
10:37	10:43	10:49	10:58	11:07	
11:22	11:28	11:34	11:43	11:52	
12:07	12:13	12:19	12:28	12:37	
12:52	12:58	1:04	1:13	1:22	
1:38	1:44	1:48	1:57	2:07	
2:23	2:29	2:33	2:42	2:52	
3:08	3:14	3:18	3:27	3:37	
3:53	3:59	4:03	4:12	4:22	
4:38	4:44	4:48	4:57	5:07	
5:23	5:29	5:33	5:42	5:52	
6:08	6:14	6:18	6:27	6:37	

No weekend service to downtown LA. For connections, board at Harbor Green Line (freeway) station.

No hay servicio de fin de semana al centro de Los Angeles. Para las conexiones, a bordo Harbor Fwy Green Line Station (autopista).

**DURING MID-DAY ON WEEKDAYS AND ON WEEKENDS LINE 1X WILL TERMINATE AT HARBOR TRANSIT STATION FOR CONNECTIONS TO METRO SERVICE TO DOWNTOWN.**

**DURANTE EL MEDIO DIA LOS DIAS DE SEMANA Y EN LOS FINES DE SEMANA LINEA 1X SE DETIENE EN EL PUERTO DE HARBOR FWY GREEN LINE STATION PARA CONEXIONES CON EL SERVICIO DE METRO HACIA EL CENTRO.**



California Environmental Protection Agency  
**Air Resources Board**

**California Air Resources Board (ARB)  
 Greenhouse Gas Emission Reduction Calculator for the  
 California Department of Transportation (Caltrans)  
 Low Carbon Transit Operations Program (LCTOP)  
 Greenhouse Gas Reduction Fund  
 Fiscal Year 2015-16**

\*\*Updated Emission factors on December 18, 2015.

The California Air Resources Board (ARB) is responsible for providing the quantification methodology to estimate greenhouse gas (GHG) emission reductions from projects receiving monies from the Greenhouse Gas Reduction Fund (GGRF).

This GHG emission reduction calculator accompanies the quantification methodology for the fiscal year (FY) 2015-16 GGRF Low Carbon Transit and Operations Program (LCTOP) available at: <http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/finalctopgm.pdf>

Applicants must use this calculator to estimate the GHG reductions associated with the LCTOP projects. Refer to the quantification methodology document for background, step by step detailed instructions and examples. To use this calculator, follow these steps:

- Step 1** Identify the LCTOP proposed project type(s): The applicant must select at least one eligible project type from Tables 1 or 2 and may select additional project types from Tables 3 or 4.
- Step 2** Determine the inputs needed: The applicant will use Tables 5 and 6 to determine the required project details needed for input into this calculator tool for the applicable project type selected in Step 1.
- Step 3** Estimate GHG emission reductions: The applicant will enter the project details identified in Step 2 into this calculator tool to calculate the GHG emission reductions of the proposed project.

**Read Me Tab (this page):**

Enter the Project Name, Project ID and the contact information for person who can answer project specific questions from staff reviewers on the quantification calculations. The Project ID is assigned by Caltrans. This file will be submitted with other documentation requirements. Please use the following file naming convention: "[Project ID]\_[Project Name]" not to exceed 20 characters. For example, if the application ID is "1-1C\_001", the project name is "Transit BRT", and the file is the input file, the file name may be "1-1C\_001Transit BRT." Project names may be abbreviated.

<b>Project Name:</b>	Line 1X Transit Service
<b>Project ID:</b>	
<b>Contact Name:</b>	Joseph Loh
<b>Contact Phone Number:</b>	(310) 965-8808
<b>Contact Email:</b>	jloh@gardenabus.com
<b>Date Completed:</b>	1/26/2016

**Inputs Tab:**

Headers in red indicate input needed by the project applicant. For each row, applicants must work from left to right and enter all relevant data. Some cells may not be applicable to the project. These cells will turn black and be locked based on inputs. Applicants should use as many rows as necessary to characterize all relevant features of the proposed project. Definitions are provided in the definitions tab, including how to determine Year 1, Year F, and adjustment factors. Inputs must be substantiated in the documentation provided to ARB; see Section C. Documentation of the quantification methodology.

Submit documentation: Save file for submittal. See Section C. Documentation of the quantification methodology for additional documentation requirements.

For more information on ARB's efforts to support implementation of GGRF investments, see: [www.arb.ca.gov/auctionproceeds](http://www.arb.ca.gov/auctionproceeds)  
 Questions on this document should be forwarded to [GGRFProgram@arb.ca.gov](mailto:GGRFProgram@arb.ca.gov)  
 Questions on the LCTOP program should be forwarded to [LCTOPcomments@dot.ca.gov](mailto:LCTOPcomments@dot.ca.gov)



Displaced Autos Details					New/Expanded Vehicle Details		
YrF Annual Ridership	Adjustment (A)	Length (L)	Adjustment (AA)	Length (LL)	Annual Average VMT Displaced	Fuel Type	Engine MY
13,112	0.50	6.32	0.10	2.00	38,966.04	Electric/BEV or PHEV	2010
					-		
					-		
					-		
					-		
					-		
					-		
					-		
					-		





**California Air Resources Board (ARB)  
 Greenhouse Gas Emission Reduction Calculator for the  
 California Department of Transportation (Caltrans)  
 Low Carbon Transit Operations Program (LCTOP)  
 Greenhouse Gas Reduction Fund  
 Fiscal Year 2015-16**

Project Name:	Line 1X Transit Service
Project ID:	0

Inputs in **RED** must be filled out

Results	GHG Emissions (MTCO2e)	Description
Net GHG Benefits	84.05	Total GHG Emission Reductions (MTCO2e)
LCTOP Funds Requested (\$)	111,484.00	Funds requested per State Controller's Office Eligible list for FY 2015-16
Total LCTOP Funds Requested (\$)	111,484.00	Includes all LCTOP allocations the applicant intends to utilize (up to three FY allocations including FY 2015-16) for the proposed project. Use the State Controller's Office Eligible list for FY 2015-16 allocation funding amounts to estimate the subsequent funding allocations.
Total GGRF Funds Requested (\$)	111,484.00	Includes the Total LCTOP fund requested and any other GGRF Program monies
Total GHG Emission Reductions / Total GGRF Funds Requested (\$)	0.0008	The metric to be reported in the application.

Inputs		Description
Project Details	<b>Eligible Project Type</b>	Eligible projects fall into two Eligible Project types: "New/Expanded Service" and "Expanded Transit Facilities or Service Enhancements". See quantification methodology to select an eligible project and determine which project type to select.
	<b>Transit Type</b>	Select the transit type (e.g. bus (local bus), train, multi-modal facility) that the project will service. Select Train for expanded train station or Bus (local bus) for new bus stops.
	<b>County</b>	Select the county where the majority of the service occurs
	<b>Year 1 (Yr1)</b>	Select the first year of service, or year that facility construction will be completed.
	<b>Year F (YrF)</b>	Select the final year that the service is funded or of the facility useful life.
Displaced Auto Details	<b>Yr1 Annual Ridership</b>	The estimated annual ridership in Yr1
	<b>YrF Annual Ridership</b>	The estimated annual ridership in YrF
	<b>Adjustment (A)*</b>	Adjustment factor to account for transit dependency Use: documented project specific data or system average developed from a recent, statistically valid survey or default Default: 0.5 for local bus service or 0.83 for long distance commuter service
	<b>Length (L)*</b>	Length (miles) of average auto trip reduced Use: value based on specific project or system average reported to the National Transit Database (consult Caltrans for assistance) Adjustment factor to account for auto trips used to access transit service
	<b>Adjustment (AA)*</b>	Use: value based on project specific data or system average developed from a recent, statistically valid survey or default Default: 0.1 for local bus service or 0.8 for long distance commuter service
New/Expanded Vehicle Details	<b>Length (LL)*</b>	Length (miles) of average trip for auto access to transit Use: value based on specific project data or default Default: 2 miles for local bus or 5 miles for long distance commuter service
	<b>Annual Average VMT Displaced</b>	The estimated annual average auto VMT displaced by the project
	<b>Fuel Type</b>	Select the fuel type of the vehicle proposed for service (e.g. Electric/BEV or PHEV)
	<b>Engine MY Annual VMT or Units of Fuel</b>	Select the engine model year of the new/expanded vehicle proposed for service Enter the annual vehicle miles traveled or units of fuel (e.g. gallons of diesel) of the proposed service. Units of fuel needed is only applicable for ferry service.
	<b>Useful life</b>	Input 10 years for advance technologies (i.e., electric, hydrogen fuel cell buses); for others, use Federal Transit Administration guidance available here <a href="http://www.fta.dot.gov/documents/C-5010-1D-Finalpub.pdf">www.fta.dot.gov/documents/C-5010-1D-Finalpub.pdf</a> . Documentation of useful life is required to be included with the application.
Old Service Vehicle or Displaced Fuel Details	<b>Additional Project</b>	Additional projects fall into two Additional Project types: "Vehicle Improvements" and "Fuel Savings". See quantification methodology to select an eligible project and determine which project type to select.
	<b>Fuel Type</b>	Select the fuel type of the old vehicle proposed for improvement, or of the "Fuel Savings" project (e.g. Diesel)
	<b>Engine MY</b>	Select the engine model year of the old vehicle proposed for improvement
	<b>Annual VMT or Units of Fuel</b>	Enter the annual VMT of the old service vehicle being replaced by a new vehicle (e.g., 1,000 miles) or for ferry service enter units of fuel (gallons of diesel) of the proposed service. For Fuel Savings projects enter the units of fuel displaced (e.g., 12,000 gallons of diesel).
	<b>Total GHG Emission Reductions (MTCO2e) FY 2015-16 LCTOP</b>	The estimated net GHG benefits from the proposed project.
Funds Requested	<b>Funds Requested (\$)</b>	Funds requested per State Controller's Office Eligible list for FY 2015-16
	<b>Total LCTOP Funds Requested (\$)</b>	Includes all LCTOP allocations the applicant intends to utilize (up to three FY allocations including FY 2015-16) for the proposed project. Use the State Controller's Office Eligible list for FY 2015-16 allocation funding amount to estimate the subsequent funding allocations.
	<b>Total GGRF Funds Requested (\$)</b>	Includes the Total LCTOP fund requested and any other GGRF Program monies

## Low Carbon Transit Operations Program (LCTOP) CERTIFICATIONS AND ASSURANCES

**Project Sponsor:** City of Gardena

**Agency Name:** City of Gardena's, GTrans

**Effective Date of this Document:** February 23, 2016

The California Department of Transportation (Department) has adopted the following certifications and assurances for the Low Carbon Transit Operations Program. As a condition of the receipt of LCTOP funds, project lead must comply with these terms and conditions.

### A. General

- (1) The project lead agrees to abide by the current LCTOP Guidelines and applicable legal requirements.
- (2) The project lead must submit to the Department a signed Authorized Agent form designating the representative who can submit documents on behalf of the project sponsor and a copy of the board resolution appointing the Authorized Agent.

### B. Project Administration

- (1) The project lead certifies that required environmental documentation is complete before requesting an allocation of LCTOP funds. The project lead assures that projects approved for LCTOP funding comply with Public Resources Code § 21100 and § 21150.
- (2) The project lead certifies that a dedicated bank account for LCTOP funds only will be established within 30 days of receipt of LCTOP funds.
- (3) The project lead certifies that when LCTOP funds are used for a transit capital project, that the project will be completed and remain in operation for its useful life.
- (4) The project lead certifies that it has the legal, financial, and technical capacity to carry out the project, including the safety and security aspects of that project.
- (5) The project lead certifies that they will notify the Department of pending litigation, dispute, or negative audit findings related to the project, before receiving an allocation of funds.
- (6) The project lead must maintain satisfactory continuing control over the use of project equipment and facilities and will adequately maintain project equipment and facilities for the useful life of the project.
- (7) Any interest the project lead earns on LCTOP funds must be used only on approved LCTOP projects.
- (8) The project lead must notify the Department of any changes to the approved project with a Corrective Action Plan (CAP).
- (9) Under extraordinary circumstances, a project lead may terminate a project prior to completion. In the event the project lead terminates a project prior to completion, the project lead must (1) contact the Department in writing and follow-up with a phone call verifying receipt of such notice; (2) pursuant to

verification, submit a final report indicating the reason for the termination and demonstrating the expended funds were used on the intended purpose; (3) submit a request to reassign the funds to a new project within 180 days of termination.

- (10) Funds must be encumbered and liquidated within the time allowed.

### C. Reporting

- (1) The project lead must submit the following LCTOP reports:
  - a. Semi-Annual Progress Reports by May 15<sup>th</sup> and November 15<sup>th</sup> each year.
  - b. A Final Report within six months of project completion.
  - c. The annual audit required under the Transportation Development Act (TDA), to verify receipt and appropriate expenditure of LCTOP funds. A copy of the audit report must be submitted to the Department within six months of the close of the year (December 31) each year in which LCTOP funds have been received or expended.
- (2) Other Reporting Requirements: ARB is developing funding guidelines that will include reporting requirements for all State agencies that receive appropriations from the Greenhouse Gas Reduction Fund. Caltrans and project sponsors will need to submit reporting information in accordance with ARB's funding guidelines, including reporting on greenhouse gas reductions and benefits to disadvantaged communities.

### D. Cost Principles

- (1) The project lead agrees to comply with Title 2 of the Code of Federal Regulations 225 (2 CFR 225), Cost Principles for State and Local Government, and 49 CFR, Part 18, Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments.
- (2) The project lead agrees, and will assure that its contractors and subcontractors will be obligated to agree, that:
  - a. Contract Cost Principles and Procedures, 48 CFR, Federal Acquisition Regulations System, Chapter 1, Part 31, et seq., shall be used to determine the allow ability of individual project cost items and
  - b. Those parties shall comply with Federal administrative procedures in accordance with 49 CFR, Part 18, Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments. Every sub-recipient receiving LCTOP funds as a contractor or sub-contractor shall comply with Federal administrative procedures in accordance with 49 CFR, Part 18, Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments.
- (3) Any project cost for which the project lead has received funds that are determined by subsequent audit to be unallowable under 2 CFR 225, 48 CFR, Chapter 1, Part 31 or 49 CFR, Part 18, are subject to repayment by the project lead to the State of California (State). All projects must reduce greenhouse gas emissions, as required under Public Resources Code section 75230, and any project that fails to reduce greenhouse gases shall also have its project costs submit to repayment by the project lead to the State. Should the project lead fail to reimburse moneys due to the State within thirty (30) days of demand, or within such other period as may be agreed in writing between the Parties hereto, the State is authorized to intercept and withhold future payments due the project lead from the State or any third-party source, including but not limited to, the State Treasurer and the State Controller.

### E. Record Retention

- (1) The project lead agrees, and will assure that its contractors and subcontractors shall establish and maintain an accounting system and records that properly accumulate and segregate incurred project costs and matching funds by line item for the project. The accounting system of the project lead, its contractors and all subcontractors shall conform to Generally Accepted Accounting Principles (GAAP), and enable the determination of incurred costs at interim points of completion. All accounting records and other supporting papers of the project lead, its contractors and subcontractors connected with LCTOP funding shall be maintained for a minimum of three (3) years after the “Project Closeout” report or final Phase 2 report is submitted (per ARB Funding Guidelines, Vol. 3, page 3.A-16), and shall be held open to inspection, copying, and audit by representatives of the State and the California State Auditor. Copies thereof will be furnished by the project lead, its contractors, and subcontractors upon receipt of any request made by the State or its agents. In conducting an audit of the costs claimed, the State will rely to the maximum extent possible on any prior audit of the project lead pursuant to the provisions of federal and State law. In the absence of such an audit, any acceptable audit work performed by the project lead’s external and internal auditors may be relied upon and used by the State when planning and conducting additional audits.
- (2) For the purpose of determining compliance with Title 21, California Code of Regulations, Section 2500 et seq., when applicable, and other matters connected with the performance of the project lead’s contracts with third parties pursuant to Government Code § 8546.7, the project sponsor, its contractors and subcontractors and the State shall each maintain and make available for inspection all books, documents, papers, accounting records, and other evidence pertaining to the performance of such contracts, including, but not limited to, the costs of administering those various contracts. All of the above referenced parties shall make such materials available at their respective offices at all reasonable times during the entire project period and for three (3) years from the date of final payment. The State, the California State Auditor, or any duly authorized representative of the State, shall each have access to any books, records, and documents that are pertinent to a project for audits, examinations, excerpts, and transactions, and the project lead shall furnish copies thereof if requested.
- (3) The project lead, its contractors and subcontractors will permit access to all records of employment, employment advertisements, employment application forms, and other pertinent data and records by the State Fair Employment Practices and Housing Commission, or any other agency of the State of California designated by the State, for the purpose of any investigation to ascertain compliance with this document.

### F. Special Situations

The Department may perform an audit and/or request detailed project information of the project sponsor’s LCTOP funded projects at the Department’s discretion at any time prior to the completion of the LCTOP.

I certify all of these conditions will be met.

BY:

---

AUTHORIZING OFFICER, Title - **Mitchell G. Lansdell, City Manager**  
Unit/Department/Agency - **City of Gardena’s, GTrans**



**Low Carbon Transit Operations Program (LCTOP)  
AUTHORIZED AGENT**

AS THE Mayor  
(Chief Executive Officer / Director / President / Secretary)

OF THE City of Gardena  
(Name of County/City Organization)

I hereby authorize the following individual(s) to execute for and on behalf of the named Regional Entity/Transit Operator, any actions necessary for the purpose of obtaining Low Carbon Transit Operations Program (LCTOP) funds provided by the California Department of Transportation, Division of Rail and Mass Transportation. I understand that if there is a change in the authorized agent, the project sponsor must submit a new form. This form is required even when the authorized agent is the executive authority himself. I understand the Board must provide a resolution approving the Authorized Agent. The Board Resolution appointing the Authorized Agent is attached.

Mitchell G. Lansdell, City Manager OR  
(Name and Title of Authorized Agent)

\_\_\_\_\_  
(Name and Title of Authorized Agent) OR

\_\_\_\_\_  
(Name and Title of Authorized Agent)

Paul K. Tanaka Mayor  
(Print Name) (Title)

\_\_\_\_\_  
(Signature)

Approved this 23<sup>rd</sup> day of February, 2016.

Attachment: Board Resolution approving Authorized Agent

ATTACHMENT I

RESOLUTION # 6206

**AUTHORIZATION FOR THE EXECUTION OF  
THE CERTIFICATIONS AND ASSURANCES  
FOR THE LOW CARBON TRANSIT OPERATIONS PROGRAM (LCTOP)**

**WHEREAS**, the City of Gardena is an eligible project sponsor and may receive state funding from the Low Carbon Transit Operations Program (LCTOP) now or sometime in the future for transit projects; and

**WHEREAS**, the statutes related to state-funded transit projects require a local or regional implementing agency to abide by various regulations; and

**WHEREAS**, Senate Bill 862 (2014) named the Department of Transportation (Department) as the administrative agency for the LCTOP; and

**WHEREAS**, the Department has developed guidelines for the purpose of administering and distributing LCTOP funds to eligible project sponsors (local agencies); and

**WHEREAS**, the City of Gardena wishes to delegate authorization to execute these documents and any amendments thereto to the City Manager .

**NOW, THEREFORE, BE IT RESOLVED** by the City Council of the City of Gardena that the fund recipient agrees to comply with all conditions and requirements set forth in the Certification and Assurances document and applicable statutes, regulations and guidelines for all LCTOP funded transit projects.

**NOW THEREFORE, BE IT FURTHER RESOLVED** that the City Manager be authorized to execute all required documents of the LCTOP program and any Amendments thereto with the California Department of Transportation.

Passed, approved and adopted this 23<sup>rd</sup> day of February, 2016.

\_\_\_\_\_  
Paul K. Tanaka, Mayor

ATTEST:

\_\_\_\_\_  
Mina Semenza, City Clerk

APPROVED AS TO FORM:

\_\_\_\_\_  
Peter L. Wallin, City Attorney

**RESOLUTION # 6207**

**AUTHORIZATION FOR THE EXECUTION OF THE  
THE LOW CARBON TRANSIT OPERATIONS PROGRAM (LCTOP) PROJECT:  
CITY OF GARDENA'S, GTRANS – LINE 1X TRANSIT SERVICE; \$111,484 (FY 2016)**

**WHEREAS**, the City of Gardena is an eligible project sponsor and may receive state funding from the Low Carbon Transit Operations Program (LCTOP) now or sometime in the future for transit projects; and

**WHEREAS**, the statutes related to state-funded transit projects require a local or regional implementing agency to abide by various regulations; and

**WHEREAS**, Senate Bill 862 (2014) named the Department of Transportation (Department) as the administrative agency for the LCTOP; and

**WHEREAS**, the Department has developed guidelines for the purpose of administering and distributing LCTOP funds to eligible project sponsors (local agencies); and

**WHEREAS**, the City of Gardena wishes to implement the LCTOP project(s) listed above,

**NOW, THEREFORE, BE IT RESOLVED** by the Board of Directors of the City of Gardena that the fund recipient agrees to comply with all conditions and requirements set forth in the applicable statutes, regulations and guidelines for all LCTOP funded transit projects.

**NOW, THEREFORE, BE IT RESOLVED** by the Board of Directors of the City of Gardena that it hereby authorizes the submittal of the following project nomination(s) and allocation request(s) to the Department in FY 2015-16 LCTOP funds:

*List project(s), including the following information:*

*Project Name: Line 1X Transit Service*

*Amount of LCTOP funds requested: \$111,484 (FY 2016)*

*Short description of project:*

*This project help continue to fund the increased in bus service frequency while reduce Green House Gases (GHG) in the Disadvantaged Communities along freeway I-110*

*Contributing Sponsors (if applicable): N/A*

ATTEST:

\_\_\_\_\_  
Mina Semenza, City Clerk

\_\_\_\_\_  
Paul K. Tanaka, Mayor

APPROVED AS TO FORM:

\_\_\_\_\_  
Peter L. Wallin, City Attorney

## Greenhouse Gas Emissions from a Typical Passenger Vehicle

The U.S. Environmental Protection Agency (EPA) developed this fact sheet to answer common questions about greenhouse gas emissions from passenger vehicles. This fact sheet provides emission rates and calculations consistent with EPA's regulatory work.

How much tailpipe carbon dioxide (CO<sub>2</sub>) is created from burning one gallon of fuel?

The amount of CO<sub>2</sub> created from burning one gallon of fuel depends on the amount of carbon in the fuel. Typically, more than 99% of the carbon in a fuel is emitted as CO<sub>2</sub> when the fuel is burned. Very small amounts are emitted as hydrocarbons and carbon monoxide, which are converted to CO<sub>2</sub> relatively quickly in the atmosphere. Carbon content varies by fuel, and some variation within each type of fuel is normal. The EPA and other agencies use the following average carbon content values to estimate CO<sub>2</sub> emissions:

CO <sub>2</sub> Emissions from a gallon of gasoline:	8,887	grams CO <sub>2</sub> / gallon <sup>1</sup>
CO <sub>2</sub> Emissions from a gallon of diesel:	10,180	grams CO <sub>2</sub> / gallon <sup>2</sup>

Diesel creates about 15% more CO<sub>2</sub> per gallon. However, many vehicles that use diesel fuel achieve higher fuel economy than similar vehicles that use gasoline, which generally offsets the higher carbon content of diesel fuel.

<sup>1</sup> This gasoline factor is from a recent regulation establishing GHG standards for model year 2012-2016 vehicles (75 FR 25324, May 7, 2010).

<sup>2</sup> This diesel factor is from the calculations that vehicle manufacturers use to measure fuel economy (40 C.F.R. 600.113).

**How much tailpipe carbon dioxide (CO<sub>2</sub>) is emitted from driving one mile?**

The average passenger vehicle emits about 411 grams of CO<sub>2</sub> per mile. This number can vary based on two factors: the fuel economy of the vehicle and the amount of carbon in the vehicle's fuel. Most vehicles on the road in the U.S. today are gasoline vehicles, and they average about 21.6 miles per gallon.<sup>3</sup> Every gallon of gasoline creates about 8,887 grams of CO<sub>2</sub> when burned. Therefore, the average vehicle when driving one mile has tailpipe CO<sub>2</sub> emissions of about:

$$\text{CO}_2 \text{ emissions per mile} = \frac{\text{CO}_2 \text{ per gallon}}{\text{MPG}} = \frac{8,887}{21.6} = 411 \text{ grams}$$

This value will decrease slightly each year as standards become more stringent.

**What are the average annual carbon dioxide (CO<sub>2</sub>) emissions of a typical passenger vehicle?**

A typical passenger vehicle emits about 4.7 metric tons of carbon dioxide per year. This number can vary based on a vehicle's fuel, fuel economy, and the number of miles driven per year. The average gasoline vehicle on the road today has a fuel economy of about 21.6 miles per gallon and drives around 11,400 miles per year<sup>4</sup>. Every gallon of gasoline burned creates about 8,887 grams of CO<sub>2</sub>, and there are one million grams per metric ton. Therefore, the average vehicle over a year of driving has tailpipe CO<sub>2</sub> emissions of about<sup>5</sup>:

$$\text{Annual CO}_2 \text{ emissions} = \frac{\text{CO}_2 \text{ per gallon}}{\text{MPG}} \times \text{miles} = \frac{8,887}{21.6} \times 11,400 = 4.7 \text{ metric tons}$$

EPA uses this to compare CO<sub>2</sub> emissions from other sources to emissions from passenger vehicles. For example, an energy efficiency program that reduces greenhouse gas emissions by 4,700 metric tons of CO<sub>2</sub> per year has the same impact as removing 1,000 vehicles from the road.

**Are there other sources of greenhouse gas (GHG) emissions from a vehicle?**

In addition to carbon dioxide (CO<sub>2</sub>), automobiles produce methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) from the tailpipe and hydrofluorocarbon (HFC) emissions from leaking air conditioners.

<sup>3</sup> Federal Highway Administration Highway Statistics 2012. This is representative of the light duty passenger vehicle fleet as a whole, including both new and existing vehicles. EPA expects the average passenger vehicle fuel economy to increase over time as a result of new greenhouse gas and fuel economy standards developed in coordination between EPA, DOT and California.

<sup>4</sup> Federal Highway Administration Highway Statistics 2012.

<sup>5</sup> This calculation provides a simple way to determine the average annual CO<sub>2</sub> emissions from a passenger vehicle. Anyone that needs a more detailed approach should use the EPA's Motor Vehicle Emission Simulator (MOVES) model. This model contains detailed data about the light duty fleet and driving patterns in the United States. Although simplified, the calculated annual CO<sub>2</sub> emissions above are consistent with analyses performed by the EPA using MOVES.

The emissions of these gases are small in comparison to CO<sub>2</sub>; however, the impact of these emissions can be important because they have a higher global warming potential (GWP) than CO<sub>2</sub>.

The global warming potential of a gas relates the impact of that gas relative to an equivalent amount of CO<sub>2</sub>. Using global warming potentials, the impact of various GHGs can be directly compared using a common metric. This metric is expressed in units of carbon dioxide equivalent, written as CO<sub>2</sub>e. Multiplying the amount of a GHG times the global warming potential of that GHG results in the amount of GHG in terms of CO<sub>2</sub>e. For automotive-related gases, these global warming potentials are:

Greenhouse Gas	Abbreviation	GWP <sup>6</sup>
Carbon Dioxide	CO <sub>2</sub>	1
Methane	CH <sub>4</sub>	25
Nitrous Oxide	N <sub>2</sub> O	298
Air Conditioning Refrigerant	HFC-134a	1,430

It is more difficult to estimate vehicle emissions of CH<sub>4</sub>, N<sub>2</sub>O, and HFCs than CO<sub>2</sub>. Emissions of CH<sub>4</sub> and N<sub>2</sub>O are dependent on the design of the engine and emission control system, rather than fuel consumption per mile. The amount of HFC leakage from air conditioners is dependent on system design, amount of use, and maintenance. On average, CO<sub>2</sub> emissions are 95-99% of the total greenhouse gas emissions from a passenger vehicle, after accounting for the global warming potential of all GHGs. The remaining 1-5% is CH<sub>4</sub>, N<sub>2</sub>O, and HFC emissions.

What are the tailpipe emissions from a plug-in hybrid electric vehicle (PHEV) or an electric vehicle (EV)? What about hydrogen fuel cell vehicles?

A vehicle that operates exclusively on electricity (an EV) will not emit any tailpipe emissions. A fuel cell vehicle operating on hydrogen will emit only water vapor.

Calculating tailpipe emissions for PHEVs is more complicated. PHEVs can operate on electricity only, gasoline only, or some combination of electricity and gasoline. A PHEV operating on electricity only (like an EV) does not generate any tailpipe emissions. When a PHEV is operating on gasoline only, it creates tailpipe emissions based on the PHEV's gasoline fuel economy. Tailpipe emissions for a PHEV operating on both electricity and gasoline cannot be calculated without detailed information about how the PHEV operates. The overall tailpipe emissions for a PHEV can vary significantly based on the PHEV's battery capacity, how it is driven, and how often it is charged.

For more information, see the "My Plug-In Hybrid" calculator.

<sup>6</sup> These 100-year time horizon GWP values are from the 2007 Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report.

**Are there any greenhouse gas emissions associated with the use of my vehicle other than what comes out of the tailpipe?**

Driving most vehicles creates tailpipe greenhouse gas emissions. Producing and distributing the fuel used to power your vehicle also creates greenhouse gasses. Gasoline, for example, requires extracting oil from the ground, transporting it to a refinery, refining the oil into gasoline, and transporting the gasoline to service stations. Each of these steps can produce additional greenhouse gas emissions.

Electric vehicles (EVs) have no tailpipe emissions; however, emissions are created during both the production and distribution of the electricity used to fuel the vehicle. Visit the [Beyond Tailpipe Emissions](#) calculator to estimate GHG emissions for an EV in your region of the country.

**I thought my gasoline was blended with ethanol. Does that change my tailpipe CO<sub>2</sub> emissions?**

Most of the gasoline sold in the U.S. is a mixture of gasoline and up to 10% ethanol (often referred to as E10). The exact formulation of the gasoline in your vehicle will vary depending on season, region in the U.S., and other factors. While your fuel economy when using an ethanol blend in your vehicle will be slightly lower than when using gasoline without ethanol, the CO<sub>2</sub> tailpipe emissions per mile will be similar. This is because ethanol has less carbon per gallon than gasoline.

**How does the EPA measure CO<sub>2</sub> emissions from vehicles?**

The EPA and automobile manufacturers measure vehicle fuel economy and CO<sub>2</sub> emissions using a set of standardized laboratory tests. These tests were designed by the EPA to mimic typical driving patterns. The EPA and the Department of Transportation use these values to ensure that manufacturers meet federal greenhouse gas and corporate average fuel economy (CAFE) standards.

For every new vehicle, the test results are used to determine real world fuel economy and CO<sub>2</sub> emissions. These adjusted results are used on the Fuel Economy and Environment Labels and on [Fueleconomy.gov](#).

For more information, see [Frequent Questions on Fuel Economy Testing and Labeling and How Vehicles Are Tested](#).

How can I find and compare CO<sub>2</sub> emission rates for specific vehicle models?

Visit [Fueleconomy.gov](http://Fueleconomy.gov) and click on "Find a Car."

When shopping at a dealership, check out tailpipe CO<sub>2</sub> emission rates on vehicle *Fuel Economy and Environment Labels*. The labels also feature a 1-to 10 Fuel Economy and Greenhouse Gas Rating to enable easy comparison shopping.

Where can I find information on the emissions of the transportation sector as a whole?

You can find documents on greenhouse gas emissions on the EPA's Transportation and Climate website. This website is maintained by the Office of Transportation and Air Quality (OTAQ).

The EPA also publishes industry-wide data in the report, "Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends." This report analyzes trends in fuel economy and CO<sub>2</sub> emissions for new light duty vehicles from 1975 to the present.

Other useful sources include:

- [Fueleconomy.gov](http://Fueleconomy.gov)
- Green Vehicle Guide
- U.S. Greenhouse Gas Inventory Report
- Greenhouse Gas Equivalencies Calculator
- Household Carbon Footprint Calculator

For additional information on calculating emissions of greenhouse gases, please contact [OTAQ@epa.gov](mailto:OTAQ@epa.gov), or you can contact the OTAQ library for document information at:

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