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Abbreviations/Acronyms

AA	Alternatives Analysis
BRT	Bus Rapid Transit
CEQA	California Environmental Quality Act
DEIR	Draft Environmental Impact Report
DEIS	Draft Environmental Impact Statement
FTA	Federal Transit Administration
LADOT	Los Angeles Department of Transportation
LRT	Light Rail Transit
L RTP	Long Range Transportation Plan
Metro	Los Angeles County Metropolitan Transportation Authority
MPH	Miles per Hour
NEPA	National Environmental Policy Act
NTD	National Transit Database
O&M	Operating and Maintenance
TSM	Transportation System Management
VAMS	Vehicles Available at Maximum Service
VHT	Vehicle Hours Traveled
VMT	Vehicle Miles Traveled
VOMS	Vehicles Operated at Maximum Service

1.0 Introduction

1.1 STUDY BACKGROUND

What is the East San Fernando Valley Transit Corridor?

The Federal Transit Administration (FTA) and the Los Angeles County Metropolitan Transportation Authority (Metro) have initiated a Draft Environmental Impact Statement (DEIS)/Environmental Impact Report (DEIR) for the East San Fernando Valley Transit Corridor Project (Project). The DEIS/DEIR is being prepared with the FTA as the Lead Agency under the National Environmental Policy Act (NEPA) and Metro as the Lead Agency under the California Environmental Quality Act (CEQA).

The DEIS/DEIR and related engineering are being undertaken by Metro, in close coordination with the City of Los Angeles Department of Transportation (LADOT). The DEIS/DEIR will be a combined document complying with the most recent state and federal environmental laws. The Project's public/community outreach component is being undertaken as an integrated parallel effort to the DEIS/EIR.

Prior to the initiation of the DEIS/DEIR, an Alternatives Analysis (AA) was carried out to study the East San Fernando Valley Transit Corridor in order to define, screen, and recommend alternatives to be studied further.

This study will enable Metro, the City of Los Angeles, and the City of San Fernando to evaluate a range of new public transit service alternatives that can accommodate future population growth and transit demand, while being compatible with existing land uses and future development opportunities. The study considered the Sepulveda Pass Corridor, which is another Measure R project, and the proposed California High Speed Rail project. Both of these projects may be directly served by a future transit project in the study area. The Sepulveda Pass Corridor could someday link the West Los Angeles area to the east San Fernando Valley and the California High Speed Rail Project via the Project corridor.

1.1.1. Study Area

Where is the study area located?

The East San Fernando Valley Transit Corridor Project area is located in the San Fernando Valley in the County of Los Angeles. Generally, the Project area extends from Ventura Boulevard in the south in the City of Los Angeles to the City of San Fernando and the Sylmar/San Fernando Metrolink Station in the north. The eastern San Fernando Valley includes the two major north-south arterial roadways of Sepulveda and Van Nuys Boulevards, spanning approximately 10 to 12 miles and the major north-west arterial roadway of San Fernando Road.

Several freeways traverse or border the eastern San Fernando Valley. These include the Ventura Freeway (US-101), the San Diego Freeway (I-405), the Golden State Freeway (I-5), the Ronald Reagan Freeway (SR-118), and the Foothill Freeway (I-210). The Hollywood

Freeway (SR-170) is located east of the Project area. In addition to Metro local and Rapid bus service, the Metro Orange Line (Orange Line) Bus Rapid Transit service, the Metrolink Ventura Line commuter rail service, Amtrak inter-city rail service, and the Metrolink Antelope Valley Line commuter rail service are the major transit corridors that serve interregional trips in the area.

Land uses in the area include neighborhood and regional commercial uses. Numerous car dealerships on the Van Nuys Auto Row are located along Van Nuys Boulevard, south of Chandler Boulevard. Other uses in the area include government services at the Van Nuys Civic Center, major shopping and office uses at the Sherman Oaks Galleria, and medium- to high-density residential uses throughout the area. Major activity centers in the eastern San Fernando Valley include: The Village at Sherman Oaks, Panorama Mall, Whiteman Airport, Van Nuys Airport, Mission Community Hospital, Kaiser Permanente Hospital, and several schools, youth centers, and recreational centers.

1.1.2. Alternatives Considered

What alternatives are under consideration?

The alternatives being studied include the No Build Alternative, Transportation System Management (TSM) Alternative, and build alternatives which include two Bus Rapid Transit (BRT) options, an At-Grade Tram Option and a Light Rail Transit (LRT). The project alternatives being studied include:

- No Build Alternative – The No-Build Alternative represents the predicted conditions through the year 2040. No new transportation infrastructure would be built within the eastern San Fernando Valley aside from projects currently under construction, or funded for construction and operation by 2040. This alternative will include the highway and transit projects in the current constrained element of the Metro Long Range Transportation Plan (LRTP) and the 2012 Southern California Association of Governments Regional Transportation Plan (RTP). This alternative establishes a baseline for comparison for the other alternatives in terms of benefits and costs, and in terms of environmental analysis.
- Transportation System Management (TSM) Alternative – The TSM Alternative enhances the No-Build Alternative and emphasizes transportation systems upgrades. This represents the best that can be done to improve transit service without high-cost investment, and includes increased bus frequencies or minor modifications to the roadway network or traffic control systems. The TSM Alternative would consist of the No-Build bus network and enhanced bus frequencies for the existing Rapid Bus 761, which runs primarily on Van Nuys Boulevard in the Corridor. Metro Rapid Bus 761 would operate on headways reduced from 10 minutes peak/17.5 minutes off-peak to 8 minutes peak/16 minutes off-peak. Metro Local 233, which also provides service to Van Nuys Boulevard and the north-south lines on Sepulveda Boulevard, would operate on headways reduced from 12 minutes peak/20 minutes off-peak to 8 minutes peak/16 minutes off-peak.

- **Alternative 1: BRT (Curb Running Bus Lanes)** – This BRT alternative would operate from the Sylmar/San Fernando Metrolink Station in the north to the Metro Orange Line Station in the south (see Figure 1-1). It would serve the cities of San Fernando and Los Angeles, including the communities of Sylmar, Pacoima, Arleta, Panorama City, and Van Nuys with approximately 18 stations. Approximately 6.6 miles of the route would operate in curb-running bus only lanes. The remaining 2.6 miles would operate in mixed-flow traffic between the Sylmar/San Fernando Metrolink Station and San Fernando Road/Van Nuys Boulevard. Alternative 1 would require operation in mixed-flow traffic along San Fernando Road.
- **Alternative 2: BRT (Median Running Bus Lanes)** – This BRT alternative would operate from the Sylmar/San Fernando Metrolink Station in the north to the Metro Orange Line Station in the south (see Figure 1-2). It would serve the cities of San Fernando and Los Angeles, including the communities of Sylmar, Pacoima, Arleta, Panorama City, and Van Nuys with approximately 17 stations. Approximately 6.6 miles of the route would operate in a dedicated median-running configuration. The remaining 2.6 miles would operate in mixed-flow traffic between the Sylmar/San Fernando Metrolink Station and San Fernando Road/Van Nuys Boulevard.
- **Alternative 3: Rail (Median Running At-Grade Tram)** – The At-Grade Tram Alternative would operate from the Sylmar/San Fernando Metrolink Station in the north to the Metro Orange Line Station in the south (see Figure 1-3). It would serve the cities of San Fernando and Los Angeles, including the communities of Pacoima, Arleta, Panorama City, and Van Nuys with approximately 28 stations. The alternative would operate in a dedicated guideway for approximately 6.6 miles along Van Nuys Boulevard between the Van Nuys Orange Line Station and San Fernando Road. The remaining 2.6 miles would operate in mixed-flow traffic between the Sylmar/San Fernando Metrolink Station and San Fernando Road/Van Nuys Boulevard.
- **Alternative 4: Rail (Median Running LRT)** – The LRT alternative would travel from Sylmar/San Fernando Metrolink Station in the north to the Van Nuys Metro Orange Line Station in the south (see Figure 1-4). It would serve the city of Los Angeles, including the communities of Pacoima, Arleta, Panorama City, and Van Nuys with approximately 14 stations. The entire 9.2-mile route would operate in a dedicated guideway. For approximately 1.4 miles, between Sherman Way and Roscoe Boulevard, the LRT alternative would operate on below-grade track. Along San Fernando Road the alignment would operate within the existing freight/commuter rail right-of-way, but on separate tracks.

Figure 1-1 – Alternative 1
East San Fernando Valley Transit Corridor
Curb Running Bus Rapid Transit (BRT)



 **Metro**
Source: STV, 2014

Figure 1-2 – Alternative 2
East San Fernando Valley Transit Corridor
Median Running Bus Rapid Transit (BRT)



Source: Metro, 2014

Figure 1-3 – Alternative 3
East San Fernando Valley Transit Corridor
Median Running Tram



 **Metro**
Source: STV, 2014

Figure 1-4 – Alternative 4
East San Fernando Valley Transit Corridor
Median Running Light Rail Transit (LRT)



Source: STV, 2014

1.2 REPORT PURPOSE AND STRUCTURE

This Operations & Maintenance (O&M) Costs Report describes the costs that are associated with operating and maintaining the transit investment after it is constructed. Developing a reliable O&M costs estimate is a key requirement for any major transit investment. Reliable cost estimates contribute to an accurate and useful cost effectiveness evaluation and can establish a baseline for budgeting.

This report describes the methodology for developing O&M costs and presents the O&M cost estimates for each alternative being considered in the Draft EIR/EIS.

2.0 Alternatives

Project alternatives are described in additional detail in the following section.

2.1 NO BUILD ALTERNATIVE

The No Build Alternative represents existing conditions in the study area including transportation projects currently under construction or funded for construction and operations by the year 2040. This alternative includes transit and highway projects funded by Measure R and specified in the financially constrained element of Metro's LRTP and Southern California Association of Governments' 2012 constrained RTP.

For the sake of this operations analysis, existing 2012 conditions under the No Build Alternative are discussed in addition to 2040 conditions under the No Build Alternative.

2.2 TRANSPORTATION SYSTEMS MANAGEMENT ALTERNATIVE

The TSM Alternative represents the No Build Alternative plus modest cost capital and operational improvements. The TSM Alternative may include relatively low cost transit service improvements and represents the best that can be done to improve transit service such as increased bus frequencies or minor modifications to the roadway network or traffic control systems.

For this analysis, the TSM Alternative will consist of the No Build bus network and enhanced operating hours and bus frequencies for the existing Van Nuys Metro Rapid Bus 761 and Local Bus 233. The Rapid 761 would operate at headways reduced from 10 minutes peak/17.5 minutes off-peak to eight minutes peak/12 minutes off-peak. The Local 233 would operate at headways reduced from 12 minutes peak/20 minutes off-peak to eight minutes peak/16 minutes off-peak. The Rapid 761 and Local 233 buses would retain existing station locations and stops under the TSM Alternative. These Rapid 761 station locations and stops include the following from north to south (along Van Nuys Boulevard unless otherwise noted):

- Foothill Boulevard
- Glenoaks Boulevard
- San Fernando Road
- Laurel Canyon Boulevard
- Arleta Avenue
- Woodman Avenue
- Plummer Street
- Nordhoff Street
- Chase Street
- Roscoe Boulevard
- Victory Boulevard
- Bessemer Street/Oxnard Boulevard
- Burbank Boulevard
- Magnolia Street
- Huston Street
- Ventura Boulevard (at Van Nuys Boulevard)
- Ventura Boulevard (at Sepulveda Boulevard)
- Existing 761 stops in Westwood

Additional TSM Alternative options that may be considered include, but are not limited to, traffic signalization improvements, bus stop amenities/improvements and bus schedule restructuring.

2.3 ALTERNATIVES 1 AND 2 – BUS RAPID TRANSIT

The BRT Alternatives would add a dedicated busway along Van Nuys Boulevard between the Metro Orange Line and San Fernando Road. There are two Alternatives being considered for Bus Rapid Transit: curb running bus lanes (Alternative 1) and median running bus lanes (Alternative 2).

The Metro Rapid 761 (761X) would utilize the BRT guideway and would have fewer stations within the Study Area (one approximately every mile) to improve travel times. The 761X would be able to utilize the BRT lanes all-day for Alternatives 1 and 2. The 761X would also be rerouted to service the existing Sylmar Metrolink Station via San Fernando Road to improve connectivity to the regional rail services. To the south the 761X would continue through the Sepulveda Pass to Westwood as it currently operates today.

The Local 233 (233X) would also be improved in the BRT Alternative 1, as it would be able to utilize the BRT lanes. For Alternative 2, the 233 would not be able to utilize the dedicated lanes as lanes.

The BRT Alternatives would serve the City of San Fernando and the City of Los Angeles communities of Pacoima, Arleta, Panorama City, and Van Nuys. Overviews of the BRT Alternatives are shown in Figure 1-1 and Figure 1-2

2.3.1. Vehicles

The vehicles would be the same as those that currently operate on in the corridor. These vehicles are high-capacity articulated 60-foot buses, and each bus would have the capacity to serve up to 75 passengers (57 seats x 1.30 passenger loading standard).

2.3.2. Alignment

Alternative 1 – Curb Running Bus Lanes

From the Sylmar/San Fernando Metrolink Station in the north, the improved Metro Rapid 761 (761X) would operate within roadway traffic lanes on San Fernando Road. At Van Nuys Boulevard the 761X would turn southwest and travel south within a curb running dedicated bus lane along Van Nuys Boulevard. The bus lane would be dedicated to buses 24-hours per day. The BRT guideway would continue to be curb running along Van Nuys Boulevard, until reaching the Metro Orange Line Van Nuys Station, where the 761X service would then be integrated into mixed-flow traffic. The 761X would then continue south to Westwood as is currently done today.

The Metro Local 233 (233X) would operate similar to how it operates today between Van Nuys and Glenoaks Boulevards in the north and Van Nuys and Ventura Boulevards in the south. The 233X would have improvements over existing service as it would utilize the BRT guideway when available.

Alternative 2 – Median Running Bus Lanes

Similar to Alternative 1, from the Sylmar/San Fernando Metrolink Station in the north the 761X would operate within roadway traffic lanes on San Fernando Road. At Van Nuys Boulevard, 761X would turn southwest and travel south within the median of Van Nuys Boulevard, in a new dedicated guideway. The dedicated guideway would continue to operate in the median along Van Nuys Boulevard, until reaching the Metro Orange Line Van Nuys Station, where the 761X service would then be integrated into mixed-flow traffic. The 761X would then continue south to Westwood as is currently done today.

The Metro Local 233 would operate similar to how it operates today between Van Nuys and Glenoaks Boulevards in the north and Van Nuys and Ventura Boulevards in the south. The 233 would not be able to operate in the dedicated lanes.

2.4 ALTERNATIVE 3 –LOW-FLOOR LRT/TRAM

The Low-Floor LRT/Tram Alternative would operate using low-floor articulated vehicles that would be electrically powered by overhead wires. The Low-Floor LRT/Tram vehicles would operate in a mixed traffic along San Fernando Road, and dedicated guideway in the median along Van Nuys Boulevard to the Metro Orange Line. This alternative would implement Tram service along the 9.2-mile route from the Sylmar/San Fernando Metrolink Station on the north to Metro Orange Line Station on the south while serving the City of San Fernando and the City of Los Angeles communities of Pacoima, Arleta, Panorama City, and Van Nuys. The Low-Floor LRT/Tram Alternative would have approximately 28 stations and supporting facilities such as traction power substations and a maintenance facility.

Because Alternative 3 would fulfill the current functions of the existing Metro Rapid 761 and Local 233 buses, they would be modified to only maintain service to areas outside of the corridor. The Metro Rapid 761 (761S) would only operate between the Metro Orange Line and Westwood, and the Metro Local 233 (233S) would only operate between San Fernando Road and Glenoaks Boulevard. An overview of Alternative 3 is provided in Figure 1-3.

2.4.1. Vehicles

The Low-Floor LRT/Tram vehicles would be similar to those currently used in Portland, Oregon, and cities across Europe. These vehicles typically consist of two cars connected to form a 90 to 95 feet in length vehicle. While Low-Floor LRT/Tram vehicles can operate at speeds of up to 65 miles per hour (mph) in an exclusive guideway, while at-grade along Van Nuys Boulevard they would not exceed the posted adjacent roadway speed limit which is 35 mph in most sections. Tram vehicles would carry approximately 60-70 seated passengers and over 200 with the potential for standing passengers. The vehicles would be configured with a driver's cab at either end so that the train could run in either direction without the need to turn around at terminus points.

2.4.2. Alignment

From the Sylmar/San Fernando Metrolink Station in the north, the Tram Alternative would operate within roadway traffic lanes on San Fernando Road. At Van Nuys Boulevard, the Tram Alternative would turn southwest and travel south within the median of Van Nuys Boulevard, in a new dedicated guideway. Tram Alternative would continue to operate in the median along Van Nuys Boulevard, until reaching its terminus at the Metro Orange Line Van Nuys Station.

2.5 ALTERNATIVE 4 – LIGHT RAIL TRANSIT

The LRT Alternative would operate using high-floor articulated LRT vehicles that would be electrically powered by overhead wires. The LRT vehicles would operate in a dedicated guideway in the median of San Fernando Road and Van Nuys Boulevard. This alternative would implement LRT service along the 9.2-mile route from the Sylmar/San Fernando Metrolink Station on the north to the Metro Orange Line on the south while serving the City of San Fernando and the City of Los Angeles communities of Pacoima, Arleta, Panorama City, and Van Nuys. The LRT Alternative would have approximately 14 stations and supporting facilities such as traction power substations and a maintenance facility.

Because Alternative 4 would fulfill the current functions of the existing Metro Rapid 761 it would be realigned to only continue service to areas outside of the corridor. The Metro Rapid 761 (761S) would only operate between the Metro Orange Line and Westwood. An overview of the LRT Alternative is provided on Figure 1-4.

2.5.1. Vehicles

LRT vehicles would be similar to those currently used throughout the existing Metro LRT system. These vehicles are typically six-axle, double-ended and articulated, and can be combined in trains up to three cars in length. While LRT vehicles can operate at speeds of up to 65 miles per hour (mph) in an exclusive guideway, but while at-grade along Van Nuys Boulevard they would not exceed the posted adjacent roadway speed limit which is 35 mph in most sections. LRT vehicles would carry approximately 230 seated passengers and over 300 with the potential for standing passengers on a three-car train. The LRT vehicles would be configured with a driver's cab at either end so that the train could run in either direction without the need to turn around at terminus points.

2.5.2. Alignment

The LRT alignment would be fully dedicated and there would be no interaction with automobile traffic except at at-grade crossing. From the intersection of San Fernando Road and Van Nuys Boulevard the LRT Alternative would operate what is currently the median of Van Nuys Boulevard. Two tracks can be accommodated along the corridor. The LRT Alternative would generally run at-grade, with an underground section between Roscoe Boulevard and Sherman Way. Along San Fernando Road the alignment would operate within the existing freight/commuter rail right-of-way, but on separate tracks.

3.0 Operating Assumptions

This section details the assumptions used to generate the operating plan for each alternative. These include parameters such as vehicle performance characteristics, service patterns and headways, and are used to generate full operating characteristics suitable for the forthcoming O&M cost estimation and report.

3.1 FORECAST YEAR

For the purposes of this Operating Plan and other documents based off it, operating characteristics are defined for the year 2040. However, it should be noted that the No Build Alternative is discussed in terms of both existing (2012) conditions as well as 2040 conditions.

3.2 SERVICE HOURS AND HEADWAYS

The TSM, BRT, Low-Floor LRT/Tram and LRT Alternatives are assumed to operate throughout the duration of each weekday except between 1 AM and 4 AM. The 761 for the No Build Alternative under existing 2012 conditions operates fewer hours in the evening and late night time frames, from 10 PM to 4 AM, whereas the 761 for the No Build Alternative under 2040 conditions would operate from 12 AM to 4 PM. The service hours have been formulated using existing Metro bus, BRT and LRT service hours as guides.

Headways generally are shortest during the peak commute hours and longer during off-peak hours. Headways for each Alternative are shown in Table 3-1. The headways for the alternatives have been set using existing Metro bus, BRT and LRT headways as guides, as well as future modeling assumptions from Metro Operations.

Table 3-1 – Alternative Headways (peak/off-peak)

Alternative	233	761	Tram	LRT
Existing / No Build	12/20	10/17.5		
TSM	8/16	8/16		
Alt. 1 – BRT (Curb)	8/16	6/12		
Alt. 2 – BRT (Median)	8/16	6/12		
Alt. 3 – Tram			4/8	
Alt. 4 – LRT	8/16			6/12

Source: STV, 2014

3.3 OTHER OPERATING PARAMETERS

3.3.1. Annualization Factors

To convert from daily and weekly operating statistics to annual statistics (to calculate annual O&M costs), an annualization factor must be applied. It is assumed that the weekday schedule will be operated five days per week and the weekend schedule two days per week. In addition, approximately six holidays per year fall on weekdays when a weekend/holiday schedule would be used instead. All alternatives are assumed to operate 365 days per year, given their crucial place in the county's transportation system. The following breakdown of annual service days was applied:

- Weekdays per Year – 255
- Weekends / Holidays per Year – 110

3.3.2. Layover / Recover Periods

At the end of each run, a bus or train will have scheduled dwell time to allow for an operator layover period and schedule recovery. A layover time for the project alternatives have been calculated using comparable numbers from the Metro system and other transit operators. The minimum layover/recovery time used is three minutes.

3.3.3. Spare Ratios

Transit systems require that spare vehicles be available for use in revenue service, in case of breakdowns or maintenance for the normally scheduled vehicles. Spare ratios are calculated by comparing Vehicles Operated for Maximum Service (VOMS or Peak Vehicle Requirement) and Vehicle Available for Maximum Service (VAMS or Total Vehicle Requirement) for Metro Bus and Rail operations. These spare ratios are then applied in the Operating Plan by multiplying the required number of revenue vehicles (VOMS) by the spare ratio to determine the fleet size including spares (VAMS). Metro Bus Spare Ratios are used for the TSM and BRT Alternatives and Metro Rail Spare Ratios for the LRT Alternative. Data is drawn from the National Transit Database (NTD). The following are the assumed vehicle spare ratios:

- Metro Bus Spare Ratio (from NTD):
 - VOMS – 2,094
 - VAMS – 2,496
 - Spare Ratio – 20%
- Metro Rail Spare Ratio (from NTD):
 - VOMS – 102
 - VAMS – 121
 - Spare Ratio – 20%

3.3.4. Deadhead Ratio

All transit vehicles have non-revenue travel from their maintenance and storage facilities to their normal revenue routes. These “deadhead” times range from 1% to 20% of the revenue service times and distances depending on how closely the maintenance areas are to the route (especially the terminus points). Deadhead percentages are calculated by comparing revenue vehicle hours traveled (VHT) and vehicle miles traveled (VMT) to total VHT and VMT (which include non-revenue deadhead runs) for Metro Bus and Rail operations. These deadhead ratios are applied in the Operations Model to calculate Total VHT and VMT from the calculated Revenue VHT and VMT figures. Metro Bus Deadhead Ratios are used for the TSM and BRT Alternatives and Metro Rail Deadhead Ratios for the LRT Alternative. The following are the assumed deadhead ratios:

- Metro Bus Deadhead Ratios (from NTD):
 - VHT – 10%
 - VMT – 19%
- Metro Rail Deadhead Ratios (from Metro):
 - VHT – 2.5%
 - VMT – 2.5%

3.3.5. Station Dwell Time

All build alternatives (Alternatives 1-4) assume the use of off-board fare payment machines to reduce station dwell times compared to existing and TSM conditions. The build alternatives assume a maximum dwell time of 20 seconds. The Existing Condition and TSM Alternatives assume a maximum dwell time of 50 seconds.

4.0 Operating and Maintenance Cost Methodology

4.1 GENERAL APPROACH

This section provides an overview of the methodology used to estimate operating and maintenance costs for the Project. This methodology is designed to satisfy FTA criteria for cost modeling. The FTA requires that cost modeling process be detailed enough to ensure fair assessment of the proposed transit investment. The O&M cost estimate is also instrumental in risk assessment of the project.

O&M costs have been estimated using fully allocated cost models, which ensure that all potential costs are identified, including: direct operating expenses, materials and supplies, overhead and indirect costs. This methodology calculates O&M costs for potential transit investments based on the level of service and expenditure necessary to operate and maintain similar existing transit systems. Current O&M data from Metro and the National Transit Database (NTD) has been used for cost estimating.

Cost models have been developed for each alternative being studied in the Draft EIR/EIS. The alternatives differ in labor intensiveness, energy requirements, extent of fixed facilities and amount of capital investment to be maintained. Inputs to these models include level of service measures and O&M costs obtained from Metro and NTD. Service and expenditure data are then used to derive unit costs, which are applied to the estimated service levels and operating characteristics of each alternative.

Unit costs have generally been applied to the estimated service levels at 100 percent of the system-wide average with the exception of the general administration costs, as any alternative selected will be an extension of the existing Metro system that has administrative positions and procedures already in place. Incremental administrative expenditures are expected to be moderate and not proportionate to the additional service. Therefore, general administration costs will be applied at 90 percent of their system-wide value for all alternatives. Cost outputs are adjusted for inflation to Fiscal Year (FY) 2014 values, based on the California Consumer Price Index.

4.2 SERVICE VARIABLES

Service variables are necessary inputs to the O&M cost models. Service variables measure service levels and the amount of infrastructure requiring maintenance over a one-year period. Service variables used are described below:

- **Directional Route Miles (DRM)** – The mileage in each direction over which public transportation vehicles travel while in revenue service. DRM are computed in regards to direction of service, but without regard to the number of traffic lanes or rail tracks existing in ROW. DRM do not include staging or storage areas at the beginning or end of a route. For Metro Bus travel, DRM can be non-exclusive (travel in mixed-traffic) and exclusive (travel in dedicated busway or over rail).

- **Annual Vehicle Miles (AVM)** – The miles that a vehicle is scheduled to or actually travels from the time it pulls out from its garage to go into revenue service to the time it pulls in after completing revenue service.
- **Annual Vehicle Hours (AVH)** – The hours that a vehicle is scheduled to or actually travels from the time it pulls out from its garage to go into revenue service to the time it pulls in after completing revenue service.
- **Vehicles Operated for Maximum Service (VOMS)** – The number of revenue vehicles operated to meet the annual maximum service requirement, excluding atypical days or one-time special events. Each train car counts as a single vehicle, so LRT trains made of two smaller cars, for example, count as two vehicles. LRT trains are expected to be three-car trains based on the ridership estimate developed for this project.

Service variables used to compute unit costs are available through NTD. A summary of 2012 Metro LRT (Metro Green, Blue, Gold and Expo Lines) and bus (Metro Local and Rapid) service data is provided in Table 4-1.

Table 4-1 – Metro 2012 Service Levels (as reported in 2014 National Transit Database)

Service Variable	Metro Bus System	Metro LRT System
Directional Route Miles (DRM)	177	136.3
Non-Exclusive DRM	3,578.7	-
Annual Vehicle Miles (AVM)	91,831,800	11,354,100
Annual Vehicle Hours (AVH)	7,485,900	549,600
Vehicles Operated for Maximum Service (VOMS)	1,900	140

Source: NTD, 2014

4.3 COST CATEGORIES

Cost categories are another necessary input to the O&M cost models. Cost categories are selected based on their applicability to the facilities, systems and services proposed as part of the alternatives being examined. In addition, the cost categories selected are typically stable and predictable rather than being subject to external economic forces or other risk factors.

On the basis of these objectives, the following cost components are used:

- **Vehicle Operations** – Vehicle operations including transportation administration, vehicle movement control, scheduling, ticketing / fare collection and security.

- **Vehicle Maintenance** – Vehicle maintenance, including administration, inspection and servicing (cleaning, fueling, etc.). Vehicle Maintenance also includes repairs due to vandalism and accidents.
- **Non-Vehicle Maintenance** – Facility maintenance including administration, operation of electric power facilities and maintenance of all buildings, grounds and equipment, vehicle movement control systems, fare collection and counting equipment, structures, tunnels and subways, roadway and track, communication systems and electric power facilities. For Metro Bus costs, this category is broken into two: nonexclusive (mixed-traffic travel) and exclusive (dedicated guideway travel).
- **General Administration** – General administration including transit service development, injuries / damages, safety personnel administration, legal services, data processing, finance / accounting, purchasing / stores, engineering, real estate management, office management, customer services, promotion, market research and planning.

Table 4-2 sorts these expenditures by category for the Metro LRT and Bus System in FY 2012. Data was gathered from Metro and NTD.

Table 4-2 – Metro 2012 O&M Costs by Category

Cost Categories	Metro Bus System	Metro LRT System
Vehicle Operations	\$522,227,000	\$104,307,219
Vehicle Maintenance	\$219,781,400	\$35,124,242
Non-Vehicle Maintenance (nonexclusive)	\$47,728,100	-
Non-Vehicle Maintenance (exclusive)*	\$3,341,343	\$33,126,223
General Administration	\$134,775,100	\$28,858,357

Source: NTD, 2014; Metro, 2012

4.4 UNIT COSTS

Service variables and expenditures are then used to calculate unit costs. Unit costs are derived by attributing a service variable shown in Table 4-1 to each cost item shown in Table 4-2. The attribution of service parameters to expenditure item relies primarily on logic, although there are generalized relationships between service variables and expenditures. For instance, Vehicle Operations costs are typically linked with AVH since vehicle maintenance is approximately proportional to how many hour vehicles are running. Vehicle Maintenance costs are often linked with AVM since vehicle maintenance is approximately proportional to how many miles the vehicles operate. Non-Vehicle Maintenance is often linked with DRM, since guideway and road maintenance is proportional to the length of the route over which

services run. General Administration costs are often associated with fleet size or VOMS, since administration costs are related to the size of the fleet/agency.

4.5 ESTIMATION OF OPERATING AND MAINTENANCE COSTS

Once unit costs are calculated, they are applied to the operating parameters projected for each alternative in the Operating Plan. These calculations produced expected O&M costs for each alternative under the various cost categories. The results of this process are shown in Section 5.0.

5.0 Operating and Maintenance Cost Models

This section includes the O&M Cost Models for all alternatives.

5.1 NO BUILD ALTERNATIVE

The No Build Alternative O&M Cost Models use 2012 service statistics and operating expenditures associated with the Metro Bus system to project the cost of operating the existing Metro Bus service and all planned projects at future service levels in 2014 dollars.

The No Build Alternative’s estimated annual O&M costs are shown in Table 5-1. The cost of the No Build Alternative is calculated for the existing Metro Bus service along the project corridor, Metro Rapid Line 761 and Metro Local Line 233. It should be noted that General Administration costs for the No Build Alternative are only applied at 90 percent of their projected value since the Metro Lines 761 and 233 are just two transit lines in a larger bus system operated by Metro.

Table 5-1 – No Build Alternative – O&M Cost

Operating Costs and Categories	761	233	Total
	10/17.5 min Headways	12/20 min Headways	
Nonexclusive Directional Route Miles (DRM) – On-Street	22.0	44.0	66.0
Exclusive DRM - Busway	-	-	-
Vehicle Miles (VM)	1,314,201	784,237	2,098,437
Vehicle Hours (VH)	109,416	84,100	193,516
Vehicles Operated at Max Service (VOMS)	25	15	40
Vehicle Operations	\$7,633,007	\$5,866,958	\$13,499,965
Vehicle Maintenance	\$3,145,281	\$1,876,917	\$5,022,198
Non-Vehicle Maintenance (nonexclusive)	\$293,408	\$586,815	\$880,223
Non-Vehicle Maintenance (exclusive)	-	-	-
General Administration	\$1,596,021	\$957,613	\$2,553,633
Total O&M Expenses (FY 12)	\$12,961,124	\$9,021,569	\$21,982,693
O&M Expenses Inflated (FY 14)	\$13,386,284	\$9,317,501	\$22,703,786

Source: STV, 2014; Metro, 2012; NTD, 2014

The No Build Alternative is projected to cost \$22.7 million to operate and maintain annually, with Metro Line 761 with 10/17.5 minute headways at \$13.1 million and Metro Line 233 with 12/20 minute headways at \$9.6 million.

5.2 TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVE

The TSM Alternative O&M Cost Model uses 2012 service statistics and operating expenditures associated with the Metro Bus system (including local and rapid lines) to project the cost of operating Metro Local Line 233/224 with decreased headways.

Like the No Build Alternative, the General Administration costs for the TSM Alternative are applied at 90 percent. The decreased headways would be part of an existing line in a larger bus system with administrative positions and procedures already in place. Incremental administrative expenditures are expected to be moderate and not proportional to the additional route length being served.

The TSM Alternative’s estimated annual O&M cost is show in Table 5-2. Full detail for the TSM Alternative O&M Cost Model is shown in Appendix A.

Table 5-2 – TSM Alternative – O&M Cost

Operating Costs and Categories	761 8/16 min Headways	233/224 8/16 min Headways	Total
Nonexclusive Directional Route Miles (DRM) – On-Street	44.0	24.0	68.0
Exclusive DRM - Busway	-	-	-
Vehicle Miles (VM)	1,955,044	1,113,639	3,068,683
Vehicle Hours (VH)	165,185	117,151	282,336
Vehicles Operated at Max Service (VOMS)	31	22	53
Vehicle Operations	\$11,523,544	\$8,172,590	\$19,696,134
Vehicle Maintenance	\$4,679,014	\$2,665,277	\$7,344,291
Non-Vehicle Maintenance (nonexclusive)	\$586,815	\$320,081	\$906,897
Non-Vehicle Maintenance (exclusive)	-	-	-
General Administration	\$1,979,066	\$1,404,498	\$3,383,564
Total O&M Expenses (FY 12)	\$18,768,440	\$12,562,447	\$31,330,887
O&M Expenses Inflated (FY 14)	\$19,384,095	\$12,974,529	\$32,358,625

Source: STV, 2014; Metro, 2012; NTD, 2014

The TSM Alternative is projected to cost approximately \$32.4 million to operate and maintain annually, with Metro Line 761 at \$19.4 million and Metro Line 233/224 at \$13.0 million.

5.3 ALTERNATIVES 1 – BUS RAPID TRANSIT (CURB RUNNING)

The Alternative 1 O&M Cost Model uses 2012 service statistics and operating expenditures associated with the Metro Bus system to project the cost of a curb running BRT guideway along Van Nuys Boulevard, in which Metro Rapid Line 761x and 233x would operate.

Like the previous alternatives, General Administration unit costs are only applied to projected service variables of Alternative 1 at 90 percent. The proposed BRT guideway and Metro Bus service would be part of a larger Metro Bus system with administrative positions and procedures already in place. Incremental administrative expenditures are expected to be moderate and not proportional to the additional route length being served.

The Alternative 1 estimated annual O&M cost is show in Table 5-3. Full detail for the Alternative 1 O&M Cost Model is shown in Appendix A.

Table 5-3 – Alternative 1 – O&M Cost

Operating Costs and Categories	761x 6/12 min Headways	233x 8/16 min Headways	Total
Nonexclusive Directional Route Miles (DRM) – On-Street	44.0	24.0	68.0
Exclusive DRM - Busway	13.5	13.5	26.9
Vehicle Miles (VM)	2,722,168	1,113,639	3,835,807
Vehicle Hours (VH)	206,764	111,527	318,291
Vehicles Operated at Max Service (VOMS)	39	20	59
Vehicle Operations	\$14,424,141	\$7,780,306	\$22,204,446
Vehicle Maintenance	\$6,514,975	\$2,665,277	\$9,180,252
Non-Vehicle Maintenance (nonexclusive)	\$586,815	\$320,081	\$906,897
Non-Vehicle Maintenance (exclusive)	\$253,806	\$253,806	\$507,613
General Administration	\$2,489,793	\$1,276,817	\$3,766,609
Total O&M Expenses (FY 12)	\$24,090,225	\$12,116,996	\$36,207,221
O&M Expenses Inflated (FY 14)	\$24,880,450	\$12,514,466	\$37,394,916

Source: STV, 2014; Metro, 2012; NTD, 2014

Alternative 1 is projected to cost approximately \$37.4 million to operate and maintain annually, with Metro Line 761x at \$24.9 million and Metro Line 233x at \$12.5 million.

5.4 ALTERNATIVES 2 – BUS RAPID TRANSIT (MEDIAN RUNNING)

The Alternative 2 O&M Cost Model uses 2012 service statistics and operating expenditures associated with the Metro Bus system to project the cost of a median running BRT guideway along Van Nuys Boulevard, in which Metro Rapid Line 761x would operate.

Like the previous alternatives, General Administration unit costs are only applied to projected service variables of Alternative 2 at 90 percent. The proposed BRT guideway and Metro Bus service would be part of a larger Metro Bus system with administrative positions and procedures already in place. Incremental administrative expenditures are expected to be moderate and not proportional to the additional route length being served.

The Alternative 2 estimated annual O&M cost is show in Table 5-4. Full detail for the Alternative 2 O&M Cost Model is shown in Appendix A.

Table 5-4 – Alternative 2 – O&M Cost

Operating Costs and Categories	761x 6/12 min Headways	233x 8/16 min Headways	Total
Nonexclusive Directional Route Miles (DRM) – On-Street	44.0	24.0	68.0
Exclusive DRM - Busway	13.5	-	13.5
Vehicle Miles (VM)	2,722,168	1,113,639	3,835,807
Vehicle Hours (VH)	197,860	134,395	332,256
Vehicles Operated at Max Service (VOMS)	38	24	62
Vehicle Operations	\$13,803,024	\$9,375,595	\$23,178,619
Vehicle Maintenance	\$6,514,975	\$2,665,277	\$9,180,252
Non-Vehicle Maintenance (nonexclusive)	\$586,815	\$320,081	\$906,897
Non-Vehicle Maintenance (exclusive)	\$253,806	-	\$253,806
General Administration	\$2,425,952	\$1,532,180	\$3,958,132
Total O&M Expenses (FY 12)	\$23,405,267	\$13,893,134	\$37,298,401
O&M Expenses Inflated (FY 14)	\$24,173,024	\$14,348,866	\$38,521,890

Source: STV, 2014; Metro, 2012; NTD, 2014

Alternative 2 is projected to cost approximately \$38.5 million to operate and maintain annually, with Metro Line 761x at \$24.2 million and Metro Line 233x at \$14.3 million.

5.5 ALTERNATIVE 3 – TRAM

The Alternative 3 O&M Cost Model uses 2012 service statistics and operating expenditures associated with the Metro Bus and Rail system to project the cost of a Tram service in mixed traffic from the Sylmar Metrolink Station along San Fernando Road to a dedicated median guideway system along Van Nuys Boulevard.

Like the previous alternatives, General Administration unit costs are only applied to projected service variables of Alternative 3 at 90 percent. The proposed Tram Service would

be part of a larger Metro Bus and Light Rail system with administrative positions and procedures already in place. Incremental administrative expenditures are expected to be moderate and not proportional to the additional route length being served.

The Alternative 3 estimated annual O&M cost is show in Table 5-5. Full detail for the Alternative 3 O&M Cost Model is shown in Appendix A.

Table 5-5 – Alternative 3 – O&M Cost

Operating Costs and Categories	Alternative 3 Tram 4/8 min Headways	761s 6/12 min Headways	233s 8/16 min Headways	Total
Directional Route Miles (DRM)	18.1	25.6	6.8	50.5
Vehicle Miles (VM)	2,686,035	1,586,441	315,531	4,588,008
Vehicle Hours (VH)	182,225	136,192	22,868	341,285
Vehicles Operated at Max Service (VOMS)	44	26	4	74
Vehicle Operations	\$34,583,935	\$9,500,972	\$1,595,290	\$45,680,197
Vehicle Maintenance	\$8,309,329	\$3,796,836	\$755,162	\$12,861,326
Non-Vehicle Maintenance (nonexclusive)	-	\$341,980	\$90,690	\$432,670
Non-Vehicle Maintenance (exclusive)	\$4,400,298	-	-	\$4,400,298
General Administration	\$8,162,792	\$1,659,862	\$255,363	\$10,078,018
Total O&M Expenses (FY 12)	\$55,456,355	\$15,299,650	\$2,696,505	\$73,452,509
O&M Expenses Inflated (FY 14)	\$57,275,474	\$15,801,520	\$2,784,957	\$75,861,951

Source: STV, 2014; Metro, 2012; NTD, 2014

Alternative 3 is projected to cost approximately \$75.9 million to operate and maintain annually, with the Tram at \$57.3 million, Metro Line 761x at \$15.8 million and Metro Line 233s at \$2.8 million.

5.6 ALTERNATIVE 4 – LIGHT RAIL TRANSIT

The Alternative 4 O&M Cost Model uses 2012 service statistics and operating expenditures associated with the Metro Bus and Rail system to project the cost of a light rail service in from the Sylmar Metrolink Station along San Fernando Road and along Van Nuys Boulevard.

Like the previous alternatives, General Administration unit costs are only applied to projected service variables of Alternative 4 at 90 percent. The proposed Light Rail Service would be part of a larger Metro Bus and Light Rail system with administrative positions and procedures already in place. Incremental administrative expenditures are expected to be moderate and not proportional to the additional route length being served.

The Alternative 4 estimated annual O&M cost is show in Table 5-6. Full detail for the Alternative 4 O&M Cost Model is shown in Appendix A.

Table 5-6 – Alternative 4 – O&M Cost

Operating Costs and Categories	Alternative 4 LRT 6/12 min Headways	761s 6/12 min Headways	233 8/16 min Headways	Total
Directional Route Miles (DRM)	18.4	25.6	24.0	68.0
Vehicle Miles (VM)	1,821,036	1,586,441	1,113,639	4,521,116
Vehicle Hours (VH)	99,692	136,192	134,395	370,279
Vehicles Operated at Max Service (VOMS)	20	26	24	70
Vehicle Operations	\$18,920,202	\$9,500,972	\$9,375,595	\$37,796,770
Vehicle Maintenance	\$5,633,428	\$3,796,836	\$2,665,277	\$12,095,541
Non-Vehicle Maintenance (nonexclusive)	-	\$341,420	\$320,081	\$662,061
Non-Vehicle Maintenance (exclusive)	\$4,464,236	-	-	\$4,464,236
General Administration	\$3,710,360	\$1,659,862	\$1,532,180	\$6,902,402
Total O&M Expenses (FY 12)	\$32,728,226	\$15,299,650	\$13,893,134	\$61,921,010
O&M Expenses Inflated (FY 14)	\$33,801,801	\$15,801,520	\$14,348,866	\$63,952,188

Source: STV, 2014; Metro, 2012; NTD, 2014

Alternative 4 is projected to cost approximately \$64 million to operate and maintain annually, with the LRT at \$33.8 million, Metro Line 761s at \$15.8 million and Metro Line 233 at \$14.4 million.

6.0 Summary and Conclusions

The build alternatives are projected to cost between \$37.4 and \$75.9 million annually to operate and maintain, with costs varying depending upon the mode (BRT, tram, or light rail) and operational headways. O&M costs for each alternative are summarized below in Table 6-1.

Table 6-1 – O&M Costs by Alternative

Alternative/Operating Scenario	O&M Cost (in millions of 2014\$)
No Build	\$22.7
TSM	\$32.4
Alternative 1 – Bus Rapid Transit – Curb Running	\$37.4
Alternative 2 – Bus Rapid Transit – Median Running	\$38.5
Alternative 3 – Tram – Median Running	\$75.9
Alternative 4 – Light Rail – Fixed Guideway	\$64.0

Source: STV, 2014; Metro, 2012; NTD, 2014

The Tram Alternative (Alternative 3) has the highest O&M costs. The most significant factor contributing to the higher O&M costs of Alternative 3 in comparison to the LRT Alternative (Alternative 4) is the more frequent service (shorter headways), while the shorter headways and maintenance required for tracks, stations, and vehicles make O&M costs greater for both Alternatives 3 and 4 in comparison with the BRT Alternatives (Alternatives 1 and 2).

These O&M Costs will be used as the project advances to determine the effectiveness of project alternatives.

Appendix A – O&M Cost Model Detail

No Build Alternative

Operating and Cost Categories		Metro Existing Bus Network (Local & Rapid)				No Build Alternative			
		2012 NTD Quantities / Costs	Unit Costs				761	233	Total
			DRM	VM	VH	VOMS	10/17.5 min Headways	12/20 min Headways	
Stats	Nonexclusive Directional Route Miles (DRM) - On-Street	3,578.7	3,578.7			44.0	24.0	68.0	
	Exclusive DRM - Busway	177	177			0.0	0.0	0.0	
	Vehicle Miles (VM)	91,831,800		91,831,800		1,314,201	784,237	2,098,437	
	Vehicle Hours (VH)	7,485,900			7,485,900	109,416	84,100	193,516	
	Vehicles Operated at Max Service (VOMS)	1,900			1,900	25	15	40	
Costs	Vehicle Operations	\$522,227,000			\$70	\$7,633,007	\$5,866,958	\$13,499,965	
	Vehicle Maintenance	\$219,781,400		\$2		\$3,145,281	\$1,876,917	\$5,022,198	
	Non-Vehicle Maintenance (nonexclusive)	\$47,728,100	\$13,337			\$586,815	\$320,081	\$906,897	
	Non-Vehicle Maintenance (exclusive)*	\$3,341,343	\$18,856			\$0	\$0	\$0	
	General Administration	\$134,775,100				\$70,934	\$1,596,021	\$957,613	\$2,553,633
	Total O&M Expenses (FY12)	\$927,852,943	\$32,193	\$2	\$70	\$70,934	\$12,961,124	\$9,021,569	\$21,982,693
	O&M Expenses Inflated (FY14)	\$958,289,045	\$33,249	\$2	\$72	\$73,261	\$13,386,284	\$9,317,501	\$22,703,786

Note: General Administration Costs highlighted in red only applied at 90% of projected cost (line part of larger system)

* Calculated using Metro FY 2012 Budget for Metro Orange Line

TSM Alternative

Operating and Cost Categories		Metro Existing Bus Network (Local & Rapid)				TSM Alternative			
		2012 NTD Quantities / Costs	Unit Costs				761	233/224	Total
			DRM	VM	VH	VOMS	8/16 min Headways	8/16 min Headways	
Stats	Nonexclusive Directional Route Miles (DRM) - On-Street	3,578.7	3,578.7				44.0	24.0	68.0
	Exclusive DRM - Busway	177	177				0.0	0.0	0.0
	Vehicle Miles (VM)	91,831,800		91,831,800			1,955,044	1,113,639	3,068,683
	Vehicle Hours (VH)	7,485,900			7,485,900		165,185	117,151	282,336
	Vehicles Operated at Max Service (VOMS)	1,900				1,900	31	22	53
Costs	Vehicle Operations	\$522,227,000			\$70		\$11,523,544	\$8,172,590	\$19,696,134
	Vehicle Maintenance	\$219,781,400			\$2		\$4,679,014	\$2,665,277	\$7,344,291
	Non-Vehicle Maintenance (nonexclusive)	\$47,728,100	\$13,337				\$586,815	\$320,081	\$906,897
	Non-Vehicle Maintenance (exclusive)*	\$3,341,343	\$18,856				\$0	\$0	\$0
	General Administration	\$134,775,100				\$70,934	\$1,979,066	\$1,404,498	\$3,383,564
	Total O&M Expenses (FY12)	\$927,852,943	\$32,193			\$70,934	\$18,768,440	\$12,562,447	\$31,330,887
	O&M Expenses Inflated (FY14)	\$958,289,045	\$33,249			\$72,1	\$19,384,095	\$12,974,529	\$32,358,625

Note: General Administration Costs highlighted in red only applied at 90% of projected cost (line part of larger system)

* Calculated using Metro FY 2012 Budget for Metro Orange Line

Alternative 1 – Bus Rapid Transit – Curb Running

Operating and Cost Categories		Metro Existing Bus Network (Local & Rapid)				Alternative 1				
		2012 NTD Quantities / Costs	Unit Costs				761x	233x	Total	
			DRM	VM	VH	VOMS	6/12 min Headways	8/16 min Headways		
Stats	Nonexclusive Directional Route Miles (DRM) - On-Street	3,578.7	3,578.7				30.5	10.5	41.0	
	Exclusive DRM - Busway	177	177				13.5	13.5	27.0	
	Vehicle Miles (VM)	91,831,800		91,831,800			2,722,168	1,113,639	3,835,807	
	Vehicle Hours (VH)	7,485,900			7,485,900		206,764	111,527	318,291	
	Vehicles Operated at Max Service (VOMS)	1,900				1,900	39	20	59	
Costs	Vehicle Operations	\$522,227,000			\$70		\$14,424,141	\$7,780,306	\$22,204,446	
	Vehicle Maintenance	\$219,781,400			\$2		\$6,514,975	\$2,665,277	\$9,180,252	
	Non-Vehicle Maintenance (nonexclusive)	\$47,728,100	\$13,337				\$406,756	\$140,036	\$546,792	
	Non-Vehicle Maintenance (exclusive)*	\$3,341,343	\$18,856				\$254,561	\$254,561	\$509,121	
	General Administration	\$134,775,100				\$70,934	\$2,489,793	\$1,276,817	\$3,766,609	
	Total O&M Expenses (FY12)	\$927,852,943	\$32,193		\$2	\$70	\$70,934	\$24,090,225	\$12,116,996	\$36,207,221
	O&M Expenses Inflated (FY14)	\$958,289,045	\$33,249		\$2	\$72	\$73,261	\$24,880,450	\$12,514,466	\$37,394,916

Note: General Administration Costs highlighted in red only applied at 90% of projected cost (line part of larger system)

* Calculated using Metro FY 2012 Budget for Metro Orange Line

Alternative 2 – Bus Rapid Transit – Median Running

Operating and Cost Categories		Metro Existing Bus Network (Local & Rapid)				Alternative 2			
		2012 NTD Quantities / Costs	Unit Costs				761x	233x	Total
			DRM	VM	VH	VOMS	6/12 min Headways	8/16 min Headways	
Stats	Nonexclusive Directional Route Miles (DRM) - On-Street	3,578.7	3,578.7				30.5	24.0	54.5
	Exclusive DRM - Busway	177	177				13.5	0.0	13.5
	Vehicle Miles (VM)	91,831,800		91,831,800			2,722,168	1,113,639	3,835,807
	Vehicle Hours (VH)	7,485,900			7,485,900		197,860	134,395	332,256
	Vehicles Operated at Max Service (VOMS)	1,900				1,900	38	24	62
Costs	Vehicle Operations	\$522,227,000			\$70		\$13,803,024	\$9,375,595	\$23,178,619
	Vehicle Maintenance	\$219,781,400		\$2			\$6,514,975	\$2,665,277	\$9,180,252
	Non-Vehicle Maintenance (nonexclusive)	\$47,728,100	\$13,337				\$406,756	\$320,081	\$726,838
	Non-Vehicle Maintenance (exclusive)*	\$3,341,343	\$18,856				\$254,561	\$0	\$254,561
	General Administration	\$134,775,100				\$70,934	\$2,425,952	\$1,532,180	\$3,958,132
	Total O&M Expenses (FY12)	\$927,852,943	\$32,193	\$2	\$70	\$70,934	\$23,405,267	\$13,893,134	\$37,298,401
	O&M Expenses Inflated (FY14)	\$958,289,045	\$33,249	\$2	\$72	\$73,261	\$24,173,024	\$14,348,866	\$38,521,890

Note: General Administration Costs highlighted in red only applied at 90% of projected cost (line part of larger system)

* Calculated using Metro FY 2012 Budget for Metro Orange Line

Alternative 3 – Tram

Operating and Cost Categories		Metro Existing Light Rail Network (Blue, Green, Gold & Expo Lines)				Alternative	
		2012 NTD Quantities / Costs	Unit Costs				Alt 3
			DRM	VM	VH	VOMS	4/8 min Headways
Stats	Exclusive Directional Route Miles (DRM)	136.3	136.3			18.1	
	Vehicle Miles (VM)	11,354,100		11,354,100		2,686,035	
	Vehicle Hours (VH)	549,600		549,600		182,225	
	Vehicles Operated at Max Service (VOMS)	140			140	44	
Costs	Vehicle Operations	\$104,307,219			\$190	\$34,583,935	
	Vehicle Maintenance	\$35,124,242		\$3		\$8,309,329	
	Non-Vehicle Maintenance (exclusive)	\$33,126,223	\$243,110			\$4,400,298	
	General Administration	\$28,858,357			\$206,131	\$8,162,792	
	Total O&M Expenses (FY12)	\$201,416,041	\$243,110	\$3	\$190	\$206,131	\$55,456,355
	O&M Expenses Inflated (FY14)	\$208,023,035	\$251,085	\$3	\$196	\$212,893	\$57,275,474

Note: General Administration Costs highlighted in red only applied at 90% of projected cost (line part of larger system)

Operating and Cost Categories		Metro Existing Bus Network (Local & Rapid)				Alternative		
		2012 NTD Quantities / Costs	Unit Costs				233s	761s
			DRM	VM	VH	VOMS	8/16 min Headways	6/12 min Headways
Stats	Nonexclusive DRM - On-Street	3,578.7	3,578.7				6.8	25.6
	Exclusive DRM - Busway	177	177				0.0	0.0
	Vehicle Miles (VM)	91,831,800		91,831,800			315,531	1,586,441
	Vehicle Hours (VH)	7,485,900			7,485,900		22,868	136,192
	Vehicles Operated at Max Service (VOMS)	1,900				1,900	4	26
Costs	Vehicle Operations	\$522,227,000			\$70		\$1,595,290	\$9,500,972
	Vehicle Maintenance	\$219,781,400		\$2			\$755,162	\$3,796,836
	Non-Vehicle Maintenance (nonexclusive)	\$47,728,100	\$13,337				\$90,690	\$341,980
	Non-Vehicle Maintenance (exclusive)*	\$3,341,343	\$18,856				\$0	\$0
	General Administration	\$134,775,100				\$70,934	\$255,363	\$1,659,862
	Total O&M Expenses (FY12)	\$927,852,943	\$32,193	\$2	\$70	\$70,934	\$2,696,505	\$15,299,650
	O&M Expenses Inflated (FY14)	\$958,289,045	\$33,249	\$2	\$72	\$73,261	\$2,784,957	\$15,801,520

Note: General Administration Costs highlighted in red only applied at 90% of projected cost (line part of larger system)

* Calculated using Metro FY 2012 Budget for Metro Orange Line

Operating and Cost Categories		Alternative
		Total
		4/8 min Headways
Stats	Directional Route Miles (DRM)	50.5
	Vehicle Miles (VM)	4,588,008
	Vehicle Hours (VH)	341,285
	Vehicles Operated at Max Service (VOMS)	74
Costs	Vehicle Operations	\$45,680,197
	Vehicle Maintenance	\$12,861,326
	Non-Vehicle Maintenance (nonexclusive)	\$432,670
	Non-Vehicle Maintenance (exclusive)*	\$4,400,298
	General Administration	\$10,078,018
	Total O&M Expenses (FY12)	\$73,452,509
	O&M Expenses Inflated (FY14)	\$75,861,951

Note: General Administration Costs highlighted in red only applied at 90% of projected cost (line part of larger system)

Alternative 4 – Light Rail

Operating and Cost Categories		Metro Existing Light Rail Network (Blue, Green, Gold & Expo Lines)				Alternative	
		2012 NTD Quantities / Costs	Unit Costs				Alt 4
			DRM	VM	VH	VOMS	6/12 min Headways
Stats	Exclusive Directional Route Miles (DRM)	136.3	136.3			18.4	
	Vehicle Miles (VM)	11,354,100		11,354,100		1,821,036	
	Vehicle Hours (VH)	549,600			549,600	99,692	
	Vehicles Operated at Max Service (VOMS)	140				140	20
Costs	Vehicle Operations	\$104,307,219			\$190	\$18,920,202	
	Vehicle Maintenance	\$35,124,242		\$3		\$5,633,428	
	Non-Vehicle Maintenance (exclusive)	\$33,126,223	\$243,110			\$4,464,236	
	General Administration	\$28,858,357				\$206,131	\$3,710,360
	Total O&M Expenses (FY12)	\$201,416,041	\$243,110	\$3	\$190	\$206,131	\$32,728,226
	O&M Expenses Inflated (FY14)	\$208,023,035	\$251,085	\$3	\$196	\$212,893	\$33,801,801

Note: General Administration Costs highlighted in red only applied at 90% of projected cost (line part of larger system)

Operating and Cost Categories		Metro Existing Bus Network (Local & Rapid)				Alternative		
		2012 NTD Quantities / Costs	Unit Costs				233	761s
			DRM	VM	VH	VOMS	8/16 min Headways	6/12 min Headways
Stats	Nonexclusive DRM - On-Street	3,578.7	3,578.7				24.0	25.6
	Exclusive DRM - Busway	177	177				0.0	0.0
	Vehicle Miles (VM)	91,831,800		91,831,800			1,113,639	1,586,441
	Vehicle Hours (VH)	7,485,900			7,485,900		134,395	136,192
	Vehicles Operated at Max Service (VOMS)	1,900				1,900	24	26
Costs	Vehicle Operations	\$522,227,000			\$70		\$9,375,595	\$9,500,972
	Vehicle Maintenance	\$219,781,400		\$2			\$2,665,277	\$3,796,836
	Non-Vehicle Maintenance (nonexclusive)	\$47,728,100	\$13,337				\$320,081	\$341,980
	Non-Vehicle Maintenance (exclusive)*	\$3,341,343	\$18,856				\$0	\$0
	General Administration	\$134,775,100				\$70,934	\$1,532,180	\$1,659,862
	Total O&M Expenses (FY12)	\$927,852,943	\$32,193	\$2	\$70	\$70,934	\$13,893,134	\$15,299,650
	O&M Expenses Inflated (FY14)	\$958,289,045	\$33,249	\$2	\$72	\$73,261	\$14,348,866	\$15,801,520

Note: General Administration Costs highlighted in red only applied at 90% of projected cost (line part of larger system)

* Calculated using Metro FY 2012 Budget for Metro Orange Line

Operating and Cost Categories		Alternative
		Total
		6/12 min Headways
Stats	Directional Route Miles (DRM)	68.0
	Vehicle Miles (VM)	4,521,116
	Vehicle Hours (VH)	370,279
	Vehicles Operated at Max Service (VOMS)	70
Costs	Vehicle Operations	\$37,796,770
	Vehicle Maintenance	\$12,095,541
	Non-Vehicle Maintenance (nonexclusive)	\$662,061
	Non-Vehicle Maintenance (exclusive)*	\$4,464,236
	General Administration	\$6,902,402
	Total O&M Expenses (FY12)	\$61,921,010
	O&M Expenses Inflated (FY14)	\$63,952,188

Note: General Administration Costs highlighted in red only applied at 90% of projected cost (line part of larger system)

