

ATTACHMENT D: GREEN CONSTRUCTION POLICY UPDATE

Metro staff provides annual update on its implementation of the Green Construction Policy. For the purposes of the report back regarding Item #57 of the February 2016 Meeting, staff is including the same information as Attachment D, herein.

I. GREEN CONSTRUCTION POLICY OVERVIEW

The Metro Board approved the Green Construction Policy (GCP) in 2011 to reduce the air quality impacts of Metro's construction projects in surrounding communities. Staff is required to report back to the Board periodically regarding the implementation status of the policy. Staff is also reporting on the implementation status of Sustainability Plan Policy which was approved in 2012 to ensure compliance with Metro Facility Design Criteria for Sustainability and the California Green Building Standards Code.

II. BACKGROUND

By adopting this policy, Metro is committed to using greener, less polluting construction equipment and vehicles, and will implement best practices to reduce harmful emissions in all construction projects performed on Metro properties and rights-of-way. Metro's GCP applies only to Metro contractors and Metro construction projects. The information in this report reflects the measurement of emissions and data from the larger Metro capital projects, specifically the Purple Line Extension Section 1, Crenshaw/LAX, and Regional Connector.

The GCP provides requirements for (a) identifying and mitigating diesel exhaust emission impacts from on-road and off-road equipment used during Metro construction and development activities, on human health and the environment; and (b) implementing appropriate best management practices to complement equipment mitigations. The goal of the policy is to reduce harmful air emissions of Particulate Matter (PM₁₀, PM_{2.5}), Nitrogen Oxides (NOx), and Reactive Organic Gases (ROGs) during Metro construction projects while minimizing any significant impact to cost schedule.

III. DISCUSSION

OUTREACH ACTIVITIES

Metro continues to schedule and facilitate GCP outreach activities, across Los Angeles County, with the assistance from a California Air Resources Board (ARB) instructor who has led all of these workshops with the support of Metro staff and consultants. The purpose of the workshops is to educate and raise awareness of the potential health impacts from diesel emissions, the state of the Los Angeles basin air quality, ARB current strategies to reduce diesel emissions, ARB enforcement programs, engine standards and diesel emission control strategies, off-road and on-road vehicle regulation requirements, public agency fleet regulations ARB's portable equipment registration program fugitive dust regulations and

the requirements in Metro's GCP. The workshop participants have included interested stakeholders and contractors.

Metro has conducted two (2) training workshops over the past several months in an ongoing effort to ensure that the regulated community is aware of the ARB and South Coast Air Quality Management District (SCAQMD) requirements governing construction equipment: off-road, on-road, and portable equipment; and to assist Metro contractors with understanding and conforming with the GCP requirements. Workshops were conducted at the following locations:

- Metro Purple Line Extension Project Field Office, Los Angeles, March 9, 2016 **(Number of Attendees: 34)**
- Division 16 / Crenshaw & LAX, Los Angeles, March 8, 2016 **(Number of Attendees: 25)**

During the workshops with the contractors, Metro provided an overview of the following: purpose/goal of the GCP, GCP project specification requirements, best management practices, conformance reviews, available exceptions, submittal requirements and a link to Metro's Green Construction Equipment Initiative website.

Metro also provided a Construction Equipment Funding Resource Guide to workshop attendees. The guide includes a program description (SCAQMD, ARB, and EPA), key deadlines to apply for grant funds to repower, replace, or retrofit aged construction equipment, and program websites. Metro also provided specific information about funding workshops focused on the Carl Moyer Program and off-road and on-road funding sources provided directly by the SCAQMD and attended each workshop on **04/20/16** and **05/04/16** to acquire and assist in transmitting information to the contractors and sub-contractors.

PROJECT INSPECTION REVIEWS

Metro has continued to conduct project inspection reviews in Fiscal Year 2016 during the execution of the Purple Line Extension Section 1, Crenshaw/LAX, Regional Connector and Universal Pedestrian Bridge Projects. As a result of the reviews, Metro has documented the following GCP implementation challenges:

- Incomplete (but improved from Fiscal Year 2015) GCP specification submittals - includes equipment lists (on-road, off-road, portable generators), compliance certification, fuel use logs, and copies of ARB/SCAQMD permits and registrations;
- Fuel use logs are not submitted monthly as required in the specifications;
- Off-road equipment observed on site without ARB registration labels;
- Sub-contractors not documenting or providing a list of equipment or fuel use data;
- Off-road equipment with less than Tier 4 rated engines observed on-site, and through review of equipment lists;
- Methodology changes in emissions calculations and continually changing quantification tools;

- ARB EIN number required to verify the equipment was missing in 35% of equipment listed and reported on in fuel logs (Figure 1);

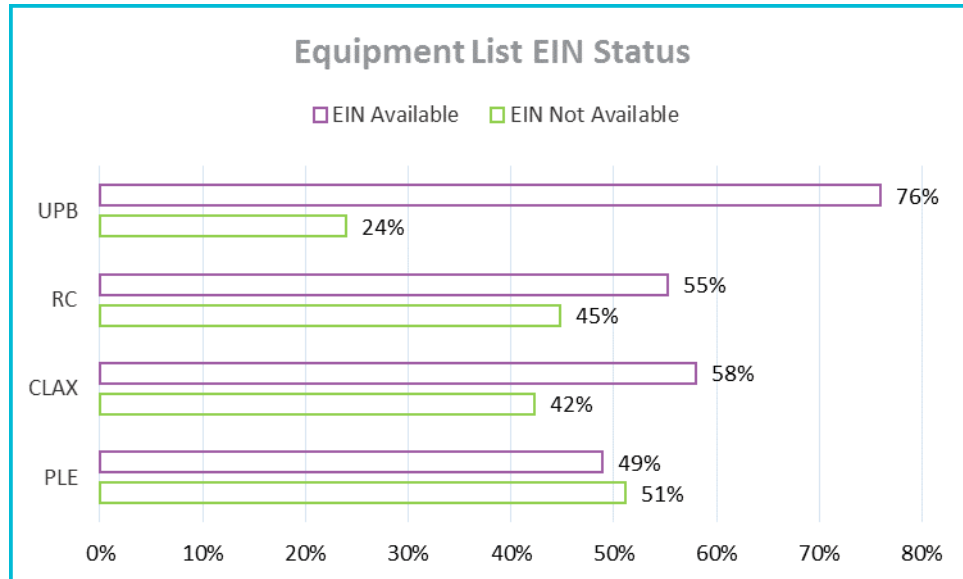


Figure 1 – Equipment EIN availability provided by contractor in equipment list

According to the Air Resources Board, “the In-Use Off-Road Diesel Vehicle Regulation (Off-Road Regulation) requires that all vehicles subject to the Off-Road Regulation be labeled with a unique EIN.¹” In each non-conformance case, the contractor or subcontractors were issued corrective action requests to respond by either providing documentation of exceptions or to remove the equipment or vehicles from the site in order to be in conformance with the GCP. The contractors for each of the projects made a notable improvement in providing fuel logs in comparison to Fiscal Year 2015; data was reported for each month during the 2015 calendar year.

Off-Road Equipment Summary

The majority of the off-road equipment used in the submitted equipment lists are comprised of excavators, backhoes, loaders, tractors and cranes. The Air Resources Board (ARB) applies engine “Tiers” to off-road equipment according to engine model year and horsepower. This higher Tier equipment has lower emissions rates, which are considered cleaner equipment. As of January 1, 2016 the ARB requires Tier 2 or higher for the fleet of equipment. Metro’s GCP contains more stringent requirements than the ARB, requiring all equipment (not just the fleet) adhere to Tier 4 standards. An overview of ARB Engine Tiers is provided in the table below.

Equipment Engine Tiers	ARB	Metro GCP	Notes

¹ Air Resources Board, “Label Vendors for Off-Road Vehicles” <http://www.arb.ca.gov/msprog/ordiesel/labelvendors.htm>

Tier 0	Not Compliant	Not Compliant	ARB banned in fleets as of January 1, 2014
Tier 1	Not Compliant	Not Compliant	ARB banned in fleets as of January 1, 2016
Tier 2	Compliant	Not Compliant*	ARB minimum compliance through January 2018
Tier 3	Compliant	Not Compliant*	
Tier 4 – Interim (Tier 4i)	Compliant	Compliant	Tier 4i emissions standard that became effective on Jan. 1, 2011
Tier 4 – Final (Tier 4F)	Compliant	Compliant	Tier 4F represents the highest level of clean air regulations proposed to date

Table 1 - Tier requirements overview;

**Exceptions are defined with the GCP specification*

Through the fuel log submittals and equipment lists, we determined Tier 4 interim equipment or better comprised 70% of the equipment used on site across all projects. A project level breakdown is listed below. The “undetermined” category is assigned due to insufficient information in the equipment list (i.e. horsepower, model year, EIN number), which is information required to determine a tier for the piece of equipment. Subsequently, the emissions associated with these were not included in the reduction calculations. The off-road equipment for each of the four capital projects is listed in Figure 2.

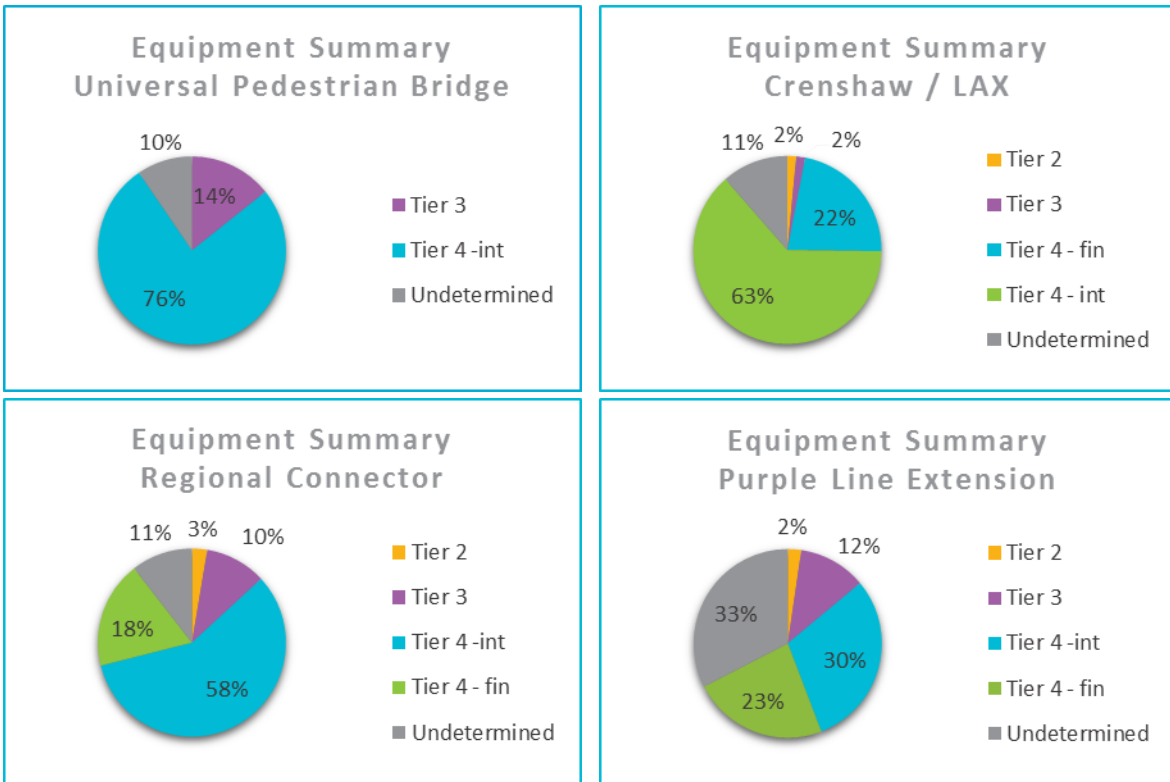


Figure 2 – Equipment Tier by project

IV. EMISSIONS REDUCTIONS

The emission reduction analysis analyzed the following criteria pollutants emitted by the construction equipment. EPA identifies these pollutants based on the human health-based and/or environmentally-based effects. These criteria pollutants included in the analysis are detailed in Table 2. The analysis primarily relies on the carbon dioxide equivalent converted into metric tons, using the Nitrogen Oxide emissions.

	Pollutant	Definition
NOx	Nitrogen Oxides	Nitrogen Oxides are a family of poisonous, highly reactive gases. NOx pollution is emitted by automobiles, trucks and various non-road vehicles (e.g., construction equipment) ²
CO2e	Carbon Dioxide Equivalent	A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). ³
PM ₁₀	Particulate Matter	10 micrometers or less in diameter, also known as inhalable coarse material by the EPA ⁴
ROG	Reactive Organic Gases	Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate.

Table 2 – Criteria pollutants used in Green Construction Policy analysis

In Fiscal Year 2015, Metro calculated the emissions reductions (NO_x, PM₁₀, PM_{2.5}, and ROGs) for the Purple Line Extension Section 1, Crenshaw / LAX, Regional Connector and the Universal Pedestrian Bridge Projects for a worst case scenario. Each of these projects utilized off-road equipment, on-road vehicles or portable generators subject to the GCP. Project specifications required fuel log submittals for the off-road equipment and on-road vehicles for each project be reviewed and tabulated to determine the emissions reductions. The following summarize the CO₂e reductions by pollutant across projects.

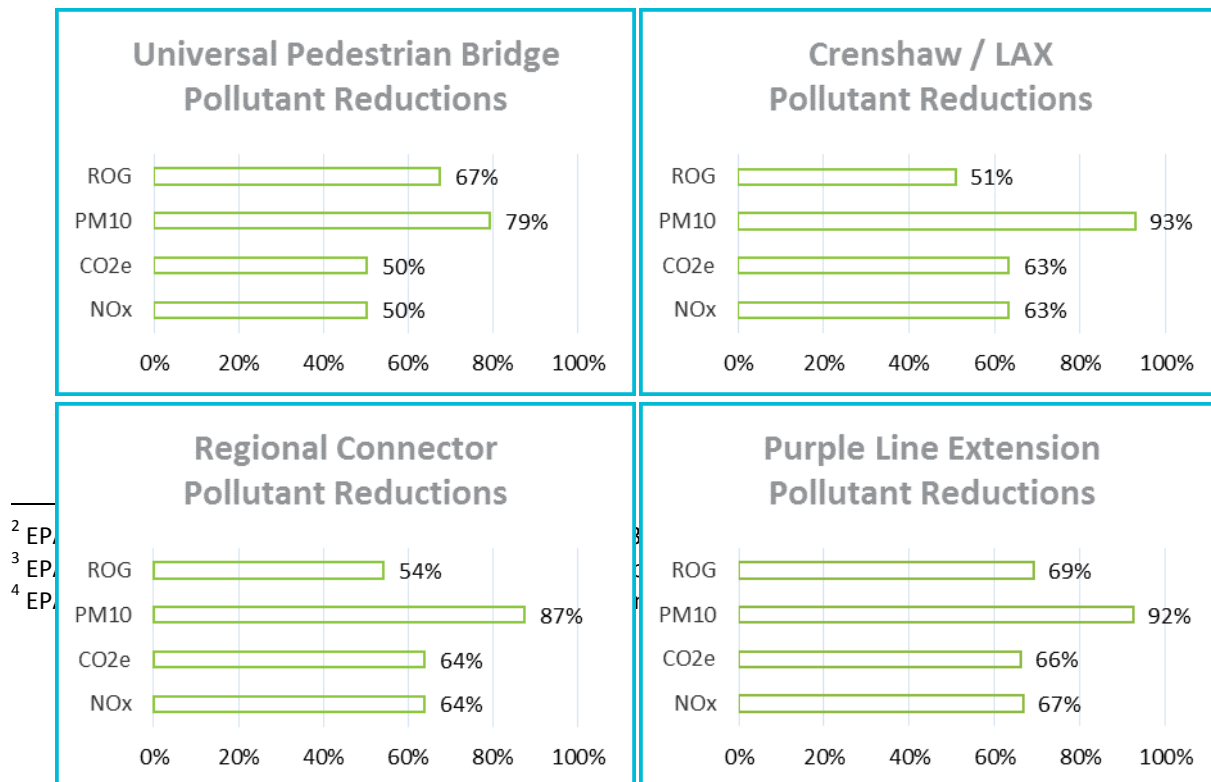


Figure 3 - Percent reduction in criteria pollutants and CO₂e

As indicated in Figure 3, the most significant reductions from using Tier 4 Interim equipment, when compared to Tier 2 equipment, occur in PM₁₀ with an average reduction of 87.5%. However, in terms of volume, Carbon-dioxide equivalents were reduced by 4,000.05 metric tons. According to the Environmental Protection Agency (EPA, 1999)⁵ nitrogen oxides (NO_x) represent seven (7) compounds, including nitrous oxide (N₂O), which forms from tail pipe emissions (EPA, 2016)⁶ and results in harmful ozone production, when combined with sunlight.

Currently, the emission factors for NO_x are available for multiple tiered off-road pieces of equipment. While nitrogen oxides are generally short-lived, nitrous oxides have long atmospheric lifetimes and the carbon dioxide equivalents were based on the global warming potentials of nitrous oxides to account for a worst possible case scenario. It should be noted that as EPA tools and methodologies continually develop for tail pipe emissions of multiple tiered off-road and on-road equipment and vehicles, emissions calculations will be further adjusted in Fiscal Year 2017. The percentage reduction in pollutants from off-road equipment emissions from the use of Tier 4 Interim equipment, when

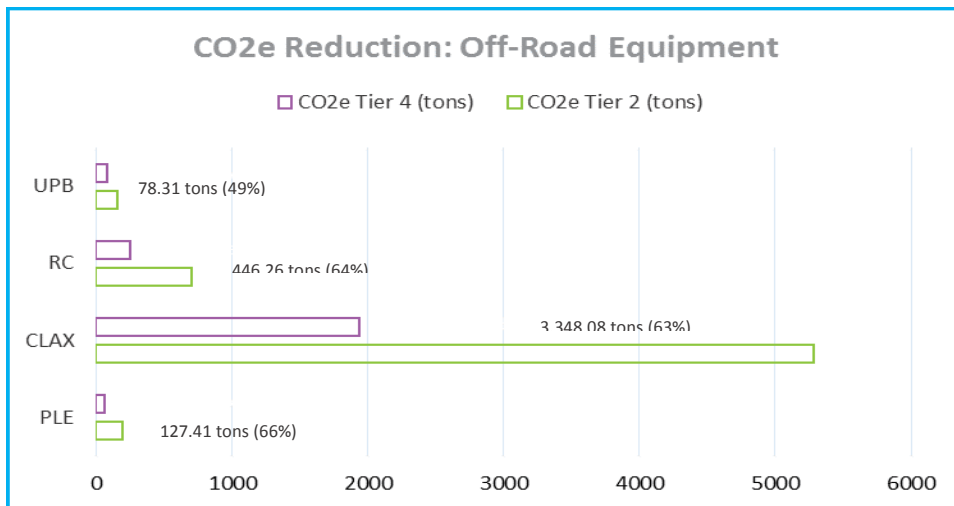


Figure 4 - Percent reduction CO2e and metric tonnage reductions.

compared to Tier 2 equipment reductions, are provided for each project in Figure 4.

Off-Road Emission Reductions

The off-road equipment CO2e emissions reductions from the use of Tier 4 Interim equipment, when compared to Tier 2 equipment, are as follows:

⁵ “Technical Bulletin, Nitrogen Oxides (NO_x) Why and How They Are Controlled”, 1999
<https://www3.epa.gov/ttnca1c1/dir1/fnoxdoc.pdf>

⁶ “Overview of Greenhouse Gases – Nitrous Oxide Emissions”, 2016
<https://www3.epa.gov/climatechange/ghgemissions/gases/n2o.html#Reducing>

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Off-Road Emission Reduction Comparisons

The reductions from using Tier 4 (Interim and Final), as required by the Metro GCP, result in greater emissions reductions than would otherwise occur under ARB regulations. The results of this more

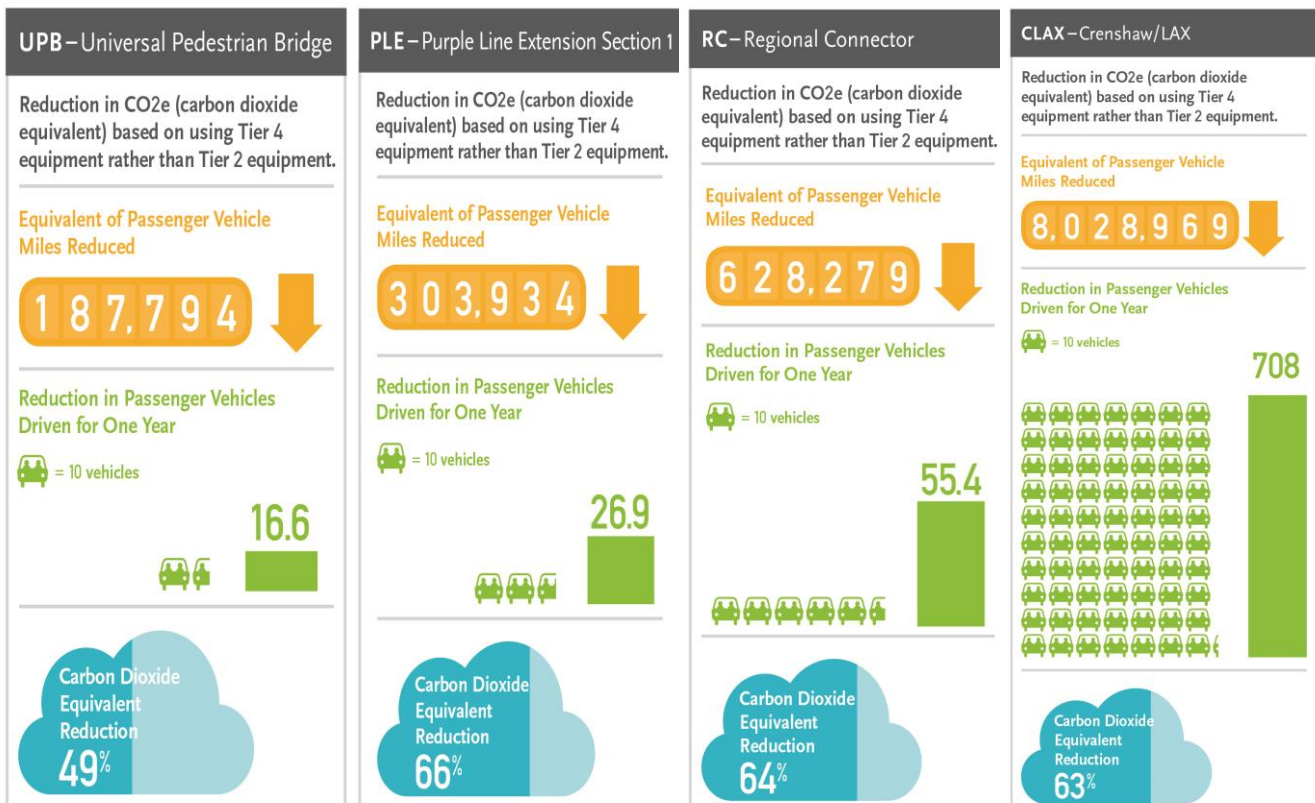


Figure 5 - Project summaries for emissions reductions (CO₂e) based on Tier 4 equipment rather than Tier 2 equipment.

stringent Metro policy can be translated to greenhouse gas and carbon dioxide equivalent reductions. These emissions reductions per project based on using the cleaner Tier 4 equipment mandated by the GCP, rather than Tier 2 equipment required by the ARB, are as follows in Figure 5.⁷

On-Road Equipment Emissions

The Green Construction Policy requires on-road vehicles' engine model year (MY) to be 2007 or newer. Figure 6 shows the relationship between gallons of fuel dedicated by a range of model years and the associated CO₂e emissions. 1998-2009 accounts for 6% of fuel usage, yet contributes to 44% of the

⁷ "EPA Greenhouse Gas Equivalencies Calculator", 2014
<https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

CO2e emissions. Conversely, 2010 and later model years consume 94% of fuel, and only contribute 56% of emission pollutants. The efficiency of newer model years indicate a nonlinear relationship between fuel usage and consequent pollutants, a relationship that highly favors using newer lower emitting construction equipment.

The on-road vehicle emissions reductions from the use of vehicles with engine model years of 2010 and newer, when compared to engine models of 1998 – 2009 are as follows:



Figure 6 –Projects summary for emissions reductions (CO2e) based on Tier 4 equipment rather than Tier 2 equipment.

III. NEXT STEPS

Metro Staff will continue to implement the GCP through the following tasks in Fiscal Year 2017:

- 1) Coordinate and schedule additional workshops jointly with the Air Resources Board (ARB).
- 2) Expand GCP implementation to other capital projects including Division 16, Purple Line Extension Section 2 and Building 61s.
- 3) Conduct construction project conformance reviews on a quarterly basis, and on a monthly basis where Metro deems necessary, based on the quality of contractor submittals.
- 4) Assist the contractors with meeting the GCP requirements through trainings and providing funding information.
- 5) Continue expanding quantification methodology and emissions reporting reductions using newly available tools in 2016.
- 6) Continue to provide Metro with infographics and visual tools for display on the Metro website.
- 7) Revise GCP specifications to include updated goals / timeframes through the year 2020 based on commercially available off-road, on-road, portable generators equipment and alternative fuel / electric equipment.

Staff will report back to the Board at the end of Fiscal Year 2017 to document additional progress of Green Construction Policy implementation.

IV. SUSTAINABILITY PLAN OVERVIEW

Starting in 2012, Metro began including the requirement for Sustainability Plans as part of specifications (Section 01 35 63) to be submitted for Metro's construction projects. The goal of the Sustainability Plan is for project contractors to address sustainable practices in the following categories:

- Planning and Design
- Energy Efficiency
- Water Efficiency and Conservation
- Material Conservation and Resource Efficiency
- Environmental Quality

The Sustainability Plan must include the project's mandatory and voluntary commitments to ensure compliance with Metro's sustainability policy and requirements and California Green Building Standards Code for Mandatory and Voluntary measures (CALGreen), Title 24. Additionally, the specification establishes that the contractor will provide a qualified Sustainability Coordinator that oversees the contractor's monthly submittals and annual Sustainability Plan updates. These reports provide the basis for the content that follows.

V. DISCUSSION

Sustainability Plans ("Plan") requirements are currently being implemented on the Crenshaw/LAX, Purple Line Extension, Regional Connector, Building 61s, and Universal Pedestrian Bridge Projects. The

Emergency Security Operations Center (ESOC) project will be kicking off its Plan in the near future and the new Division 16 rail yard project has yet to submit a Plan. The Universal Pedestrian Bridge project has been completed and we are awaiting their final annual report that will describe the project’s sustainability performance in detail.

In December of 2015, Metro’s sustainability team in ECSD kicked off tasks to elevate the level of compliance with the Sustainability Plan implementation. During the past 6 months, considerable effort has been spent to evaluate project compliance status, improve reporting on sustainability plan progress in monthly and annual reports, and identify gaps in sustainability plans where they do not adequately address mandatory requirements such as compliance with CALGreen Mandatory measures and applicable MRDC Energy Policy. The materials were also developed in 2016, including a Monthly Submittal, Monthly Review, Gap Analysis, CALGreen Report Card, and Annual Report templates. Furthermore, a *Sustainability Plan* template and implementation process document is under development for use by the contractor teams on current and future projects.

Compliance Summary

Key information provided in the contractor submitted 2015 Sustainability Plan Project Annual Reports is summarized below. The following information highlights Sustainability Plan commitments of the Crenshaw/LAX, Purple Line Extension, Regional Connector projects. It should be noted that at this early-stage of Sustainability Plan implementation much of the project performance information is presented as “projections”. This information will be refined annually as the program is implemented and more detailed performance information becomes available.

The following infographic includes the current reported status of the abovementioned projects along the path to required CALGreen State Mandatory Measure Compliance. All projects have committed to compliance with mandatory CALGreen measures in general as a primary objective of their sustainability plan as this is also the primary objective of the Sustainability Plan Specification. The projects, currently in design and early construction phases, have reported they are “on track” for all CALGreen State mandatory measures. Annually, and upon completion of construction, ESCD will assess and verify final compliance percentages.

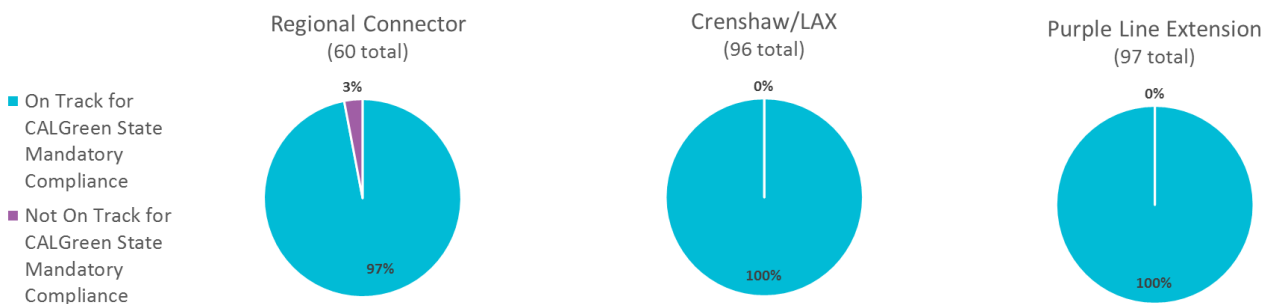


Figure 7 – CALGreen State Mandatory Compliance %

Sustainability Plan Practices

The following information highlights the sustainability practices reported by the Crenshaw/LAX (C/LAX), Purple Line Extension (PLE), Regional Connector (RC) projects for each of the Sustainability Plan specification required areas:

Planning and Design

Planning and Design

PLE – Purple Line Extension

Developing areas for a future bike sharing program that include bike storage units and multiple locations for bike racks. In order to promote the Metro Bike Sharing program, project designs do not include vehicle parking at stations.



Complying with Metro's new Vision Zero policy being implemented in Los Angeles.

We are focusing on improving our streets, during construction and for future use, for vulnerable roadway users to encourage walking and biking.



Energy Efficiency

Planning and Design	
RC – Regional Connector and PLE – Purple Line Extension Section 1	
	<p>Exceeds Metro Standards for LED Lighting, thus reducing cable sizes, losses in the cables and increasing available power on the feeders.</p> 
	<p>Improved overhead contact cable that minimizes wear and tear, reducing maintenance and materials costs.</p> 
	<p>Utilizes a single fan type for both emergency ventilation and normal operations instead of more traditional separate fan plant approach. This is a more economical design and lessens the station footprint and reduces the overall environmental impact.</p> 

Water Efficiency and Conservation

Water Efficiency and Conservation

RC – Regional Connector and PLE – Purple Line Extension Section 1



Smart irrigation controller, drip irrigation system, and native plants with low water use.



Low flow toilets, sensor operated low flow faucets, and hand dryers instead of paper towel products.



Material Conservation and Resource Efficiency

Material Conservation and Resource Efficiency

CLAX – Crenshaw/LAX

Reused crushed concrete/asphalt as temporary base, rather than purchasing new crushed miscellaneous base material, resulting in cost savings.



Approximately 100% viable soil is being used as backfill for mechanically stabilizing earth (MSE) walls.

Refurbished viable wood 1,000 tons of wood ties.



Many tons of railroad ballasts recycled or re-used to stabilize soil during construction to reduce mud and dust.



Unviable, contaminated soil sent to landfill for proper disposal.



5 million pounds of unviable wood disposed as Treated Wood Waste.

Contaminated ballasts hauled to hazardous waste site.



Reuse Reduces...



Truck Loads, Traffic Disturbances, Dust Generation



Costs on New Materials and Wear and Tear on Equipment



Energy Use and Greenhouse Gas Emissions

Environmental Quality

Environmental Quality

RC – Regional Connector and CLAX



By partnering with LADWP in the Green Power Program, Metro supports the development of new green power resources and receives 20% of the project power from renewables owned and operated by LADWP.

Reuse of felled trees to make drums, resulting in environmental, economic, and social benefits by avoiding long hauling, providing materials to a local business, and the creation of a positive association between the community members, this project and METRO.



VI. Next Steps

Metro's Sustainability Team will continue to provide the Board the Sustainability Program Annual Review. Environmental and cost performance metrics will be refined annually as the project is implemented and more detailed performance information will be reported for the following:

- Updated Percent of CALGreen project compliance to State Mandatory Measures
- CO₂ Reduction Resulting from Bike Spaces
- Annual GHG benefits from Water, Energy, Bike/EV
- Savings from Water and Energy Reductions
- Reduction of Energy Demand in Kwh
- Renewable or Alternative Energy generation (kWh)
- Water Savings in G/Y for Indoor Potable, Wastewater, And Recycled Water
- Tons of Waste Diverted from Landfills
- Emissions Reduction from reduced Truck Trips per day and miles traveled per day

In addition, ECSD will conduct Sustainability Plan Workshops with project teams to ensure a clear understanding of reporting requirements, baseline data, and methodologies for the collection and reporting of annual report data.

VII. APPENDICES

I. Appendix A – Off-Road Annual Summaries

a) Universal Pedestrian Bridge

	Tier	NO _x	CO ₂ e	PM ₁₀	ROG
UPB	Tier 2 (lbs)	1,137.59	352,653.95	42.00	53.48
UPB	Tier 4 (lbs)	566.53	175,623.76	8.69	17.47

b) Regional Connector

	Tier	NO _x	CO ₂ e	PM ₁₀	ROG
RC	Tier 2 (lbs)	4,973.56	1,542,224.68	128.07	177.91
RC	Tier 4 (lbs)	1,800.04	558,228.67	16.26	81.59

c) Purple Line Extension

	Tier	NO _x	CO ₂ e	PM ₁₀	ROG
PLE	Tier 2 (lbs)	1,358.34	424,832.97	42.52	58.07
PLE	Tier 4 (lbs)	452.32	143,899.83	3.21	17.86

II. Appendix B – On-Road Annual Summaries

a) Universal Pedestrian Bridge

	Model Year	Gallons	NOx	CO2e	PM ₁₀
UPB	1998 - 2009 (lbs)	202.70	26.47	8,204.99	0.61
UPB	2010 - later (lbs)	90.00	0.73	227.58	0.04

b) Regional Connector

	Model Year	Gallons	NOx	CO2e	PM ₁₀
RC	1998 - 2009 (lbs)	1,868.37	179.94	55,782.83	3.61
RC	2010 - later (lbs)	7,734.03	63.09	18,690.24	3.15

c) Purple Line Extension

	Model Year	Gallons	NOx	CO2e	PM ₁₀
PLE	1998 – 2009 (lbs)	387	55.94	5908.55	37.16
PLE	2010 – later (lbs)	262	20.64	681.01	18.61

d) CLAX

	Model Year	Gallons	NOx	CO2e	PM ₁₀
CLAX	1998 – 2009 (lbs)	875	134.18	41596.45	3.26
CLAX	2010 – later (lbs)	47596.5	388.24	120355.3	8.96

III. Appendix C - < 50 HP

a) Universal Pedestrian Bridge

		NOx	CO2e	PM ₁₀	ROG
UPB	Tier 4 (lbs)	82.14	25,464.23	4.97	5.15

b) Regional Connector – N/A

c) Purple Line Extension –

		NOx	CO2e	PM ₁₀	ROG
PLE	Tier 2 (lbs)	26.25	11,883.31	2.32	2.40
PLE	Tier 4 (lbs)	24.69	11,336.61	0.99	0.99

d) CLAX

		NOx	CO2e	PM ₁₀	ROG
CLAX	Tier 2 (lbs)	1.89	585.38	0.11	0.12

IV. Appendix D – Project Descriptions

Crenshaw/LAX	
Project Description	The Metro Crenshaw/LAX Line will extend from the existing Metro Exposition Line at Crenshaw and Exposition Boulevards. The Line will travel 8.5 miles to the Metro Green Line and will serve the cities of Los Angeles, Inglewood and El Segundo; and portions of unincorporated Los Angeles County.
Start Date	January 21, 2014
Proposed Completion Date	2019
Completion of Design Phase	90%
Completion of Construction Phase	30% of Tracks
Innovative Sustainable Element	The project collaborated with a local drum maker to rescue tree trunks of felled trees within the community to create drums which avoided long hauling, providing materials to a local business (by-product synergy), and the creation of a positive association between the community members, this project, and Metro.
Notable Challenge/Lesson Learned	For a design-build project such as Crenshaw/LAX, there is no contingency budget to incorporate sustainable practices that have premium costs.

Purple Line Extension #1	
Project Description	The Metro Rail extension, which will be built in three phases, will continue from the current station at Wilshire/Western extending westward for about nine miles along Wilshire Boulevard into Westwood. Section #1 is 3.92 miles and extends the line to the Wilshire/La Cienega Station
Start Date	November 11, 2014
Proposed Completion Date	2023
Completion of Design Phase	90% and 60% for Wilshire/La Cienega
Completion of Construction Phase	5%
Innovative Sustainable Element	
Notable Challenge/Lesson Learned	