APPENDIX I

Greenhouse Gas Emissions Technical Report

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GREENHOUSE GAS EMISSIONS TECHNICAL REPORT

NORTH HAIWEE DAM NO. 2 PROJECT

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

1 Introduction

North Haiwee Dam (NHD or existing Dam) is located in the Owens Valley in unincorporated areas of Inyo County, California, approximately 150 miles north of Los Angeles. Owens Valley is a part of the Great Basin Unified Air Pollution Control District (GBUAPCD). This greenhouse gas (GHG) analysis was prepared to support the environmental review process and provide information regarding potential impacts to global climate change associated with the construction and operation of the Proposed Project.

GHG emissions have the potential to adversely affect the environment because such emissions contribute, on a cumulative basis, to global climate change. Global climate change also has the potential to result in sea level rise (resulting in flooding of low-lying areas), affect rainfall and snowfall (leading to changes in water supply and runoff), affect temperatures and habitats (affecting biological and agricultural resources), and result in many other adverse effects.

Legislation, regulations, and executive orders (EO) on the subject of climate change have established federal and statewide contexts and processes for developing an enforceable cap on GHG emissions. Given the nature of environmental consequences from GHGs and global climate change, the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) require that lead agencies evaluate the cumulative impacts of GHGs, even relatively small additions, on a global basis.

The purpose of this report is to discuss global climate change and existing GHG emissions sources; summarize applicable federal, state, and local regulations; and analyze the impacts from construction and operation of the Proposed Project.

2 Project Description

The Los Angeles Department of Water and Power (LADWP) proposes to improve the seismic reliability of the North Haiwee Reservoir (NHR), which is located in the Owens Valley, California, approximately 150 miles north of Los Angeles. LADWP has prepared this draft joint Environmental Impact Report/Environmental Assessment (EIR/EA) in cooperation with the Bureau of Land Management (BLM). The purpose of the North Haiwee Dam No. 2 Project (Proposed Project) is to construct North Haiwee Dam No. 2 (NHD2 or new Dam) to the north of the existing Dam, which impounds NHR. Seismic studies have found that NHD would have potential to fail during a Maximum Credible Earthquake event, the largest possible earthquake which could happen. NHD2 would serve to improve the seismic reliability of NHR in the event that the existing Dam is damaged or breached by an earthquake event, thereby ensuring public health and safety and securing the City’s water source. The Proposed Project would provide sufficient seismic reliability for NHR, maintain the function of an essential water conveyance infrastructure component for the City of Los Angeles, and protect local populations from a hazardous flooding event. The Proposed Project would also create a basin between NHD2 and NHD, allowing LADWP to divert water from the Los Angeles Aqueduct (LAA), through the basin, and through a notch in NHD into NHR.

This technical report includes the evaluation of the No Project Alternative, as well as two Build Alternatives: the Cement Deep Soil Mixing (CDSM) Alternative and the Excavate and Recompact Alternative. The Proposed Project consists of the following components, which are common to both Build Alternatives:

- Construction of the NHD2 components: NHD2, the east and west berms, and grading of the basin area between NHD and NHD2;
- Realignment of Cactus Flats Road;
- Realignment of the LAA and construction of the diversion structure and temporary bridge;

- Construction of the diversion channel and NHD modifications;
- Excavation of materials from Borrow Site 10[1]; and
- Purchase and hauling of materials from Borrow Site 15.

The differentiating component between the two Build Alternatives is the method of construction of the foundation of NHD2, which affects the timeline and construction efforts of the NHD2 components and use of Borrow Sites 10 and 15. Construction of the remaining Proposed Project components is the same between the two Build Alternatives, except for the timeline of the diversion channel and NHD modifications.

Refer to Chapter 1.0 Introduction and Chapter 2.0 Project Description and Alternatives of the Draft EIR/EA for the full description of the Proposed Project, including purpose and need, objectives, regulatory requirements, alternatives, construction, and operations. Borrow Site 10 refers to the LAA Excavation Area and Borrow Site 15 refers to the existing nine in Keeler in the Draft EIR/EA.

3 Methodology

3.1 Emissions

Construction-related exhaust emissions for the Proposed Project were estimated for construction worker commutes, haul trucks, and the use of off-road equipment. Construction-related emissions for the Proposed Project were estimated using emission factors from California Air Resources Board's (CARB) OFFROAD and Emissions Factor Model (EMFAC2014) inventory models (CARB, 2013). Construction emissions from the operation of diesel-fueled off-road equipment were estimated by multiplying daily usage (i.e., hours per day) and total days of construction by OFFROAD equipment-specific emission factors. GHG emissions from on-road motor vehicles were estimated using vehicle trips, vehicle miles traveled, and EMFAC2014 mobile source emission factors. The emission factors represent the fleet-wide average emission factors within Inyo County.

Operation of the Proposed Project would be generally similar to existing conditions. As such, the Proposed Project would not substantially increase the generation or use of electricity, water, wastewater, or solid waste relative to existing conditions. Thus, operational impacts of the Proposed Project are evaluated qualitatively, and no operational GHG emissions were estimated.

3.2 Evaluating CEQA Impacts

According to Appendix G of the CEQA Guidelines, a project's GHG emissions and its incremental contribution to global climate change would be considered significant if it would do either of the following:

- Generate GHG emissions, either directly or indirectly, that may have a significant cumulative impact on the environment, or
- Conflict with an applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the emissions of GHGs.

3.2.1 Screening Thresholds

The California Supreme Court, in *Center for Biological Diversity v. Department of Fish and Wildlife* (Case No. S217763), held that the lead agencies must connect the thresholds of significance to individual project emissions. As the GBUAPCD and the County of Inyo have not established screening thresholds for GHG emissions, the analysis uses the applicable significance thresholds developed by the South Coast

[1] Borrow Site 10 refers to the LAA Excavation Area and Borrow Site 15 refers to the existing mine in Keeler in the Draft EIR/EA.

Air Quality Management District (SCAQMD). The SCAQMD has adopted a significance threshold of 10,000 metric tons (MT) of carbon dioxide equivalents (CO_2e) per year for industrial (stationary source) projects (SCAQMD, 2008). The GHG CEQA Significance Threshold Stakeholder Working Group recommended options for evaluating non-industrial projects, including thresholds for residential, commercial, and mixed use projects (SCAQMD, 2009). These draft thresholds include a threshold of 3,500 MT CO_2e per year for residential projects, 1,400 MT CO_2e per year for commercial projects, and 3,000 MT CO_2e per year for mixed use projects.

The thresholds are based on an emission capture rate of 90 percent for all new or modified projects. A 90 percent emission capture rate means that 90 percent of total emissions from all new or modified stationary source projects would be subject to a CEQA analysis. A GHG significance threshold based on a 90 percent emission capture rate is appropriate to address the long-term adverse impacts associated with global climate change because most projects will be required to implement GHG reduction measures. The emission thresholds capture a substantial fraction of projects that will be constructed to accommodate future statewide population and economic growth.

The SCAQMD recommends that construction emissions associated with a project be amortized over the life of the project (typically 30 years) and added to the operational emissions. Therefore, this analysis includes a quantification of the total modeled construction-related GHG emissions. Those emissions are then amortized and evaluated as a component of the Proposed Project's operational emissions over the 30-year life of the project.

The project type is closest to an industrial project (i.e., does not contain residential or commercial land uses), and therefore, this analysis compares the annual construction and operational emissions to the threshold of 10,000 MT CO_2e per year. It is not the intent of LADWP to adopt this threshold as a mass emissions limit for this or other projects, but rather to provide this additional information to put the Project-generated GHG emissions in the appropriate statewide context.

3.2.2 Evaluating Impacts Related to Climate Action Plans

At the time of this writing, GBUAPCD and Inyo County have not developed Climate Action Plans (CAP). However, in May 2007, the City of Los Angeles released its CAP, "*Green LA: An Action Plan to Lead the Nation in Fighting Global Warming*." The CAP is a voluntary plan that identifies over 50 action items, grouped into focus areas, to reduce emissions. LADWP developed a Sustainability Plan in 2009 that documents LADWP's sustainability initiatives and accomplishments. Therefore, for the purposes of this analysis, the applicable GHG reduction plans to evaluate and compare the Proposed Project to are the AB (Assembly Bill) 32 CARB Scoping Plan, the City of Los Angeles' CAP, and the LADWP Sustainability Plan. If the Proposed Project is consistent with the goals and strategies of these plans, it would not be considered to conflict with the plan's purpose of reducing GHG emissions.

3.3 Evaluating NEPA Impacts

The NEPA analysis is based on the emissions reporting limit of 25,000 MT CO_2e per year as required by the Mandatory Greenhouse Gas Reporting Rule. If the Proposed Action exceeds 25,000 MT CO_2e per year, the Proposed Action would have a substantial adverse effect on the environment.

4 Regulatory Framework

4.1 Federal

The U.S. Environmental Protection Agency (USEPA) is the federal agency responsible for implementing the federal Clean Air Act (CAA). The Supreme Court of the United States ruled on April 2, 2007, that carbon dioxide (CO_2) is an air pollutant as defined under the CAA, and that USEPA has the authority to regulate emissions of GHGs.

4.1.1 Greenhouse Gas Findings under the Federal Clean Air Act

On December 7, 2009, USEPA signed two distinct findings regarding GHGs under section 202(a) of the CAA:

- Endangerment Finding: The Administrator finds that the current and projected concentrations of the six key well-mixed GHGs—carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6)—in the atmosphere threaten the public health and welfare of current and future generations.
- Cause or Contribute Finding: The Administrator finds that the combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution which threatens public health and welfare.

Although these findings did not themselves impose any requirements on industries or other entities, this action was a prerequisite to finalizing USEPA's Proposed Greenhouse Gas Emission Standards for Light-Duty Vehicles. On May 7, 2010, the final Light-Duty Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards were published in the Federal Register. The emissions standards will require model year 2016 vehicles to meet an estimated combined average emissions level of 250 grams of CO_2 per mile, which is equivalent to 35.5 miles per gallon if the automobile industry were to meet this CO_2 level solely through fuel economy improvements.

On August 28, 2012, the U.S. Department of Transportation (USDOT) and USEPA issued a joint Final Rulemaking requiring additional federal GHG and fuel economy standards for model year 2017 through 2025 passenger cars and light-duty trucks. The standards would require these vehicles to meet an estimated combined average emissions level of 163 grams of CO_2 per mile in model year 2025, which is equivalent to 54.5 miles per gallon if the improvements were made solely through fuel efficiency.

In addition to the standards for light-duty vehicles, USDOT and USEPA adopted complementary standards to reduce GHG emissions and improve the fuel efficiency of heavy-duty trucks and buses on September 15, 2011. These standards together form a comprehensive heavy-duty national program for all on-road vehicles rated at a gross vehicle weight at or above 8,500 pounds for model years 2014 through 2018. The standards phase in with increasing stringency in each model year from 2014 to 2018. The USEPA standards adopted for 2018 will represent an average per-vehicle reduction in GHG emissions of 17 percent for diesel vehicles and 12 percent for gasoline vehicles (USEPA, 2011).

4.1.2 Mandatory Greenhouse Gas Reporting Rule

On September 22, 2009, USEPA published the Final Mandatory Greenhouse Gas Reporting Rule (Reporting Rule) in the Federal Register. The Reporting Rule requires reporting of GHG data and other relevant information from fossil fuel and industrial GHG suppliers, vehicle and engine manufacturers, and all facilities that would emit 25,000 MT CO_2e or more per year. Facility owners are required to submit an annual report with detailed calculations of facility GHG emissions on March 31 for emissions from the previous calendar year. The Reporting Rule also mandates recordkeeping and administrative requirements to enable USEPA to verify the annual GHG emissions reports.

4.2 State

CARB is the agency responsible for coordination and oversight of state and local air pollution control programs in California and for implementing the California CAA.

4.2.1 Assembly Bill 1493

AB 1493 requires CARB to develop and implement regulations to reduce automobile and light truck GHG emissions. These stricter emissions standards were designed to apply to automobiles and light trucks beginning with model year 2009. In June 2009, the USEPA Administrator granted a CAA waiver of preemption to California. This waiver allowed California to implement its own GHG emissions standards for motor vehicles beginning with model year 2009. California agencies worked with federal agencies to conduct joint rulemaking to reduce GHG emissions for passenger car model years 2017 to 2025.

4.2.2 Executive Order S-3-05

EO S-3-05, signed in June 2005, proclaimed that California is vulnerable to the impacts of climate change. EO S-3-05 declared that increased temperatures could reduce the Sierra Nevada's snowpack, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the EO established total GHG emissions targets. Specifically, emissions are to be reduced to the 2000 level by 2010, the 1990 level by 2020, and to 80 percent below the 1990 level by 2050.

4.2.3 Assembly Bill 32

In 2006, California passed the California Global Warming Solutions Act of 2006 (AB 32; California Health and Safety Code Division 25.5, Sections 38500, et seq.). AB 32 further details and puts into law the mid-term GHG reduction target established in EO S-3-05, which is to reduce statewide GHG emissions to 1990 levels by 2020 and 80 percent below 1990 levels by 2050. AB 32 also identifies CARB as the state agency responsible for the design and implementation of emissions limits, regulations, and other measures to meet the target.

In December 2008, CARB adopted its Climate Change Scoping Plan (Scoping Plan), which contains the main strategies California will implement to achieve the required GHG reductions required by AB 32 (CARB, 2008). The Scoping Plan also includes ARB-recommended GHG reductions for each emissions sector of California's GHG inventory. CARB further acknowledges that decisions about how land is used will have large impacts on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emissions sectors.

CARB is required to update the Scoping Plan at least once every five years to evaluate progress and develop future inventories that may guide this process. CARB approved the first update to the Climate Change Scoping Plan: Building on the Framework in June 2014 (CARB, 2014a). The Scoping Plan update includes a status of the 2008 Scoping Plan measures and other federal, state, and local efforts to reduce GHG emissions in California, and potential actions to further reduce GHG emissions by 2020.

4.2.4 Executive Order S-1-07

EO S-1-07, which was signed by then California Governor Arnold Schwarzenegger in 2007, proclaims that the transportation sector is the main source of GHG emissions in California, at more than 40 percent of statewide emissions. EO S-1-07 establishes a goal that the carbon intensity of transportation fuels sold in California should be reduced by a minimum of 10 percent by 2020. CARB adopted the low carbon fuel standard on April 23, 2009.

4.2.5 Senate Bill 97

Senate Bill (SB) 97 required the Governor's Office of Planning and Research to develop recommended amendments to the CEQA Guidelines for addressing GHG emissions. The amendments became effective on March 18, 2010.

4.2.6 Senate Bill 1078, SB 107, and SB X1-2

SB 1078 established California's Renewable Portfolio Standard (RPS) in 2002. SB 1078 required retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide at least 20 percent of their supply from renewable sources by 2017. SB 107 changed the target date to 2010. Executive Order S-14-08 expanded the state's Renewable Energy Standard to 33 percent renewable power by 2020. This new goal was codified in 2011 with the passage of SB X1-2.

SB 1078 did not apply directly to municipally-owned utilities, such as LADWP; however, it did require those utilities to develop their own RPS. LADWP has met its goal of 20 percent by 2010 and has identified a goal to increase the supply of renewable energy to 35 percent by 2020.

4.2.7 Executive Order B-30-15

In April 2015, Governor Edmund Brown issued an EO establishing a statewide GHG reduction goal of 40 percent below 1990 levels by 2030. The emission reduction target acts as an interim goal between the AB 32 goal (i.e., achieve 1990 emission levels by 2020) and Governor Brown's EO S-03-05 goal of reducing statewide emissions 80 percent below 1990 levels by 2050. In addition, the EO aligns California's 2030 GHG reduction goal with the European Union's reduction target (i.e., 40 percent below 1990 levels by 2030) that was adopted in October 2014.

4.3 Regional and Local

CARB also acknowledges that local governments have broad influence and, in some cases, exclusive jurisdiction over activities that contribute to significant direct and indirect GHG emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and municipal operations.

4.3.1 Great Basin Unified Air Pollution Control District

In Inyo County, the GBUAPCD is the agency responsible for protecting public health and welfare through the administration of federal and state air quality laws and policies. The GBUAPCD has no regulations relative to GHG emissions.

4.3.2 Inyo County

Inyo County is in the process of preparing a Cost, Energy and Service Efficiencies Action Plan (County of Inyo, 2012). This planning effort will identify and promote activities that lead to long-term sustainable changes that support energy efficiency. As a part of this planning effort, the County adopted an Energy Action Plan in 2012. This plan outlines the strategies and programs that will guide energy reduction throughout the County (County of Inyo, 2012). The primary focus of the plan is on energy efficiencies that can be achieved in new and existing buildings.

The County has also been addressing the need to implement energy efficiencies through its General Plan process. The draft Conservation/Open Space Element of the Inyo County General Plan contains several policies which indirectly address global climate change (County of Inyo, 2014).

In addition to the Conservation/Open Space Element amendment, the County adopted a Renewable Energy General Plan Amendment in March 2015 which included updates to several elements of the County General Plan that address potential utility scale and commercial scale renewable energy solar facilities within the County.

4.3.3 City of Los Angeles/LADWP

In May 2007, the City of Los Angeles released its CAP, "*Green LA: An Action Plan to Lead the Nation in Fighting Global Warming*." The City of Los Angeles' CAP sets forth a goal of reducing the City's GHG emissions to 35 percent below 1990 levels by the year 2030. The CAP is a voluntary plan that identifies over 50 action items, grouped into focus areas, to reduce emissions. One of the key strategies listed in the Green LA Plan related to energy and water includes increasing the use of renewable energy to 35 percent by 2020. ClimateLA is the implementation program that provides detailed information, including a context, lead departments, and a timeline for completion, for each action item discussed in the City of Los Angeles' CAP. Where possible, the ClimateLA program document includes potential CO_2 emission reductions from full implementation of the measures.

LADWP developed a Sustainability Plan in 2009 that documents LADWP's sustainability initiatives and accomplishments. LADWP's Sustainability Plan includes goals and strategies for renewable energy, energy conservation and efficiency programs, sustainable water supply, and sustainable design practices in LADWP business operations.

5 Existing Conditions

5.1 Scientific Basis of Climate Change

Certain gases in the earth's atmosphere, classified as GHGs, play a critical role in determining the earth's surface temperature. A portion of the solar radiation that enters the earth's atmosphere is absorbed by the earth's surface, and a smaller portion of this radiation is reflected back toward space. This infrared radiation (i.e., thermal heat) is absorbed by GHGs within the earth's atmosphere. As a result, infrared radiation released from the earth that otherwise would have escaped back into space is instead "trapped," resulting in a warming of the atmosphere. This phenomenon, known as the "greenhouse effect," is responsible for maintaining a habitable climate on the earth.

GHGs are present in the atmosphere naturally, are released by natural and anthropogenic sources, and are formed from secondary reactions taking place in the atmosphere. Natural sources of GHGs include the respiration of humans, animals and plants, decomposition of organic matter, and evaporation from the oceans. Anthropogenic sources include the combustion of fossil fuels, waste treatment, and agricultural processes. The following are GHGs that are widely accepted as the principal contributors to human-induced global climate change:

- CO_2
- CH_4
- N_2O
- HFCs
- PFCs
- SF_6
- Nitrogen Trifluoride (NF_3)

The majority of CO_2 emissions are byproducts of fossil fuel combustion. CH_4 is the main component of natural gas and is associated with agricultural practices and landfills. N_2O is a colorless GHG that results from industrial processes, vehicle emissions, and agricultural practices. HFCs are synthetic chemicals used as a substitute for chlorofluorocarbons in automobile air conditioners and refrigerants. PFCs are produced as a byproduct of various industrial processes associated with aluminum production and the manufacturing of semiconductors. SF_6 is an inorganic, odorless, colorless, nontoxic, nonflammable GHG used for insulation in electric power transmission and distribution equipment, and in semiconductor manufacturing. NF_3 is used in the electronics industry during the manufacturing of consumer items, including photovoltaic solar panels and liquid-crystal-display (i.e., LCD) television screens.

Global warming potential (GWP) is a concept developed to compare the ability of each GHG to trap heat in the atmosphere relative to CO_2. The GWP of a GHG is based on several factors, including the relative effectiveness of a gas in absorbing infrared radiation and length of time (i.e., lifetime) that the gas remains in the atmosphere ("atmospheric lifetime"). The reference gas for GWP is CO_2; therefore, CO_2 has a GWP of 1. The other main GHGs that have been attributed to human activity include CH_4, which has a GWP of 28, and N_2O, which has a GWP of 265 (IPCC, 2013). For example, one ton of CH_4 has the same contribution to the greenhouse effect as approximately 28 tons of CO_2. GHGs with lower emissions rates than CO_2 may still contribute to climate change because they are more effective at absorbing outgoing infrared radiation than CO_2 (i.e., high GWP). The concept of CO_2e is used to account for the different GWP potentials of GHGs to absorb infrared radiation.

Although the exact lifetime of any particular GHG molecule is dependent on multiple variables, it is understood by scientists who study atmospheric chemistry that more CO_2 is emitted into the atmosphere than is sequestered by ocean uptake, vegetation, and other forms of sequestration. GHG emissions related to human activities have been determined as "extremely likely" to be responsible (indicating 95 percent certainty) for intensifying the greenhouse effect and leading to a trend of unnatural warming of the earth's atmosphere and oceans, with corresponding effects on global circulation patterns and climate (CARB, 2014a).

5.2 GHG Sources

GHG emissions contributing to global climate change are attributable in large part to human activities associated with the transportation, industrial/manufacturing, electric utility, residential, commercial, and agricultural categories. The majority of CO_2 emissions are byproducts of fossil fuel combustion, and CH_4, a highly potent GHG, is the primary component in natural gas and is associated with agricultural practices and landfills. N_2O is also largely attributable to agricultural practices and soil management.

For purposes of accounting for and regulating GHG emissions, sources of GHG emissions are grouped into emission categories. CARB identifies the following main GHG emission categories that account for most anthropogenic GHG emissions generated within California:

- Transportation: On-road motor vehicles, off-road equipment, recreational vehicles, aviation, ships, and rail
- Electric Power: Use and production of electrical energy
- Industrial: Mainly stationary sources (e.g., boilers and engines) associated with process emissions
- Commercial and Residential: Area sources, such as landscape maintenance equipment, fireplaces, and consumption of natural gas for space and water heating
- Agriculture: Agricultural sources that include off-road farm equipment; irrigation pumps; crop residue burning (CO_2); and emissions from flooded soils, livestock waste, crop residue decomposition, and fertilizer volatilization (CH_4 and N_2O)
- High GWP: Refrigerants for stationary and mobile-source air conditioning and refrigeration, electrical insulation (e.g., SF_6), and various consumer products that use pressurized containers
- Recycling and Waste: Waste management facilities and landfills; primary emissions are CO_2 from combustion and CH_4 from landfills and wastewater treatment

5.2.1 California

CARB performs an annual GHG inventory for the six major GHGs. California produced 459 million metric tons of CO_2e in 2013. Combustion of fossil fuel in the transportation category was the single largest source of California's GHG emissions in 2013, accounting for 37 percent of total GHG emissions in the State. The transportation category was followed by the industrial category, which accounts for

23 percent of total GHG emissions in California, and the electric power category (including in-state and out-of-state sources), which accounts for 20 percent of the State's total GHG emissions (CARB, 2014b).

5.2.2 Inyo County

Inyo County emitted approximately 3,618 MT of GHGs in 2011 (County of Inyo, 2012). Unleaded gasoline was the largest emissions source, accounting for approximately 47 percent of total emissions. Electricity was the next largest source of emissions at 29 percent of the total.

6 Impact Analysis

6.1 Generate GHG emissions

6.1.1 Construction Impacts

Excavate and Recompact Alternative

Construction-related GHG exhaust emissions would be generated by sources such as heavy-duty diesel off-road equipment, trucks hauling materials from the borrow sites, and construction worker commutes. Construction emissions were estimated based on the construction data provided in Chapter 2.0 of the Draft EIR/EA and using the earliest calendar year when construction could begin (i.e., 2018) to generate conservative estimates. If construction occurs in later years, advancements in engine technology, retrofits, and turnover in the equipment fleet may result in lower levels of emissions. The annual construction emissions include all construction phases for the Excavate and Recompact Alternative and are shown in Table 1.

TABLE 1
EXCAVATE AND RECOMPACT ALTERNATIVE – CONSTRUCTION-RELATED GHG EMISSIONS (MT CO_2e/year)

Year	Emissions (MT CO_2e)
2018	1,769
2019	2,432
2020	14,689
2021	14,054
2022	11,798
2023	9,479
2024	421
Total	**54,642**
30-Year Amortized Emissions	**1,821**
SCAQMD Significance Threshold	**10,000**
Exceeds Threshold?	**No**

Notes: Totals may not add due to rounding.
MT CO_2e = metric tons of carbon dioxide equivalent
Additional details available in Appendix A.
Source: AECOM, 2017

As shown in Table 1, the maximum annual emissions would be 14,689 MT CO_2e in 2020. Total emissions over the entire construction period for the Excavate and Recompact Alternative would be approximately 54,642 MT CO_2e. When this total is amortized over the 30-year life of the Excavate and Recompact Alternative, annual construction emissions would be approximately 1,821 MT CO_2e per year. It should be noted that although all GHG emissions are important with respect to climate change because of the atmospheric lifetimes of GHGs, construction emissions would cease following completion of the

Excavate and Recompact Alternative. As shown in Table 1, the amortized construction-related CO_2e emissions associated with the Excavate and Recompact Alternative would be less than the 10,000 MT CO_2e per year, the threshold of significance recommended by the SCAQMD. Therefore, impacts related to generation of GHG emissions during construction under the Excavate and Recompact Alternative, either directly or indirectly, would be less than significant.

The maximum annual GHG emissions of 14,689 MT CO_2e would also not exceed the NEPA threshold of 25,000 MT CO_2e per year. Therefore, under NEPA, the Excavate and Recompact Alternative would not result, either directly or indirectly, in a substantial adverse effect related to the generation of GHG emissions.

CDSM Alternative

The construction schedule and heavy-duty off-road equipment use for the Cactus Road Realignment, the LAA Realignment, and the diversion channel were assumed to be consistent with the Excavate and Recompact Alternative. NHD2 would be constructed as it would under the Excavate and Recompact Alternative; however, the off-road equipment, haul truck trips, and schedule for that construction phase would vary from the Excavate and Recompact Alternative. The notch and basin protection measures would also be constructed as it would under the Excavate and Recompact Alternative; however, the schedule for that construction phase would be different under the CDSM Alternative. The emissions associated with the borrow site material includes haul truck trips from Borrow Sites 10 and 15. The annual construction emissions for the CDSM Alternative are shown in Table 2.

TABLE 2
CDSM ALTERNATIVE – CONSTRUCTION-RELATED GHG EMISSIONS (MT CO_2e/year)

Year	Emissions (MT CO_2e)
2018	1,769
2019	2,565
2020	14,544
2021	13,716
2022	12,979
2023	4,144
Total	**49,717**
30-Year Amortized Emissions	**1,657**
SCAQMD Significance Threshold	**10,000**
Exceeds Threshold?	**No**

Notes: Totals may not add due to rounding.
MT CO_2e = metric tons of carbon dioxide equivalent
Additional details available in Appendix A.
Source: AECOM, 2017

As shown in Table 2, the maximum annual emissions would be 14,544 MT CO_2e in 2020. Total emissions over the entire construction period for the CDSM Alternative would be approximately 49,717 MT CO_2e. When this total is amortized over the 30-year life of the CDSM Alternative, annual construction emissions would be approximately 1,657 MT CO_2e per year. It should be noted that although all GHG emissions are important with respect to climate change because of the atmospheric lifetimes of GHGs, construction emissions would cease following completion of the CDSM Alternative. As shown in Table 2, the amortized construction-related emissions associated with the CDSM Alternative would be less than the 10,000 MT CO_2e per year threshold of significance recommended by the SCAQMD. Therefore, impacts related to generation of GHG emissions during construction under the CDSM Alternative, either directly or indirectly, would be less than significant.

The maximum annual GHG emissions of 14,544 MT CO_2e would also not exceed the NEPA threshold of 25,000 MT CO_2e per year. Therefore, the CDSM Alternative would not result, either directly or indirectly, in a substantial adverse effect related to the generation of GHG emissions

6.1.2 Operational Impacts

Excavate and Recompact Alternative

The Excavate and Recompact Alternative is not anticipated to generate new vehicle trips. The required maintenance of NHD2 would be similar to existing maintenance of the existing Dam. The NHR reservoir keeper whose residence is adjacent to NHD would remain on site and would be the primary person responsible for the upkeep of the existing Dam and the new Dam. The Excavate and Recompact Alternative would not significantly increase the generation or use of electricity, water, wastewater, or solid waste. Therefore, impacts related to generation of GHG emissions during operations under the Excavate and Recompact Alternative, either directly or indirectly, would be less than significant.

CDSM Alternative

Similar to the Excavate and Recompact Alternative, the CDSM Alternative is not anticipated to generate new vehicle trips and would require a similar maintenance of NHD2 as the existing maintenance of the existing Dam. The CDSM Alternative would not significantly increase the generation or use of electricity, water, wastewater, or solid waste. Therefore, impacts related to generation of GHG emissions during operations under the CDSM Alternative, either directly or indirectly, would be less than significant.

6.2 Conflict with Applicable Plan

6.2.1 Excavate and Recompact Alternative

Measures included in the CARB Scoping Plan update would indirectly address GHG emissions levels associated with construction activities, including the phasing-in of cleaner technology for diesel engine fleets (including construction equipment) and the development of a low-carbon fuel standard. According to CARB, the 2020 goal was established as an achievable, mid-term target, and the 2050 GHG emissions reduction goal represents the level scientists believe is necessary to stabilize the climate. However, the CARB Scoping Plan does not recommend additional measures for meeting specific GHG emissions limits beyond 2020. Policies formulated under the mandate of AB 32 that apply to construction-related activity, either directly or indirectly, are assumed to be implemented statewide and would affect construction of the Excavate and Recompact Alternative should those policies be implemented before construction begins. Therefore, it is assumed that Proposed Project's construction and operation would not conflict with the CARB Scoping Plan update.

The measures in the City of Los Angeles' CAP and LADWP's Sustainability Plan do not directly relate to the purpose and objectives of the Proposed Project as discussed in Section 2, Project Description. The purpose of the Excavate and Recompact Alternative is to improve the seismic reliability of NHR through construction of NHD2 to the north of the existing Dam to serve as a backup dam in the event the existing Dam is damaged by an earthquake event, thereby ensuring public health and safety.

The Excavate and Recompact Alternative would avoid reactive rebuilding and repairing expenditures, as well as associated GHG emissions, associated with failure of NHD. Construction of the Excavate and Recompact Alternative would also help to avoid losses in water storage and a reliable water supply to the City of Los Angeles. Therefore, the intent, purpose, and functions of the Proposed Project are consistent with the goals of the AB 32 Scoping Plan, City of Los Angeles' CAP, and LADWP's Sustainability Plan to protect against the detrimental effects of climate change and ensure a sustainable water supply.

The Excavate and Recompact Alternative would not conflict with the CARB Scoping Plan update or any other plans, policies, or regulations for the purpose of reducing GHG emissions. As discussed earlier, the

Excavate and Recompact Alternative would also not generate GHG emissions that would have a significant impact on the environment. Therefore, under the Excavate and Recompact Alternative, impacts related to conflict with any applicable plan, policy, or regulation for the purpose of reducing GHG emissions would not occur.

6.2.2 CDSM Alternative

Similar to the Excavate and Recompact Alternative, the CDSM Alternative would not conflict with the CARB Scoping Plan update or any other plans, policies, or regulations for the purpose of reducing GHG emissions. The CDSM Alternative would also not generate GHG emissions that would have a significant impact on the environment. Therefore, under the CDSM Alternative, impacts related to conflict with any applicable plan, policy, or regulation for the purpose of reducing GHG emissions would not occur.

6.3 Cumulative Impacts

The analysis of GHG emissions is inherently a cumulative impact analysis. Therefore, no additional analysis is required, and as described above, it is not anticipated that construction and operation of the Proposed Project would generate GHG emissions that would cause a significant impact on the environment. Therefore, the Proposed Project would not result in a considerable incremental contribution to a significant cumulative impact.

7 Mitigation Measures

There are no significant impacts related to construction and operation of the Proposed Project and, therefore, no mitigation measures are required.

8 CEQA Significance Conclusions

The Proposed Project would generate GHG emissions, but GHG emissions, both direct and indirect, would not have a significant impact on the environment. The Proposed Project would not conflict with any applicable plan, policy, or regulation for the purpose of reducing GHG emissions. Therefore, impacts related to climate change would be less than significant.

9 NEPA Impacts Summary

As described above, the Proposed Project would not exceed the annual threshold for GHG emissions. The Proposed Project would not result in, either directly or indirectly, a substantial adverse effect related to the generation of GHG emissions.

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11 List of Abbreviations and Acronyms

AB	Assembly Bill
ARB	Air Resources Board
CAA	Clean Air Act
CAP	Climate Action Plan
CARB	California Air Resources Board
CDSM	Cement Deep Soil Mixing
CEQA	California Environmental Quality Act
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
County	County of Inyo
EMFAC	EMissions FACtor model
EO	Executive Order
GBUAPCD	Great Basin Unified Air Pollution Control District
GHG	greenhouse gases
GWP	Global Warming Potential
HFC	hydrofluorocarbons
LAA	Los Angeles Aqueduct
LADWP	City of Los Angeles Department of Water and Power
MT	Metric Tons
NEPA	National Environmental Policy Act
NF_3	Nitrogen Trifluoride
NHD	North Haiwee Dam or existing Dam
NHD2	North Haiwee Dam No. 2 or new Dam
NHR	North Haiwee Reservoir
N_2O	Nitrous oxide
PFC	perfluorocarbons
SB	Senate Bill
SCAQMD	South Coast Air Quality Management District
SF_6	sulfur hexafluoride
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency

12 Preparer Qualifications

12.1 AECOM

Jason Paukovits, Air Quality Specialist
George Lu, Air Quality and Greenhouse Gas Analyst

Appendix A
Emission Estimates

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APPENDIX A
EMISSION CALCULATIONS

Excavate and Recompact Alternative
Construction Emissions Summary

	Maximum Daily Emissions (lbs/day)					Annual Emissions (tons/year)					Metric Tons
Construction Phase/Source	**VOC**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**
2018											
Cactus Flats Road Realignment	10.75	109.36	60.96	16.01	10.38	1.29	13.12	7.31	1.92	1.25	1,769
Maximum Daily	**10.75**	**109.36**	**60.96**	**16.01**	**10.38**	**1.29**	**13.12**	**7.31**	**1.92**	**1.25**	**1,769**
2019											
LAA Realignment	26.54	259.91	155.84	35.58	23.69	2.23	21.83	13.09	2.99	1.99	2,432
Borrow Site 10	0.22	4.97	3.42	59.62	5.17	0.02	0.36	0.25	4.29	0.37	122
Maximum Daily	**26.54**	**259.91**	**155.84**	**35.58**	**23.69**	**2.23**	**21.83**	**13.09**	**2.99**	**1.99**	**2,432**
2020											
LAA Realignment	26.54	259.91	155.84	35.58	23.69	3.82	37.43	22.44	5.12	3.41	4,170
Borrow Site 10	0.22	4.97	3.42	59.62	5.17	0.01	0.24	0.16	2.86	0.25	81
Borrow Site 15	2.47	81.25	9.51	119.73	12.24	0.09	2.93	0.34	4.31	0.44	607
NHD2	98.28	720.41	511.33	82.48	58.80	11.79	86.45	61.36	9.90	7.06	9,831
Maximum Daily	**127.29**	**1,061.58**	**676.68**	**237.79**	**94.73**	**15.71**	**127.04**	**84.31**	**22.19**	**11.16**	**14,689**
2021											
LAA Realignment	26.54	259.91	155.84	35.58	23.69	0.96	9.36	5.61	1.28	0.85	1,042
Borrow Site 15	2.47	81.25	9.51	119.73	12.24	0.18	5.85	0.68	8.62	0.88	1,214
NHD2	98.28	720.41	511.33	82.48	58.80	14.15	103.74	73.63	11.88	8.47	11,798
Maximum Daily	**127.29**	**1,061.58**	**676.68**	**237.79**	**94.73**	**15.29**	**118.95**	**79.93**	**21.78**	**10.20**	**14,054**
2022											
NHD2	98.28	720.41	511.33	82.48	58.80	14.15	103.74	73.63	11.88	8.47	11,798
Maximum Daily	**98.28**	**720.41**	**511.33**	**82.48**	**58.80**	**14.15**	**103.74**	**73.63**	**11.88**	**8.47**	**11,798**
2023											
NHD2	98.28	720.41	511.33	82.48	58.80	10.61	77.80	55.22	8.91	6.35	8,848
Basin	14.91	152.98	84.15	18.26	12.03	0.48	4.93	2.72	0.96	0.57	631
Maximum Daily	**98.28**	**720.41**	**511.33**	**82.48**	**58.80**	**11.09**	**82.74**	**57.95**	**9.87**	**6.92**	**9,479**
2024											
Basin	14.91	152.98	84.15	18.26	12.03	0.32	3.29	1.81	0.64	0.38	421
Maximum Daily	**14.91**	**152.98**	**84.15**	**18.26**	**12.03**	**0.32**	**3.29**	**1.81**	**0.64**	**0.38**	**421**
											54,642.32
											1,821

	Total Emissons by Construction Phase (Tons)					Metric Tons
	VOC	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**
Cactus Flats Road Realignment	1.29	13.12	7.31	1.92	1.25	1,769.26
LAA Realignment	7.01	68.62	41.14	9.39	6.25	7,644.63
Borrow Site 10	0.03	0.60	0.41	7.15	0.62	202.68
Borrow Site 15	0.27	8.78	1.03	12.93	1.32	1,821.36
NHD2	50.71	371.73	263.85	42.56	30.34	42,274.48
Basin	0.80	8.22	4.54	1.60	0.96	1,051.51

	2018	2019	2020	2021	2022	2023	2024	Total Months
Cactus Flats Road Realignment	10							10
LAA Realignment		7	12	3				22
Borrow Site 10		6	4					10
Borrow Site 15			3	6				9
NHD2			10	12	12	9		43
Basin						3	2	5

	2018	2019	2020	2021	2022	2023	2024	Total Percentage
Cactus Flats Road Realignment	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
LAA Realignment	0.00	0.32	0.55	0.14	0.00	0.00	0.00	1.00
Borrow Site 10	0.00	0.60	0.40	0.00	0.00	0.00	0.00	1.00
Borrow Site 15	0.00	0.00	0.33	0.67	0.00	0.00	0.00	1.00
NHD2	0.00	0.00	0.23	0.28	0.28	0.21	0.00	1.00
Basin	0.00	0.00	0.00	0.00	0.00	0.60	0.40	1.00

E&R Alternative

Excavate and Recompact Alternative
Mitigated Construction Emissions Summary

	Maximum Daily Emissions (lbs/day)					Annual Emissions (tons/year)					Metric Tons
Construction Phase/Source	**VOC**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**
2018											
Cactus Flats Road Realignment	2.19	20.46	79.57	11.10	5.88	0.26	2.46	9.55	0.04	0.04	1,794.95
Maximum Daily	**2.19**	**20.46**	**79.57**	**11.10**	**5.88**	**0.26**	**2.46**	**9.55**	**0.04**	**0.04**	**1,794.95**
2019											
LAA Realignment	4.38	43.17	164.87	23.93	12.91	0.37	3.63	13.85	0.06	0.05	2,465.30
Borrow Site 10	0.22	4.97	3.42	59.62	7.09	0.02	0.36	0.25	4.29	0.37	121.61
Maximum Daily	**4.59**	**48.13**	**168.29**	**83.55**	**19.99**	**0.38**	**3.98**	**14.10**	**4.35**	**0.42**	**2,586.90**
2020											
LAA Realignment	4.38	43.17	164.87	23.93	12.91	0.63	6.22	23.74	0.10	0.08	4,226.22
Borrow Site 10	0.22	4.97	3.42	59.62	5.17	0.01	0.24	0.16	2.86	0.25	81.07
Borrow Site 15	2.47	81.25	9.51	119.73	12.24	0.09	2.93	0.34	4.31	0.44	607.12
NHD2	14.41	221.21	512.16	48.32	26.19	1.73	26.55	61.46	0.20	0.18	9,922.22
Maximum Daily	**21.26**	**345.64**	**686.53**	**191.98**	**51.34**	**2.46**	**35.93**	**85.71**	**7.47**	**0.95**	**14,836.63**
2021											
LAA Realignment	4.38	43.17	164.87	23.93	12.91	0.16	1.55	5.94	0.02	0.02	1,056.56
Borrow Site 15	2.47	81.25	9.51	119.73	12.24	0.18	5.85	0.68	8.62	0.88	1,214.24
NHD2	14.41	221.21	512.16	48.32	26.19	2.08	31.85	73.75	0.24	0.21	11,906.66
Maximum Daily	**21.26**	**345.64**	**686.53**	**191.98**	**51.34**	**2.41**	**39.26**	**80.37**	**8.88**	**1.12**	**14,177.46**
2022											
NHD2	14.41	221.21	512.16	48.32	26.19	2.08	31.85	73.75	0.24	0.21	11,906.66
Maximum Daily	**14.41**	**221.21**	**512.16**	**48.32**	**26.19**	**2.08**	**31.85**	**73.75**	**0.24**	**0.21**	**11,906.66**
2023											
NHD2	14.41	221.21	512.16	48.32	26.19	1.56	23.89	55.31	0.18	0.16	8,930.00
Basin	2.83	25.68	100.17	11.83	6.13	0.09	0.86	3.25	0.02	0.01	639.56
Maximum Daily	**14.41**	**221.21**	**512.16**	**48.32**	**26.19**	**1.65**	**24.75**	**58.57**	**0.20**	**0.17**	**9,569.56**
2024											
Basin	2.83	25.68	100.17	11.83	6.13	0.06	0.57	2.17	0.01	0.01	426.37
Maximum Daily	**2.83**	**25.68**	**100.17**	**11.83**	**6.13**	**0.06**	**0.57**	**2.17**	**0.01**	**0.01**	**426.37**

	Total Emissons by Construction Phase (Tons)					Metric Tons
	VOC	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**
Cactus Flats Road Realignment	0.26	2.46	9.55	0.04	0.04	1,794.95
LAA Realignment	1.16	11.40	43.52	0.18	0.15	7,748.08
Borrow Site 10	0.03	0.60	0.41	7.15	0.62	202.68
Borrow Site 15	0.27	8.78	1.03	12.93	1.32	1,821.36
NHD2	7.44	114.15	264.27	0.85	0.77	42,665.54
Basin	0.15	1.44	5.42	0.03	0.02	1,065.94

	2018	2019	2020	2021	2022	2023	2024	Total Months
Cactus Flats Road Realignment	10							10
LAA Realignment		7	12	3				22
Borrow Site 10		6	4					10
Borrow Site 15			3	6				9
NHD2			10	12	12	9		43
Basin						3	2	5

	2017	2018	2019	2020	2021	2022	2023	Total Percentage
Cactus Flats Road Realignment	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
LAA Realignment	0.00	0.32	0.55	0.14	0.00	0.00	0.00	1.00
Borrow Site 10	0.00	0.60	0.40	0.00	0.00	0.00	0.00	1.00
Borrow Site 15	0.00	0.00	0.33	0.67	0.00	0.00	0.00	1.00
NHD2	0.00	0.00	0.23	0.28	0.28	0.21	0.00	1.00
Basin	0.00	0.00	0.00	0.00	0.00	0.60	0.40	1.00

Cement Deep Soil Mixing Alternative
Construction Emissions Summary

	Maximum Daily Emissions (lbs/day)				
Construction Phase/Source	**VOC**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**
2018					
Cactus Flats Road Realignment	10.75	109.36	60.96	16.01	10.38
Maximum Daily	**10.75**	**109.36**	**60.96**	**16.01**	**10.38**
2019					
LAA Realignment	26.54	259.91	155.84	35.58	23.69
Borrow Site 10	0.25	6.70	2.74	83.06	7.09
Maximum Daily	**26.79**	**266.62**	**158.58**	**118.64**	**30.78**
2020					
LAA Realignment	26.54	259.91	155.84	35.58	23.69
Borrow Site 10	0.25	6.70	2.74	83.06	7.09
NHD2	99.04	782.19	512.32	167.09	66.53
Maximum Daily	**125.83**	**1,048.81**	**670.91**	**285.73**	**97.31**
2021					
LAA Realignment	26.54	259.91	155.84	35.58	23.69
Borrow Site 15	1.23	39.84	5.54	58.82	6.06
NHD2	99.04	782.19	512.32	167.09	66.53
Maximum Daily	**125.58**	**1,042.10**	**668.17**	**225.90**	**90.21**
2022					
NHD2	99.04	782.19	512.32	167.09	66.53
Borrow Site 15	1.23	39.84	5.54	58.82	6.06
Maximum Daily	**100.27**	**822.03**	**517.87**	**225.90**	**72.59**
2023					
NHD2	99.04	782.19	512.32	167.09	66.53
Basin	14.91	152.98	84.15	18.26	12.03
Maximum Daily	**99.04**	**782.19**	**512.32**	**167.09**	**66.53**

Cement Deep Soil Mixing Alternative
Construction Emissions Summary

Annual Emissions (tons/year)					Metric Tons
VOC	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**
2018					
1.29	13.12	7.31	1.92	1.25	1,769
1.29	**13.12**	**7.31**	**1.92**	**1.25**	**1,769**
2019					
2.23	21.83	13.09	2.99	1.99	2,432
0.02	0.48	0.20	5.98	0.51	133
2.25	**22.32**	**13.29**	**8.97**	**2.50**	**2,565**
2020					
3.82	37.43	22.44	5.12	3.41	4,170
0.01	0.24	0.10	2.99	0.26	66
11.59	84.04	60.41	19.86	7.88	10,308
15.42	**121.71**	**82.95**	**27.97**	**11.54**	**14,544**
2021					
0.96	9.36	5.61	1.28	0.85	1,042
0.04	1.43	0.20	2.12	0.22	305
13.91	100.85	72.50	23.83	9.45	12,369
14.91	**111.64**	**78.31**	**27.23**	**10.52**	**13,716**
2022					
13.91	100.85	72.50	23.83	9.45	12,369
0.09	2.87	0.40	4.23	0.44	610
13.99	**103.72**	**72.90**	**28.07**	**9.89**	**12,979**
2023					
3.48	25.21	18.12	5.96	2.36	3,092
0.80	8.22	4.54	1.60	0.96	1,052
4.28	**33.43**	**22.66**	**7.55**	**3.32**	**4,144**
					49,717
					1,657

	Total Emissons by Construction Phase (Tons)					Metric Tons
	VOC	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**
Cactus Flats Road Realignment	1.29	13.12	7.31	1.92	1.25	1,769.26
LAA Realignment	7.01	68.62	41.14	9.39	6.25	7,644.63
Borrow Site 10	0.03	0.72	0.30	8.97	0.77	199.09
Borrow Site 15	0.13	4.30	0.60	6.35	0.65	915.07
NHD2	42.88	310.95	223.53	73.48	29.15	38,137.77
Basin	0.80	8.22	4.54	1.60	0.96	1,051.51

	2018	2019	2020	2021	2022	2023	Total Months
Cactus Flats Road Realignment	10						10
LAA Realignment		7	12	3			22
Borrow Site 10		6	3				9
Borrow Site 15				3	6		9
NHD2			10	12	12	3	37
Basin						5	5

	2018	2019	2020	2021	2022	2023	Total Percentage
Cactus Flats Road Realignment	1.00	0.00	0.00	0.00	0.00	0.00	1.00
LAA Realignment	0.00	0.32	0.55	0.14	0.00	0.00	1.00
Borrow Site 10	0.00	0.67	0.33	0.00	0.00	0.00	1.00
Borrow Site 15	0.00	0.00	0.00	0.33	0.67	0.00	1.00
NHD2	0.00	0.00	0.27	0.32	0.32	0.08	1.00
Basin	0.00	0.00	0.00	0.00	0.00	1.00	1.00

Cement Deep Soil Mixing Alternative
Mitigated Construction Emissions Summary

	Maximum Daily Emissions (lbs/day)					Annual Emissions (tons/year)					Metric Tons
Construction Phase/Source	**VOC**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**
2018											
Cactus Flats Road Realignment	2.19	20.46	79.57	11.10	5.88	0.26	2.46	9.55	1.33	0.71	1,794.95
Maximum Daily	**2.19**	**20.46**	**79.57**	**11.10**	**5.88**	**0.26**	**2.46**	**9.55**	**1.33**	**0.71**	**1,794.95**
2019											
LAA Realignment	4.38	43.17	164.87	23.93	12.91	0.37	3.63	13.85	2.01	1.08	2,465.30
Borrow Site 10	0.25	6.70	2.74	83.06	7.09	0.02	0.48	0.20	5.98	0.51	132.73
Maximum Daily	**4.63**	**49.87**	**167.61**	**106.99**	**20.00**	**0.39**	**4.11**	**14.05**	**7.99**	**1.59**	**2,598.03**
2020											
LAA Realignment	4.38	43.17	164.87	23.93	12.91	0.63	6.22	23.74	3.45	1.86	4,226.22
Borrow Site 10	0.25	6.70	2.74	83.06	7.09	0.01	0.24	0.10	2.99	0.26	66.36
NHD2	17.17	301.38	539.40	134.71	35.50	1.76	26.34	63.66	15.97	4.15	10,395.46
Maximum Daily	**21.79**	**351.25**	**707.01**	**241.70**	**55.50**	**2.40**	**32.80**	**87.50**	**22.41**	**6.27**	**14,688.05**
2021											
LAA Realignment	4.38	43.17	164.87	23.93	12.91	0.16	1.55	5.94	0.86	0.46	1,056.56
Borrow Site 15	1.23	39.84	5.54	58.82	6.06	0.04	1.43	0.20	2.12	0.22	305.02
NHD2	17.17	301.38	539.40	134.71	35.50	2.12	31.61	76.40	19.17	4.98	12,474.55
Maximum Daily	**21.54**	**344.55**	**704.27**	**193.52**	**48.40**	**2.32**	**34.60**	**82.53**	**22.15**	**5.67**	**13,836.13**
2022											
NHD2	17.17	301.38	539.40	134.71	35.50	2.12	31.61	76.40	19.17	4.98	12,474.55
Borrow Site 15	1.23	39.84	5.54	58.82	6.06	0.09	2.87	0.40	4.23	0.44	610.05
Maximum Daily	**18.40**	**341.22**	**544.95**	**193.52**	**41.56**	**2.21**	**34.48**	**76.80**	**23.40**	**5.42**	**13,084.60**
2023											
NHD2	17.17	301.38	539.40	134.71	35.50	0.53	7.90	19.10	4.79	1.25	3,118.64
Basin	2.83	25.68	100.17	11.83	6.13	0.15	1.44	5.42	1.25	0.64	615.83
Maximum Daily	**17.17**	**301.38**	**539.40**	**134.71**	**35.50**	**0.68**	**9.34**	**24.52**	**6.04**	**1.89**	**3,734.46**

	Total Emissons by Construction Phase (Tons)					Metric Tons
	VOC	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**
Cactus Flats Road Realignment	0.26	2.46	9.55	1.33	0.71	1,794.95
LAA Realignment	1.16	11.40	43.52	6.32	3.41	7,748.08
Borrow Site 10	0.03	0.72	0.30	8.97	0.77	199.09
Borrow Site 15	0.13	4.30	0.60	6.35	0.65	915.07
NHD2	6.53	97.47	235.56	59.10	15.37	38,463.19
Basin	0.15	1.44	5.42	1.25	0.64	615.83

	2018	2019	2020	2021	2022	2023	Total Months
Cactus Flats Road Realignment	10						10
LAA Realignment		7	12	3			22
Borrow Site 10		6	3				9
Borrow Site 15				3	6		9
NHD2			10	12	12	3	37
Basin						5	5

	2018	2019	2020	2021	2022	2023	Total Percentage
Cactus Flats Road Realignment	1.00	0.00	0.00	0.00	0.00	0.00	1.00
LAA Realignment	0.00	0.32	0.55	0.14	0.00	0.00	1.00
Borrow Site 10	0.00	0.67	0.33	0.00	0.00	0.00	1.00
Borrow Site 15	0.00	0.00	0.00	0.33	0.67	0.00	1.00
NHD2	0.00	0.00	0.27	0.32	0.32	0.08	1.00
Basin	0.00	0.00	0.00	0.00	0.00	1.00	1.00

Fugitive Dust Summary

Construction Activity/Year	Construction Days	Daily Emissions		Total Emissions	
		PM_{10} (lbs/day)	$PM_{2.5}$ (lbs/day)	PM_{10} (tons)	$PM_{2.5}$ (tons)
Cactus Flats Road Realignment	240	10.73	5.58	1.29	0.67
LAA Realignment	528	23.27	12.34	6.14	3.26
ERA - NHD2	1032	46.67	24.70	24.08	12.75
ERA - Borrow Site 10	240	59.42	5.07	7.13	0.61
ERA - Borrow Site 15	216	118.13	11.36	12.76	1.23
CDSM - NHD2	888	131.38	33.05	58.33	14.68
CDSM - Borrow Site 10	216	82.85	6.99	8.95	0.76
CDSM - Borrow Site 15	216	58.00	5.61	6.26	0.61
Basin	216	11.33	5.72	1.22	0.62

Note: Estimates include emission reductions associated with the fugitive dust control measures.

Haiwee Dam

Fugitive Dust - Truck Loading Emissions

Construction Phase/Subphase	Work Days	Total Materials Moved (cy)	Total Materials Moved (tons)	Daily Materials Moved (tons/day)	Unmitigated Daily PM_{10} (lbs/day)	Unmitigated Daily $PM_{2.5}$ (lbs/day)	Mitigated Daily PM_{10} (lbs/day)	Mitigated Daily $PM_{2.5}$ (lbs/day)	Unmitigated PM_{10} (tons)	Unmitigated $PM_{2.5}$ (tons)	Mitigated PM_{10} (tons)	Mitigated $PM_{2.5}$ (tons)
CDSM - Borrow Site 10	216	311,000	393,156	1,820.17	0.21	0.03	0.08	0.01	0.02	0.00	0.01	0.00
CDSM - Borrow Site 15	216	107,000	238,343	1,103.44	0.13	0.02	0.05	0.01	0.01	0.00	0.01	0.00
ERA - Borrow Site 10	240	343,000	433,609	1,806.70	0.21	0.03	0.08	0.01	0.03	0.00	0.01	0.00
ERA- Borrow Site 15	216	107,000	238,343	1,103.44	0.13	0.02	0.05	0.01	0.01	0.00	0.01	0.00
CDSM - NHD2	888	418,000	528,421	595.07	0.07	0.01	0.03	0.00	0.03	0.00	0.01	0.00
ERA - NHD2	1032	450,000	568,875	551.24	0.06	0.01	0.03	0.00	0.03	0.00	0.01	0.00
Basin	120	22,000	27,812	231.76	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.00

Earthwork Fugitive Particulate Matter Emissions - Bulldozing, Scraping and Grading

Activity	Equipment	Daily Activity Level	Total Activity Level	PM10 Emission Factor (lb/activity)	PM2.5 Emission Factor (lb/activity)	Unmitigated PM10 (lb/day)	Unmitigated PM2.5 (lb/day)	Mitigated Daily PM_{10} (lbs/day)	Mitigated Daily $PM_{2.5}$ (lbs/day)	Unmitigated PM_{10} (tons)	Unmitigated $PM_{2.5}$ (tons)	Mitigated PM_{10} (tons)	Mitigated $PM_{2.5}$ (tons)
Cactus Flats Road Realignment	4	8.0	32.0	0.753	0.415	24.09	13.27	9.64	5.31	2.89	1.59	1.16	0.64
LAA Realignment	9	8.0	72.0	0.753	0.415	54.20	29.87	21.68	11.95	14.31	7.88	5.72	3.15
ERA - NHD2	18	8.0	144.0	0.753	0.415	108.40	59.73	43.36	23.89	55.93	30.82	22.37	12.33
CDSM - NHD2	14	8.0	112.0	0.753	0.415	84.31	46.46	33.72	18.58	37.43	20.63	14.97	8.25
Basin	4	8.0	32.0	0.753	0.415	24.09	13.27	9.64	5.31	1.45	0.80	0.58	0.32

Rule 403 Control Measures	0.6	percent reduction
Work Days Per Week	6	
Work Days Per Month	24	

Paved Roads Fugitive Dust Emissions

Paved Roads	100%

				Paved Road Dust Emissions (lbs/day)		Paved Road Dust Emissions (tons)
	Vehicle Type	**No.**	**Miles Per Day**	**PM10**	**PM2.5**	**PM10**
Cactus Flats Road Realignment	Truck	3	150	0.62	0.15	0.074
LAA Realignment	Truck	4	200	0.83	0.20	0.218
ERA - NHD2	Truck	12	600	2.48	0.61	1.278
ERA - Borrow Site 10	Truck	57	-	-	-	-
ERA - Borrow Site 15	Truck	45	2,216	9.14	2.24	0.99
CDSM - NHD2	Truck	29	4,118	16.99	4.17	7.545
CDSM - Borrow Site 10	Truck	80	-	-	-	-
CDSM - Borrow Site 15	Truck	22	1,083	4.47	1.10	0.483
Basin	Truck	5	250	1.03	0.25	0.06

	Vehicle Type	**No.**	**Miles Per Day**	**PM10**	**PM2.5**
Cactus Flats Road Realignment	Worker	22	739	0.48	0.12
LAA Realignment	Worker	35	1,176	0.76	0.19
ERA - NHD2	Worker	37	1,243	0.80	0.20
ERA - Borrow Site 10	Worker	33	1109	0.72	0.18
ERA - Borrow Site 15	Worker	8	269	0.17	0.04
CDSM - NHD2	Worker	37	1,243	0.80	0.20
CDSM - Borrow Site 10	Worker	23	773	0.50	0.12
CDSM - Borrow Site 15	Worker	14	470	0.30	0.07
Basin	Worker	30	1008	0.65	0.16

Paved Road Dust $EF_{DUST} = [(k(sL)^{0.91} \times (W)^{1.02}](1 - P/4N))$

Source: AP-42 Section 13.2.1 (Paved Roads) - http://www.epa.gov/ttnchie1/ap42/ch13/final/c13s0201.pdf

Variable	**Value**	**Description**
k (PM10)	0.0022	particle size multiplier for particle size rangeand units of interest (lb/VMT)
k (PM2.5)	0.00054	particle size multiplier for particle size rangeand units of interest (lb/VMT)
sL	0.1	road surface silt loading (g/m^2)
W	2.4	average weight (tons) of vehicles (2.4 tons)
W	14.75	haul truck tons
P	30	number of "wet" days with at least 0.254 mm of precipitation during the averaging period
N	365	number of days in averaging period

Pickup and Worker

EF (PM10)	0.00064747	lb/VMT
EF (PM2.5)	0.00015893	lb/VMT

Haul Truck

EF (PM10)	0.00412642	lb/VMT
EF (PM2.5)	0.00101285	lb/VMT

Fugitive Dust - Unpaved Roads

	Daily On-Site Construction Motor Vehicle Fugitive Particulate Matter Emissions													
					Silt Loading (g/m^2)/ Silt Content (%)[a]		Uncontrolled Emission Factors (lb/mi)[b]		Uncontrolled Emissions (lb/day)[c]			Controlled Emissions (lb/day)[e]		Controlled Emissions (tons)
	Vehicle Type	No.	Mi/Veh-Day	Surface Type		Vehicle Weight (tons)	PM10	PM2.5	PM10	PM2.5	Control Efficiency[d]	PM10	PM2.5	PM10
CDSM - Borrow Site 10	Truck	80	2.45	Unpaved	5	25	2.17	0.18	425.1	35.4	81%	82.3	6.9	8.9
CDSM - Borrow Site 15	Truck	22	5.77	Unpaved	5	25	2.17	0.18	274.8	22.9	81%	53.2	4.4	5.7
ERA - Borrow Site 10	Truck	57	2.45	Unpaved	5	25	2.17	0.18	302.9	25.2	81%	58.6	4.9	7.0
ERA - Borrow Site 15	Truck	45	5.77	Unpaved	5	25	2.17	0.18	562.1	46.8	81%	108.8	9.1	11.7

Note: Totals may not match sum of individual values because of rounding.

[a] Unpaved surface silt content from SCAQMD CEQA Handbook, (1993) Table A9-9-D-1 for city and county roads

[b] Equations:

$EF(unpaved) = k_u (s/12)^a (W/3)^b$ Ref: AP-42, Section 13.2.2, "Unpaved Roads," November 2006

Constants:

k_u =	1.8	(Particle size multiplier for PM)
	0.15	(Particle size multiplier for PM2.5)
a =	1	for PM10
	1	for PM2.5
b =	0.5	for PM10
	0.5	for PM2.5

[c] Uncontrolled emissions [lb/day] = Emission factor [lb/mi] x Number x Daily miles traveled [mi/vehicle-day]

[d] Control efficiency from watering unpaved road twice a day (55%) and limiting maximum speed to 15 mph (57%), from Table XI-A, Mitigation Measure Examples,

Fugitive Dust from Construction & Demolition, http://www.aqmd.gov/ceqa/handbook/mitigation/fugitive/MM_fugitive.html

[e] Controlled emissions [lb/day] = Uncontrolled emissions [lb/day] x (1 - Control efficiency [%])

CDSM - Concrete Batch Plant - PM-10 Emissions

Maximum Quantity of Concrete Produced (yd/yr) =	71,456
Days of Operation per Year =	48

Composition of Concrete

Material	lb/yd	ton/yr	
Cement	491	90,450	
Water	167	5,967	[167 = 20 gal/yd X 8.34 lb/gal]
Total Concrete Material Required	4,024	96,417	

Emissions from Concrete Batching

*water spray efficiency	70%			PM10		PM2.5	
Process	lb/ton	controlled lb/ton	lb/yr	lb/day	tpy	lb/day	tpy
Cement delivery to Silo (controlled)		0.00034	3.08E+01				
Central Mix loading (controlled)		0.0048	4.34E+02				
PM10 Emissions from Concrete Batching (lb/yr) =			464.91	9.686	0.232	4.164846	0.10

Emissions from Unpaved Roads	PM10	PM2.5	lb/day	tpy	lb/day	tpy
Emission Factor of Unpaved Roads (lb/VMT) =	2.17	0.18				
# VMT/yr	7,968	7,968				
Abatement Efficiency (%) =	81	81				
PM10 Emissions from Unpaved Roads (lb/yr) =	3,285.21	272.51	68.442	1.643	5.677	0.136

Emissions from Storage Piles	PM10	PM2.5	lb/day	tpy	lb/day	tpy
Emission Factor of Storage Piles (lb/acre/day)	1.7	0.255				
Area of Storage Piles (acres) =	1	1				
# Days Storage Piles Exist =	48	48				
PM10 Emissions from Storage Piles (lb/yr) =	81.6	12.24	1.700	0.041	0.255	0.006
Total			79.827	1.916	10.097	0.242

Total PM10 Emissions (lb/yr) =	3831.72
Total PM10 Emissions (TPY) =	1.92
Total PM2.5 Emissions (lb/yr) =	484.66
Total PM2.5 Emissions (TPY) =	0.24

Fugitive Dust Emission Factors

Truck Loading Fugitive Dust Emission Factors

$EF_D = k \times (0.0032) \times ((U/5)^{1.3})/((M/2)^{1.4})$

Variable	Amount	Units	
EF (PM_{10})	0.0001	lb/ton	
EF ($PM_{2.5}$)	0.00002	lb/ton	
k (PM_{10})	0.35	factor	
k ($PM_{2.5}$)	0.053	factor	
U (mean wind speed)	3.83	miles/hr	Consistent with Air Quality Report (Figure 1. Bishop Wind Rose)
M (moisture content)	7.90	percent	USEPA, AP-42, July 1998, Table 11.9-3 Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations
Soil density (CalEEMod default)	1.26	tons/cy	
Rip rap density	2.23	tons/cy	
Derrick/Grouted stone density	1.96	tons/cy	

E (lbs) = EF (lb/ton) x TP (tons)

Bulldozing, Scraping and Grading

PM10 Emission Factor [lb/hr] = 0.75 x (silt content [%])$^{1.5}$ / (moisture)$^{1.4}$

PM2.5 Emission Factor [lb/hr] = 0.60 x (silt content [%])$^{1.2}$ / (moisture)$^{1.3}$

Reference: AP-42, Table 11.9-1, July 1998

Parameter	Value	Basis
Silt Content	6.9	USEPA, AP-42, July 1998, Table 11.9-3 Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations
Moisture	7.9	USEPA, AP-42, July 1998, Table 11.9-3 Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations

PM10 Emission Factor 0.75 lb/hr

PM2.5 Emission Factor 0.41 lb/hr

Emissions [pounds per day] = Controlled emission factor [pounds per hour] x Bulldozing, scraping or grading time [hours/day]

Cactus Flats Road Improvements

						Emissions Summary (lbs/day)							Emissions Summary (tons per phase)							
Equipment Category	Equipment Type	Number	Usage Factor (hrs/day or miles/day)	Power Rating (hp)	Total Days/VMT	VOC	NOX	CO	PM10	PM2.5	CO2	CH4	VOC	NOX	CO	PM10	PM2.5	CO_2	CH4	Total GHG Emissions (MT CO2e)
Excavators >251 and <500	Excavator - 3.5 CY	2	8	396	240	0.93	10.88	6.05	0.35	0.32	2,596.17	0.81	0.11	1.31	0.73	0.04	0.04	311.54	0.10	285.97
Off-Highway Trucks >176 and <250	Dump Truck (12 CY)	2	8	230	240	1.05	10.64	4.76	0.44	0.40	1,503.35	0.47	0.13	1.28	0.57	0.05	0.05	180.40	0.06	165.60
Other Construction Equipment >26 and <50	Vibrator	2	8	50	240	0.87	3.90	4.10	0.33	0.31	406.63	0.13	0.10	0.47	0.49	0.04	0.04	48.80	0.02	44.79
Graders >121 and <175	Grader	2	8	135	240	1.29	12.90	7.24	0.72	0.67	971.09	0.30	0.15	1.55	0.87	0.09	0.08	116.53	0.04	106.97
Paving Equipment >121 and <175	Asphalt Paver - 130 hp	1	8	130	240	0.23	2.62	2.50	0.13	0.12	403.79	0.13	0.03	0.31	0.30	0.02	0.01	48.46	0.02	44.48
Rollers >51 and <120	Pneumatic Wheel Roller 12 Ton	1	8	100	240	0.32	3.12	2.42	0.21	0.20	329.88	0.10	0.04	0.37	0.29	0.03	0.02	39.59	0.01	36.34
Rollers >51 and <120	Tandem vibratory roller, 10 ton	1	8	100	240	0.32	3.12	2.42	0.21	0.20	329.88	0.10	0.04	0.37	0.29	0.03	0.02	39.59	0.01	36.34
Rollers >51 and <120	Vibratory Roller 25 Ton	1	8	100	240	0.32	3.12	2.42	0.21	0.20	329.88	0.10	0.04	0.37	0.29	0.03	0.02	39.59	0.01	36.34
Off-Highway Trucks >176 and <250	3,000 gal water truck	2	8	230	240	1.05	10.64	4.76	0.44	0.40	1,503.35	0.47	0.13	1.28	0.57	0.05	0.05	180.40	0.06	165.60
Tractors/Loaders/Backhoes >51 and <120	Front End Loader	2	8	93	240	0.51	5.04	4.48	0.36	0.33	599.76	0.19	0.06	0.61	0.54	0.04	0.04	71.97	0.02	66.06
Rubber Tired Dozers > 176 and <250	Crawler Dozer	2	8	200	240	1.89	20.34	7.09	0.99	0.91	1,392.99	0.43	0.23	2.44	0.85	0.12	0.11	167.16	0.05	153.44
Off-Highway Tractors >501 and <750	Truck Tractor, 6x4, 450 H.P.	1	8	450	240	0.68	7.56	3.91	0.28	0.26	1,711.78	0.53	0.08	0.91	0.47	0.03	0.03	205.41	0.06	188.56
Off-Highway Tractors >501 and <750	Truck Tractor, 6x4, 380 H.P.	2	8	380	240	1.15	12.77	6.60	0.48	0.44	2,891.00	0.90	0.14	1.53	0.79	0.06	0.05	346.92	0.11	318.45
Total						**10.62**	**106.65**	**58.74**	**5.16**	**4.74**	**14,969.56**	**4.66**	**1.27**	**12.80**	**7.05**	**0.62**	**0.57**	**1,796.35**	**0.56**	**1,648.93**

On Road Construction Emissions

						Emissions Summary (lbs/day)							Emissions Summary (tons per phase)							
	Daily Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	22	16.8	739	240	177,408							0.05								59.67
Concrete/Asphalt Truck Trips		25	150	240	36,000	0.05			0.08	0.03			0.01	0.03					0.01	60.66
Total						**0.13**	**2.71**	**2.22**	**0.12**	**0.06**	**1,100.63**	**0.05**	**0.02**	**0.33**	**0.27**	**0.01**	**0.01**	**132.08**	**0.01**	**120.34**
						0.07	0.25	1.95	0.05	0.03	545	0.00	0.01		0.23	0.01	0.00	65.42	0.00	
							2.46	0.27			555				0.03	0.01	0.00	66.66		

Notes:
Concrete and haul trucks assumed to haul material from Keeler at a distance of approximately 25 miles (50 miles round trip).

	Emissions Summary (lbs/day)							Emissions Summary (tons per phase)							
Total	VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Maximum Daily Emissions	**10.75**	**109.36**	**60.96**	**5.28**	**4.80**	**16,070.19**	**4.71**								
Maximum Annual Emissions								**1.29**	**13.12**	**7.31**	**0.63**	**0.58**	**1,928.42**	**0.56**	**1,769.26**

3

LAA Realignment

Equipment Type	Equipment Category	Number	Usage Factor (hrs/day or miles/day)	Power Rating (hp)	Total Days/VMT	Emissions Summary (lbs/day) VOC	NOX	CO	PM10	PM2.5	CO2	CH4	Emissions Summary (tons per phase) VOC	NOX	CO	PM10	PM2.5	CO_2	CH4	Total GHG Emissions (MT CO2e)
Cranes >251 and <500	Crawler Crane	1	8	375	528	0.71	8.89	6.11	0.36	0.33	941.54	0.29	0.19	2.35	1.61	0.09	0.09	248.57	0.08	228.17
Off-Highway Trucks >176 and <250	Dump Truck (12 CY)	8	8	230	528	4.20	42.55	19.03	1.74	1.60	6,013.41	1.87	1.11	11.23	5.02	0.46	0.42	1,587.54	0.49	1,457.25
Off-Highway Trucks >176 and <250	3,000 gal water truck	3	8	230	528	1.58	15.96	7.14	0.65	0.60	2,255.03	0.70	0.42	4.21	1.88	0.17	0.16	595.33	0.19	546.47
Rollers >51 and <120	Tandem vibratory roller, 10 ton	1	8	100	528	0.32	3.12	2.42	0.21	0.20	329.88	0.10	0.09	0.82	0.64	0.06	0.05	87.09	0.03	79.94
Other Construction Equipment >121 and <175	Hammer, Diesel, 22k ft-lb	1	8	175	528	0.57	6.16	4.23	0.32	0.30	632.59	0.20	0.15	1.63	1.12	0.09	0.08	167.00	0.05	153.30
Excavators >251 and <500	Hydraulic Excavator, 396 HP	2	8	396	528	0.93	10.88	6.05	0.35	0.32	2,596.17	0.81	0.24	2.87	1.60	0.09	0.09	685.39	0.21	629.14
Concrete/Industrial Saws >26 and <50	Concrete Saw	3	8	50	528	1.99	8.68	9.20	0.53	0.53	1,097.53	0.18	0.53	2.29	2.43	0.14	0.14	289.75	0.05	264.88
Rough Terrain Forklifts >51 and <120	Rough terrain forklift	1	8	75	528	0.12	1.51	1.73	0.07	0.07	259.90	0.08	0.03	0.40	0.46	0.02	0.02	68.61	0.02	62.98
Tractors/Loaders/Backhoes >51 and <120	Backhoe Loader	1	8	93	528	0.26	2.52	2.24	0.18	0.16	299.88	0.09	0.07	0.67	0.59	0.05	0.04	79.17	0.02	72.67
Rubber Tired Dozers > 176 and <250	Crawler Dozer	4	8	200	528	3.78	40.68	14.17	1.98	1.82	2,785.99	0.87	1.00	10.74	3.74	0.52	0.48	735.50	0.23	675.14
Air Compressors >26 and <50	Jack Hammer	2	8	50	528	1.10	3.98	4.60	0.28	0.28	481.11	0.10	0.29	1.05	1.22	0.07	0.07	127.01	0.03	116.25
Generator Sets >26 and <50	Generators	3	8	50	528	1.75	8.55	8.19	0.50	0.50	1,112.56	0.16	0.46	2.26	2.16	0.13	0.13	293.72	0.04	268.34
Other Construction Equipment >251 and <500	Soil compactor, 232 HP	2	8	232	528	0.86	10.89	6.23	0.39	0.36	1,695.73	0.53	0.23	2.87	1.64	0.10	0.10	447.67	0.14	410.93
Scrapers >251 and <500	Elevating scraper, 23 C.Y.	3	8	365	528	3.42	42.34	26.22	1.67	1.54	4,549.47	1.42	0.90	11.18	6.92	0.44	0.41	1,201.06	0.37	1,102.49
Other Construction Equipment >121 and <175	Vibratory soil compactor	5	8	131	528	2.12	23.07	15.83	1.21	1.12	2,367.68	0.74	0.56	6.09	4.18	0.32	0.29	625.07	0.19	573.77
Graders >121 and <175	Grader, 30,000 lbs.	2	8	145	528	1.39	13.85	7.78	0.78	0.72	1,043.02	0.32	0.37	3.66	2.05	0.21	0.19	275.36	0.09	252.76
Tractors/Loaders/Backhoes >51 and <120	Front End Loader	5	8	93	528	1.28	12.61	11.20	0.89	0.82	1,499.39	0.47	0.34	3.33	2.96	0.24	0.22	395.84	0.12	363.35
Total						**26.36**	**256.23**	**152.38**	**12.13**	**11.27**	**29,960.88**	**8.92**	**6.96**	**67.65**	**40.23**	**3.20**	**2.97**	**7,909.67**	**2.36**	**7,257.84**

On Road Construction Emissions

	Daily Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	35	16.8	1,176	528	620,928							0.07								208.85
Concrete/Asphalt Truck Trips		25	200	528	105,600															177.94
Total						**0.18**	**3.68**	**3.46**	**0.18**	**0.09**	**1,607.92**	**0.08**	**0.05**	**0.97**	**0.91**	**0.05**	**0.02**	**424.49**	**0.02**	**386.80**
						0.08 0.10	0.40 3.28	3.11 0.36	0.12 0.06	0.05 0.04	867 741	0.00	0.02 0.03	0.11 0.87	0.82 0.09	0.03 0.02	0.01	228.97 195.53	0.02 0.00	

Concrete and haul trucks assumed to haul material from Keeler at a distance of approximately 25 miles (50 miles round trip).

Total	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Maximum Daily Emissions	**26.54**	**259.91**	**155.84**	**12.32**	**11.35**	**31,568.81**	**9.00**								
Maximum Annual Emissions								**7.01**	**68.62**	**41.14**	**3.25**	**3.00**	**8,334.16**	**2.38**	**7,644.63**

Excavate and Recompact Alternative
NHD2

Equipment Type	Equipment Category	Number	Usage Factor (hrs/day or miles/day)	Power Rating (hp)	Total Days/VMT	Emissions Summary (lbs/day) VOC	NOX	CO	PM10	PM2.5	CO2	CH4	Emissions Summary (tons per phase) VOC	NOX	CO	PM10	PM2.5	CO_2	CH4	Total GHG Emissions (MT CO2e)
Tractors/Loaders/Backhoes >51 and <120	Backhoe Loader	1	8	93	1032	0.26	2.52	2.24	0.18	0.16	299.88	0.09	0.13	1.30	1.16	0.09	0.08	154.74	0.05	142.04
Cranes >176 and <250	Crane	1	8	240	1032	0.59	7.09	2.62	0.31	0.28	603.22	0.19	0.31	3.66	1.35	0.16	0.15	311.26	0.10	285.72
Rubber Tired Dozers > 176 and <250	Crawler Dozer	4	8	200	1032	3.78	40.68	14.17	1.98	1.82	2,785.99	0.87	1.95	20.99	7.31	1.02	0.94	1,437.57	0.45	1,319.59
Off-Highway Trucks >176 and <250	Dump Truck (12 CY)	8	8	230	1032	4.20	42.55	19.03	1.74	1.60	6,013.41	1.87	2.17	21.96	9.82	0.90	0.83	3,102.92	0.97	2,848.27
Scrapers >251 and <500	Elevating scraper, 23 C.Y.	10	8	365	1032	11.41	141.14	87.39	5.56	5.12	15,164.91	4.72	5.89	72.83	45.09	2.87	2.64	7,825.09	2.44	7,182.91
Excavators >251 and <500	Hydraulic Excavator, 396 HP	2	8	396	1032	0.93	10.88	6.05	0.35	0.32	2,596.17	0.81	0.48	5.62	3.12	0.18	0.17	1,339.62	0.42	1,229.69
Graders >176 and <250	Motor Grader	4	8	200	1032	2.22	30.49	8.19	0.99	0.91	2,866.04	0.89	1.15	15.73	4.23	0.51	0.47	1,478.87	0.46	1,357.50
Off-Highway Trucks >176 and <250	Off-Highway Trucks	5	8	230	1032	2.63	26.60	11.89	1.09	1.00	3,758.38	1.17	1.35	13.72	6.14	0.56	0.52	1,939.33	0.60	1,780.17
Rough Terrain Forklifts >51 and <120	Rough terrain forklift	1	8	75	1032	0.12	1.51	1.73	0.07	0.07	259.90	0.08	0.06	0.78	0.89	0.04	0.03	134.11	0.04	123.10
Other Construction Equipment >251 and <500	Soil compactor, 232 HP	4	8	232	1032	1.72	21.77	12.46	0.79	0.72	3,391.45	1.06	0.89	11.23	6.43	0.41	0.37	1,749.99	0.54	1,606.37
Rollers >51 and <120	Tandem vibratory roller, 10 ton	1	8	100	1032	0.32	3.12	2.42	0.21	0.20	329.88	0.10	0.17	1.61	1.25	0.11	0.10	170.22	0.05	156.25
Tractors/Loaders/Backhoes >51 and <120	Front End Loader 3 CY	3	8	93	1032	0.77	7.56	6.72	0.54	0.49	899.63	0.28	0.39	3.90	3.47	0.28	0.25	464.21	0.14	426.11
Tractors/Loaders/Backhoes >121 and <175	Front End Loader 5 CY	2	8	150	1032	0.58	6.20	6.14	0.31	0.29	951.01	0.30	0.30	3.20	3.17	0.16	0.15	490.72	0.15	450.45
Bore/Drill Rigs >121 and <175	Truck mounted drill rig	1	8	145	1032	0.26	3.01	3.79	0.13	0.12	633.04	0.20	0.13	1.55	1.95	0.07	0.06	326.65	0.10	299.84
Generator Sets >26 and <50	Generators	2	8	50	1032	1.17	5.70	5.46	0.33	0.33	741.71	0.10	0.60	2.94	2.82	0.17	0.17	382.72	0.05	349.65
Other Construction Equipment >51 and <120	Vibrating screen	5	8	100	1032	2.21	20.15	14.07	1.54	1.42	1,814.91	0.56	1.14	10.40	7.26	0.80	0.73	936.50	0.29	859.64
Other Construction Equipment >121 and <175	Vibratory soil compactor	8	8	131	1032	3.39	36.91	25.33	1.94	1.79	3,788.28	1.18	1.75	19.05	13.07	1.00	0.92	1,954.75	0.61	1,794.33
Off-Highway Trucks >176 and <250	3,000 gal water truck	8	8	230	1032	4.20	42.55	19.03	1.74	1.60	6,013.41	1.87	2.17	21.96	9.82	0.90	0.83	3,102.92	0.97	2,848.27
Pumps >26 and <50	Submersible pump	30	24	50	1032	57.15	259.71	258.24	15.68	15.68	33,376.88	5.11	29.49	134.01	133.25	8.09	8.09	17,222.47	2.64	15,739.63
Total						**97.90**	**710.15**	**506.98**	**35.49**	**33.94**	**86,288.12**	**21.46**	**50.51**	**366.44**	**261.60**	**18.31**	**17.51**	**44,524.67**	**11.07**	**40,799.53**

On Road Construction Emissions

	Daily Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	37	16.8	1,243	1,032	1,282,982							0.08								431.54
Concrete/Asphalt Truck Trips		25	600	1,032	619,200															1,043.40
Total						**0.38**	**10.26**	**4.35**	**0.32**	**0.16**	**3,138.75**	**0.08**	**0.20**	**5.29**	**2.24**	**0.16**	**0.08**	**1,619.59**	**0.04**	**1,474.94**
						0.09	0.42	3.28	0.13	0.05	917	0.01	0.04	0.22	1.69	0.07	0.03	473.10	0.04	
						0.30	9.84	1.07	0.19	0.11	2,222		0.15	5.08	0.55	0.10		1,146.59	0.00	

Concrete and haul trucks assumed to haul material from Keeler at a distance of approximately 25 miles (50 miles round trip).

Total	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Maximum Daily Emissions	**98.28**	**720.41**	**511.33**	**35.81**	**34.10**	**89,426.87**	**21.54**								
Maximum Annual Emissions								**50.71**	**371.73**	**263.85**	**18.48**	**17.59**	**46,144.26**	**11.11**	**42,274.48**

Cement Deep Soil Mixing Alternative
NHD2

						Emissions Summary (lbs/day)							Emissions Summary (tons per phase)							
Equipment Type	Equipment Category	Number	Usage Factor (hrs/day or miles/day)	Power Rating (hp)	Total Days/VMT	VOC	NOX	CO	PM10	PM2.5	CO2	CH4	VOC	NOX	CO	PM10	PM2.5	CO_2	CH4	Total GHG Emissions (MT CO2e)
Tractors/Loaders/Backhoes >51 and <12(	Backhoe Loade	1	8	93	888	0.26	2.52	2.24	0.18	0.16	299.88	0.09	0.11	1.12	0.99	0.08	0.07	133.15	0.04	122.22
Cranes >176 and <25(	Crane	1	8	240	888	0.59	7.09	2.62	0.31	0.28	603.22	0.19	0.26	3.15	1.16	0.14	0.13	267.83	0.08	245.85
Rubber Tired Dozers > 176 and <25(	Crawler Dozer	4	8	200	888	3.78	40.68	14.17	1.98	1.82	2,785.99	0.87	1.68	18.06	6.29	0.88	0.81	1,236.98	0.39	1,135.46
Off-Highway Trucks >176 and <25(	Dump Truck (12 CY)	4	8	230	888	2.10	21.28	9.52	0.87	0.80	3,006.71	0.94	0.93	9.45	4.22	0.39	0.36	1,334.98	0.42	1,225.42
Scrapers >251 and <50(	Elevating scraper, 23 C.Y	6	8	365	888	6.84	84.69	52.43	3.34	3.07	9,098.94	2.83	3.04	37.60	23.28	1.48	1.36	4,039.93	1.26	3,708.39
Excavators >251 and <50(	Hydraulic Excavator, 396 HF	1	8	396	888	0.46	5.44	3.02	0.18	0.16	1,298.09	0.40	0.21	2.42	1.34	0.08	0.07	576.35	0.18	529.05
Graders >176 and <25(	Motor Grader	4	8	200	888	2.22	30.49	8.19	0.99	0.91	2,866.04	0.89	0.99	13.54	3.64	0.44	0.40	1,272.52	0.40	1,168.08
Rough Terrain Forklifts >51 and <12(	Rough terrain forklif	1	8	75	888	0.12	1.51	1.73	0.07	0.07	259.90	0.08	0.05	0.67	0.77	0.03	0.03	115.40	0.04	105.93
Other Construction Equipment >251 and <50(	Soil compactor, 232 HF	4	8	232	888	1.72	21.77	12.46	0.79	0.72	3,391.45	1.06	0.77	9.67	5.53	0.35	0.32	1,505.81	0.47	1,382.23
Rollers >51 and <12(	Tandem vibratory roller, 10 to	1	8	100	888	0.32	3.12	2.42	0.21	0.20	329.88	0.10	0.14	1.38	1.07	0.10	0.09	146.47	0.05	134.45
Tractors/Loaders/Backhoes >51 and <12(	Front End Loader 3 CY	3	8	93	888	0.77	7.56	6.72	0.54	0.49	899.63	0.28	0.34	3.36	2.98	0.24	0.22	399.44	0.12	366.66
Tractors/Loaders/Backhoes >121 and <17!	Front End Loader 5 CY	2	8	150	888	0.58	6.20	6.14	0.31	0.29	951.01	0.30	0.26	2.75	2.73	0.14	0.13	422.25	0.13	387.59
Bore/Drill Rigs >121 and <175	Truck mounted drill rig	1	8	145	888	0.26	3.01	3.79	0.13	0.12	633.04	0.20	0.12	1.34	1.68	0.06	0.05	281.07	0.09	258.00
Generator Sets >26 and <5(	Generators	2	8	50	888	1.17	5.70	5.46	0.33	0.33	741.71	0.10	0.52	2.53	2.42	0.15	0.15	329.32	0.05	300.86
Other Construction Equipment >51 and <12(	Vibrating screer	2	8	100	888	0.89	8.06	5.63	0.62	0.57	725.97	0.23	0.39	3.58	2.50	0.27	0.25	322.33	0.10	295.88
Other Construction Equipment >121 and <17!	Vibratory soil compacto	6	8	131	888	2.54	27.69	19.00	1.46	1.34	2,841.21	0.88	1.13	12.29	8.44	0.65	0.60	1,261.50	0.39	1,157.97
Off-Highway Trucks >176 and <25(	3,000 gal water truck	8	8	230	888	4.20	42.55	19.03	1.74	1.60	6,013.41	1.87	1.87	18.89	8.45	0.77	0.71	2,669.96	0.83	2,450.84
Pumps >26 and <5(	Submersible pump	30	24	50	888	57.15	259.71	258.24	15.68	15.68	33,376.88	5.11	25.37	115.31	114.66	6.96	6.96	14,819.33	2.27	13,543.40
Off-Highway Trucks >251 and <50(	Articulated end dump trucks (for CDSM	6	8	481	888	5.55	59.77	30.16	2.18	2.01	9,545.46	2.97	2.46	26.54	13.39	0.97	0.89	4,238.18	1.32	3,890.36
Pumps >251 and <50(	Cement pump (for CDSM)	2	8	450	888	2.65	27.49	12.23	0.83	0.83	6,675.38	0.23	1.18	12.20	5.43	0.37	0.37	2,963.87	0.10	2,699.78
Bore/Drill Rigs >121 and <175	Drill rig with multiaxis mixing augers (for CDSM	2	8	145	888	0.52	6.03	7.57	0.26	0.24	1,266.08	0.39	0.23	2.68	3.36	0.12	0.11	562.14	0.17	516.01
Tractors/Loaders/Backhoes >121 and <17!	Loader (for CDSM)	2	8	150	888	0.58	6.20	6.14	0.31	0.29	951.01	0.30	0.26	2.75	2.73	0.14	0.13	422.25	0.13	387.59
Tractors/Loaders/Backhoes >121 and <17!	Track mounted backhoe (for CDSM	2	8	150	888	0.58	6.20	6.14	0.31	0.29	951.01	0.30	0.26	2.75	2.73	0.14	0.13	422.25	0.13	387.59
Bore/Drill Rigs >121 and <175	Track mounted drill rig for coring (for CDSM	1	8	145	888	0.26	3.01	3.79	0.13	0.12	633.04	0.20	0.12	1.34	1.68	0.06	0.05	281.07	0.09	258.00
Total						**96.12**	**687.76**	**498.85**	**33.76**	**32.41**	**90,144.93**	**20.81**	**42.68**	**305.37**	**221.49**	**14.99**	**14.39**	**40,024.35**	**9.24**	**36,657.60**

On Road Construction Emissions

						Emissions Summary (lbs/day)							Emissions Summary (tons per phase)							
	Daily Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	37	16.8	1,243	888	1,103,962							0.08								371.33
Truck Trips	6	0.5	166	48	7,968															13.43
Concrete Truck Trips	9	25	1,450	312	452,400	0.09			0.13	0.05			0.04	0.19		0.06		407.08	0.03	762.33
Cement Truck Trips	9	71	4,118	48	197,664	0.08	0.42	3.28	0.05	0.03		0.00	0.00	0.07	1.46	0.00		14.75	0.00	333.08
Total						0.72 **2.92**	2.72 **94.43**	0.29 **13.47**	0.46 **1.95**	0.26 **1.07**	917 **22,150.76**	0.02 **0.14**	0.11 **0.20**	3.71 **5.58**	0.01 **2.04**	0.07 **0.16**	0.02 **0.08**	837.66 **1,625.48**	0.00 **0.04**	**1,480.16**
						2.04	23.77	2.58	1.31	0.73	615	0.05	0.05	1.62	0.40	0.03	0.00	365.99	0.00	
							67.51	7.32			5,370				0.18		0.04			
											15,250						0.02			

Concrete and haul trucks assumed to haul material from Keeler at a distance of approximately 25 miles (50 miles round tri

	Emissions Summary (lbs/day)							Emissions Summary (tons per phase)							
Total	VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Maximum Daily Emissions	**99.04**	**782.19**	**512.32**	**35.71**	**33.47**	**112,295.69**	**20.95**								
Maximum Annual Emissions								**42.88**	**310.95**	**223.53**	**15.15**	**14.47**	**41,649.83**	**9.28**	**38,137.77**

16

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Slope Protection

Equipment Type	Equipment Category	Number	Usage Factor (hrs/day or miles/day)	Power Rating (hp)	Total Days/VMT	Emissions Summary (lbs/day) VOC	NOX	CO	PM10	PM2.5	CO2	CH4	Emissions Summary (tons per phase) VOC	NOX	CO	PM10	PM2.5	CO_2	CH4	Total GHG Emissions (MT CO2e)
Tractors/Loaders/Backhoes >51 and <120	Backhoe Loader	1	8	93	120	0.26	2.52	2.24	0.18	0.16	299.88	0.09	0.02	0.15	0.13	0.01	0.01	17.99	0.01	16.52
Rollers >51 and <120	Vibratory Roller 25 Ton	1	8	100	120	0.32	3.12	2.42	0.21	0.20	329.88	0.10	0.02	0.19	0.15	0.01	0.01	19.79	0.01	18.17
Rubber Tired Dozers > 176 and <250	Crawler Dozer	1	8	200	120	0.94	10.17	3.54	0.49	0.45	696.50	0.22	0.06	0.61	0.21	0.03	0.03	41.79	0.01	38.36
Off-Highway Trucks >176 and <250	Dump Truck (12 CY)	4	8	230	120	2.10	21.28	9.52	0.87	0.80	3,006.71	0.94	0.13	1.28	0.57	0.05	0.05	180.40	0.06	165.60
Excavators >251 and <500	Hydraulic Excavator, 396 HP	1	8	396	120	0.46	5.44	3.02	0.18	0.16	1,298.09	0.40	0.03	0.33	0.18	0.01	0.01	77.89	0.02	71.49
Rough Terrain Forklifts >51 and <120	Rough terrain forklift	1	8	75	120	0.12	1.51	1.73	0.07	0.07	259.90	0.08	0.01	0.09	0.10	0.00	0.00	15.59	0.00	14.31
Other Construction Equipment >251 and <500	Soil compactor, 232 HP	1	8	232	120	0.43	5.44	3.12	0.20	0.18	847.86	0.26	0.03	0.33	0.19	0.01	0.01	50.87	0.02	46.70
Tractors/Loaders/Backhoes >51 and <120	Front End Loader 3 CY	1	8	93	120	0.26	2.52	2.24	0.18	0.16	299.88	0.09	0.02	0.15	0.13	0.01	0.01	17.99	0.01	16.52
Tractors/Loaders/Backhoes >121 and <175	Front End Loader 5 CY	1	8	150	120	0.29	3.10	3.07	0.16	0.14	475.50	0.15	0.02	0.19	0.18	0.01	0.01	28.53	0.01	26.19
Generator Sets >26 and <50	Generators	1	8	50	120	0.58	2.85	2.73	0.17	0.17	370.85	0.05	0.04	0.17	0.16	0.01	0.01	22.25	0.00	20.33
Off-Highway Trucks >176 and <250	3,000 gal water truck	2	8	230	120	1.05	10.64	4.76	0.44	0.40	1,503.35	0.47	0.06	0.64	0.29	0.03	0.02	90.20	0.03	82.80
Total						**6.81**	**68.58**	**38.39**	**3.14**	**2.90**	**9,388.41**	**2.86**	**0.41**	**4.12**	**2.30**	**0.19**	**0.17**	**563.30**	**0.17**	**516.98**

On Road Construction Emissions

	Daily Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	30	16.8	1,008	120	120,960							0.06								40.69
Concrete/Asphalt Truck Trips		25	250	120	30,000															50.55
Total						**0.19**	**4.44**	**3.11**	**0.18**	**0.09**	**1,669.18**	**0.07**	**0.01**	**0.27**	**0.19**	**0.01**	**0.01**	**100.15**	**0.00**	**91.24**

Concrete and haul trucks assumed to haul material from Keeler at a distance of approximately 25 miles (50 miles round trip).

0.07 0.12 0.34 4.10 2.66 0.44 0.10 0.08 0.04 0.04 743 926 0.00 0.00 0.01 0.02 0.25 0.16 0.03 0.01 0.00 0.00 0.00 44.60 55.55 0.00 0.00

Total	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Maximum Daily Emissions	**7.01**	**73.03**	**41.49**	**3.32**	**2.99**	**11,057.59**	**2.93**								
Maximum Annual Emissions								**0.42**	**4.38**	**2.49**	**0.20**	**0.18**	**663.46**	**0.18**	**608.22**

Diversion Channel

Equipment Type	Equipment Category	Number	Usage Factor (hrs/day or miles/day)	Power Rating (hp)	Total Days/VMT	Emissions Summary (lbs/day) VOC	NOX	CO	PM10	PM2.5	CO2	CH4	Emissions Summary (tons per phase) VOC	NOX	CO	PM10	PM2.5	CO_2	CH4	Total GHG Emissions (MT CO2e)
Other Construction Equipment >26 and <50	Vibrator	2	8	50	96	0.87	3.90	4.10	0.33	0.31	406.63	0.13	0.04	0.19	0.20	0.02	0.01	19.52	0.01	17.92
Graders >121 and <175	Grader	1	8	135	96	0.65	6.45	3.62	0.36	0.33	485.54	0.15	0.03	0.31	0.17	0.02	0.02	23.31	0.01	21.39
Rubber Tired Dozers > 176 and <250	Crawler Dozer	1	8	200	96	0.94	10.17	3.54	0.49	0.45	696.50	0.22	0.05	0.49	0.17	0.02	0.02	33.43	0.01	30.69
Off-Highway Trucks >176 and <250	Dump Truck (12 CY)	5	8	230	96	2.63	26.60	11.89	1.09	1.00	3,758.38	1.17	0.13	1.28	0.57	0.05	0.05	180.40	0.06	165.60
Scrapers >251 and <500	Elevating scraper, 23 C.Y.	1	8	365	96	1.14	14.11	8.74	0.56	0.51	1,516.49	0.47	0.05	0.68	0.42	0.03	0.02	72.79	0.02	66.82
Excavators >251 and <500	Hydraulic Excavator, 396 HP	1	8	396	96	0.46	5.44	3.02	0.18	0.16	1,298.09	0.40	0.02	0.26	0.15	0.01	0.01	62.31	0.02	57.19
Other Construction Equipment >251 and <500	Soil compactor, 232 HP	1	8	232	96	0.43	5.44	3.12	0.20	0.18	847.86	0.26	0.02	0.26	0.15	0.01	0.01	40.70	0.01	37.36
Tractors/Loaders/Backhoes >51 and <120	Front End Loader 3 CY	1	8	93	96	0.26	2.52	2.24	0.18	0.16	299.88	0.09	0.01	0.12	0.11	0.01	0.01	14.39	0.00	13.21
Off-Highway Trucks >176 and <250	3,000 gal water truck	1	8	230	96	0.53	5.32	2.38	0.22	0.20	751.68	0.23	0.03	0.26	0.11	0.01	0.01	36.08	0.01	33.12
Total						**7.90**	**79.96**	**42.66**	**3.60**	**3.32**	**10,061.05**	**3.13**	**0.38**	**3.84**	**2.05**	**0.17**	**0.16**	**482.93**	**0.15**	**443.30**

On Road Construction Emissions

	Daily Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips		16.8	-	96	-							-								-
Concrete/Asphalt Truck Trips		25	-	96	-															
Total						**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Note: Worker and truck trips included with Slope Protection phase.

Total	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Maximum Daily Emissions	**7.90**	**79.96**	**42.66**	**3.60**	**3.32**	**10,061.05**	**3.13**								
Maximum Annual Emissions								**0.38**	**3.84**	**2.05**	**0.17**	**0.16**	**482.93**	**0.15**	**443.30**

Excavate and Recompact Alternative
Borrow Site 10

On Road Construction Emissions

	Daily Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	33	16.8	1,109	240	266,112													89.51
Truck Trips		2.45	280	240	67,158													113.17
Total						**0.22**	**4.97**	**3.42**	**0.20**	**0.10**	**0.03**	**0.60**	**0.41**	**0.02**	**0.01**	**222.48**	**0.01**	**202.68**
						0.08	0.38	2.93	0.11	0.05	0.01	0.05	0.35	0.01	0.01	98.13	0.01	
						0.14	4.59	0.50	0.09	0.05	0.02	0.55	0.06	0.01	0.01	124.35	0.00	

Note: Construction equipment included with LAA Relignment.

Excavate and Recompact Alternative
Borrow Site 15

On Road Construction Emissions

						Emissions Summary (lbs/day)					Emissions Summary (tons per phase)							
	Daily Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	VOC	NO_x	CO	PM10	PM2.5	VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	8	16.8	269	216	58,061													19.53
Truck Trips		55.00	4,950	216	1,069,286													1,801.83
Total						**2.47**	**81.25**	**9.51**	**1.60**	**0.89**	**0.27**	**8.78**	**1.03**	**0.17**	**0.10**	[illegible]	**0.01**	1,821.36

Note: Assumes a total of 44 workers per day.

0.02 2.45 0.09 81.16 0.71 8.80 0.03 1.58 0.01 0.88 0.00 0.26 0.01 8.77 0.08 0.95 0.00 0.17 0.00 0.09 21.41 0.00 0.01

45

Cement Deep Soil Mixing Alternative
Borrow Site 10

On Road Construction Emissions

	Total Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	23	16.8	773	216	166,925													56.15
Truck Trips		2.45	393	216	84,831													142.95
Total						0.05 0.10 **0.25**	**6.70**	**2.74**	0.08 0.12 **0.20**	0.03 0.07 **0.10**	0.01 **0.03**	0.03 **0.72**	**0.30**	0.01 **0.02**	0.00 **0.01**	61.55 157.07 **218.62**	0.01 0.00 **0.01**	**199.09**
							0.26	2.04			0.02	0.70	0.22	0.01	0.01			
							6.44	0.70					0.08					

Note: Construction equipment included with LAA Relignment.

80

Cement Deep Soil Mixing Alternative
Borrow Site 15
On Road Construction Emissions

	Total Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	14	16.8	470	216	101,606													34.18
Truck Trips		55.00	2,420	216	522,762													880.90
Total						**1.23**	**39.84**	**5.54**	**0.82**	**0.45**	**0.13**	**4.30**	**0.60**	**0.09**	**0.05**	**1,005.40**	**0.01**	915.07
						0.03	0.16	1.24	0.05	0.02	0.00	0.02	0.13	0.01	0.00	37.47	0.00	
						1.20	39.68	4.30	0.77	0.43	0.13	4.29	0.46	0.08	0.05	967.93	0.00	

Note: Assumes a total of 44 workers per day.

22

Cactus Flats Road Improvements
Mitigated Emissions

Equipment Category	Equipment Type	Number	Usage Factor (hrs/day or miles/day)	Power Rating (hp)	Total Days/VMT	Emissions Summary (lbs/day) VOC	NOX	CO	PM10	PM2.5	CO2	CH4	Emissions Summary (tons per phase) VOC	NOX	CO	PM10	PM2.5	CO_2	CH4	Total GHG Emissions (MT CO2e)
Excavators >251 and <500	Excavator - 3.5 CY	2	8	396	240	0.32	1.38	11.68	0.04	0.04	2,637.08	0.81	0.04	0.17	1.40	0.01	0.01	316.45	0.10	290.44
Off-Highway Trucks >176 and <250	Dump Truck (12 CY)	2	8	230	240	0.18	0.80	6.78	0.02	0.02	1,525.42	0.47	0.02	0.10	0.81	0.00	0.00	183.05	0.06	168.01
Other Construction Equipment >26 and <50	Vibrator	2	8	50	240	0.09	2.04	3.04	0.01	0.01	413.34	0.13	0.01	0.24	0.36	0.00	0.00	49.60	0.02	45.52
Graders >121 and <175	Grader	2	8	135	240	0.12	0.51	7.22	0.02	0.02	989.38	0.30	0.01	0.06	0.87	0.00	0.00	118.73	0.04	108.97
Paving Equipment >121 and <175	Asphalt Paver - 130 hp	1	8	130	240	0.05	0.21	3.05	0.01	0.01	410.35	0.13	0.01	0.03	0.37	0.00	0.00	49.24	0.02	45.19
Rollers >51 and <120	Pneumatic Wheel Roller 12 Ton	1	8	100	240	0.08	1.84	2.48	0.01	0.01	335.21	0.10	0.01	0.22	0.30	0.00	0.00	40.22	0.01	36.92
Rollers >51 and <120	Tandem vibratory roller, 10 ton	1	8	100	240	0.08	1.84	2.48	0.01	0.01	335.21	0.10	0.01	0.22	0.30	0.00	0.00	40.22	0.01	36.92
Rollers >51 and <120	Vibratory Roller 25 Ton	1	8	100	240	0.08	1.84	2.48	0.01	0.01	335.21	0.10	0.01	0.22	0.30	0.00	0.00	40.22	0.01	36.92
Off-Highway Trucks >176 and <250	3,000 gal water truck	2	8	230	240	0.18	0.80	6.78	0.02	0.02	1,525.42	0.47	0.02	0.10	0.81	0.00	0.00	183.05	0.06	168.01
Tractors/Loaders/Backhoes >51 and <120	Front End Loader	2	8	93	240	0.15	3.33	4.49	0.01	0.01	610.28	0.19	0.02	0.40	0.54	0.00	0.00	73.23	0.02	67.21
Rubber Tired Dozers > 176 and <250	Crawler Dozer	2	8	200	240	0.17	0.73	6.21	0.02	0.02	1,415.33	0.43	0.02	0.09	0.74	0.00	0.00	169.84	0.05	155.88
Off-Highway Tractors >501 and <750	Truck Tractor, 6x4, 450 H.P.	1	8	450	240	0.21	0.91	7.68	0.03	0.03	1,737.74	0.53	0.03	0.11	0.92	0.00	0.00	208.53	0.06	191.39
Off-Highway Tractors >501 and <750	Truck Tractor, 6x4, 380 H.P.	2	8	380	240	0.35	1.53	12.98	0.05	0.05	2,934.86	0.90	0.04	0.18	1.56	0.01	0.01	352.18	0.11	323.24
Total						**2.06**	**17.75**	**77.35**	**0.24**	**0.24**	**15,204.83**	**4.66**	**0.25**	**2.13**	**9.28**	**0.03**	**0.03**	**1,824.58**	**0.56**	**1,674.61**

On Road Construction Emissions

	Daily Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	22	16.8	739	240	177,408							0.05								59.67
Concrete/Asphalt Truck Trips		25	150	240	36,000								0.01							60.66
Total						0.05 0.07 **0.13**	**2.71**	**2.22**	0.08 0.05 **0.12**	0.03 0.03 **0.06**	**1,100.63**	0.00 **0.05**	0.01 **0.02**	0.03 **0.33**	**0.27**	0.01 **0.01**	**0.01**	65.42 **132.08**	0.01 0.00 **0.01**	**120.34**
Notes:							0.25	1.95			545			0.30	0.23	0.01	0.00	66.66		
Concrete and haul trucks assumed to haul material from Keeler at a distance of approximately 25 miles (50 miles round trip).							2.46	0.27			555				0.03		0.00			

Total		Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Maximum Daily Emissions		**2.19**	**20.46**	**79.57**	**0.37**	**0.30**	**16,305.46**	**4.71**								
Maximum Annual Emissions	3								**0.26**	**2.46**	**9.55**	**0.04**	**0.04**	**1,956.65**	**0.56**	**1,794.95**

LAA Realignment
Mitigated Emissions

Equipment Type	Equipment Category	Number	Usage Factor (hrs/day or miles/day)	Power Rating (hp)	Total Days/VMT	Emissions Summary (lbs/day) VOC	NOX	CO	PM10	PM2.5	CO2	CH4	Emissions Summary (tons per phase) VOC	NOX	CO	PM10	PM2.5	CO_2	CH4	Total GHG Emissions (MT CO2e)
Cranes >251 and <500	Crawler Crane	1	8	375	528	0.12	0.50	4.22	0.02	0.02	956.02	0.29	0.03	0.13	1.11	0.00	0.00	252.39	0.08	231.64
Off-Highway Trucks >176 and <250	Dump Truck (12 CY)	8	8	230	528	0.74	3.21	27.13	0.10	0.10	6,101.69	1.87	0.20	0.85	7.16	0.03	0.03	1,610.85	0.49	1,478.45
Off-Highway Trucks >176 and <250	3,000 gal water truck	3	8	230	528	0.28	1.20	10.17	0.04	0.04	2,288.13	0.70	0.07	0.32	2.69	0.01	0.01	604.07	0.19	554.42
Rollers >51 and <120	Tandem vibratory roller, 10 ton	1	8	100	528	0.08	1.84	2.48	0.01	0.01	335.21	0.10	0.02	0.48	0.65	0.00	0.00	88.49	0.03	81.22
Other Construction Equipment >121 and <175	Hammer, Diesel, 22k ft-lb	1	8	175	528	0.08	0.34	4.80	0.01	0.01	642.88	0.20	0.02	0.09	1.27	0.00	0.00	169.72	0.05	155.77
Excavators >251 and <500	Hydraulic Excavator, 396 HP	2	8	396	528	0.32	1.38	11.68	0.04	0.04	2,637.08	0.81	0.08	0.36	3.08	0.01	0.01	696.19	0.21	638.97
Concrete/Industrial Saws >26 and <50	Concrete Saw	3	8	50	528	0.23	5.31	7.92	0.02	0.02	1,097.53	0.20	0.06	1.40	2.09	0.00	0.00	289.75	0.05	265.05
Rough Terrain Forklifts >51 and <120	Rough terrain forklift	1	8	75	528	0.06	1.45	1.96	0.00	0.00	264.11	0.08	0.02	0.38	0.52	0.00	0.00	69.73	0.02	64.00
Tractors/Loaders/Backhoes >51 and <120	Backhoe Loader	1	8	93	528	0.07	1.66	2.25	0.00	0.00	305.14	0.09	0.02	0.44	0.59	0.00	0.00	80.56	0.02	73.94
Rubber Tired Dozers > 176 and <250	Crawler Dozer	4	8	200	528	0.34	1.47	12.42	0.05	0.05	2,830.65	0.87	0.09	0.39	3.28	0.01	0.01	747.29	0.23	685.87
Air Compressors >26 and <50	Jack Hammer	2	8	50	528	0.10	2.33	3.47	0.01	0.01	481.11	0.11	0.03	0.61	0.92	0.00	0.00	127.01	0.03	116.34
Generator Sets >26 and <50	Generators	3	8	50	528	0.23	5.38	8.03	0.02	0.02	1,112.56	0.18	0.06	1.42	2.12	0.00	0.00	293.72	0.05	268.48
Other Construction Equipment >251 and <500	Soil compactor, 232 HP	2	8	232	528	0.21	0.89	7.56	0.03	0.03	1,722.43	0.53	0.05	0.24	2.00	0.01	0.01	454.72	0.14	417.35
Scrapers >251 and <500	Elevating scraper, 23 C.Y.	3	8	365	528	0.56	2.41	20.39	0.07	0.07	4,620.70	1.42	0.15	0.64	5.38	0.02	0.02	1,219.86	0.37	1,119.60
Other Construction Equipment >121 and <175	Vibratory soil compactor	5	8	131	528	0.29	1.26	17.95	0.04	0.04	2,406.23	0.74	0.08	0.33	4.74	0.01	0.01	635.24	0.19	583.03
Graders >121 and <175	Grader, 30,000 lbs.	2	8	145	528	0.13	0.55	7.76	0.02	0.02	1,062.67	0.33	0.03	0.14	2.05	0.00	0.00	280.54	0.09	257.49
Tractors/Loaders/Backhoes >51 and <120	Front End Loader	5	8	93	528	0.36	8.31	11.23	0.02	0.02	1,525.70	0.47	0.10	2.19	2.96	0.01	0.01	402.79	0.12	369.68
Total						**4.20**	**39.49**	**161.41**	**0.48**	**0.48**	**30,389.85**	**8.98**	**1.11**	**10.42**	**42.61**	**0.13**	**0.13**	**8,022.92**	**2.37**	**7,361.28**

On Road Construction Emissions

	Total Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	35	16.8	1,176	528	620,928							0.07								208.85
Concrete/Asphalt Truck Trips		25	200	528	105,600								0.03							177.94
Total						**0.18**	**3.68**	**3.46**	**0.18**	**0.09**	**1,607.92**	**0.08**	**0.05**	**0.97**	**0.91**	**0.05**	**0.02**	**424.49**	**0.02**	**386.80**

0.08 0.10 0.40 3.28 3.11 0.36 0.12 0.06 0.05 0.04 867 741 0.00 0.02 0.11 0.87 0.82 0.09 0.03 0.02 0.01 228.97 195.53 0.02 0.00

Concrete and haul trucks assumed to haul material from Keeler at a distance of approximately 25 miles (50 miles round trip).

Total	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Maximum Daily Emissions	**4.38**	**43.17**	**164.87**	**0.67**	**0.57**	**31,997.77**	**9.06**								
Maximum Annual Emissions								**1.16**	**11.40**	**43.52**	**0.18**	**0.15**	**8,447.41**	**2.39**	**7,748.08**

Excavate and Recompact Alternative
NHD2
Mitigated Emissions

Equipment Type	Equipment Category	Number	Usage Factor (hrs/day or miles/day)	Power Rating (hp)	Total Days/VMT	Emissions Summary (lbs/day) VOC	NOX	CO	PM10	PM2.5	CO2	CH4	Emissions Summary (tons per phase) VOC	NOX	CO	PM10	PM2.5	CO_2	CH4	Total GHG Emissions (MT CO2e)
Tractors/Loaders/Backhoes >51 and <120	Backhoe Loader	1	8	93	1032	0.07	1.66	2.25	0.00	0.00	305.14	0.09	0.04	0.86	1.16	0.00	0.00	157.45	0.05	144.51
Cranes >176 and <250	Crane	1	8	240	1032	0.07	0.32	2.70	0.01	0.01	613.00	0.19	0.04	0.16	1.39	0.01	0.01	316.31	0.10	290.31
Rubber Tired Dozers > 176 and <250	Crawler Dozer	4	8	200	1032	0.34	1.47	12.42	0.05	0.05	2,830.65	0.87	0.17	0.76	6.41	0.02	0.02	1,460.62	0.45	1,340.57
Off-Highway Trucks >176 and <250	Dump Truck (12 CY)	8	8	230	1032	0.74	3.21	27.13	0.10	0.10	6,101.69	1.87	0.38	1.65	14.00	0.05	0.05	3,148.47	0.96	2,889.69
Scrapers >251 and <500	Elevating scraper, 23 C.Y.	10	8	365	1032	1.85	8.03	67.98	0.25	0.25	15,402.33	4.72	0.96	4.15	35.08	0.13	0.13	7,947.60	2.43	7,294.36
Excavators >251 and <500	Hydraulic Excavator, 396 HP	2	8	396	1032	0.32	1.38	11.68	0.04	0.04	2,637.08	0.81	0.16	0.71	6.03	0.02	0.02	1,360.73	0.42	1,248.89
Graders >176 and <250	Motor Grader	4	8	200	1032	0.35	1.50	12.73	0.05	0.05	2,914.46	0.89	0.18	0.78	6.57	0.02	0.02	1,503.86	0.46	1,380.26
Off-Highway Trucks >176 and <250	Off-Highway Trucks	5	8	230	1032	0.46	2.00	16.96	0.06	0.06	3,813.56	1.17	0.24	1.03	8.75	0.03	0.03	1,967.79	0.60	1,806.06
Rough Terrain Forklifts >51 and <120	Rough terrain forklift	1	8	75	1032	0.06	1.45	1.96	0.00	0.00	264.11	0.08	0.03	0.75	1.01	0.00	0.00	136.28	0.04	125.08
Other Construction Equipment >251 and <500	Soil compactor, 232 HP	4	8	232	1032	0.41	1.79	15.12	0.05	0.05	3,444.86	1.06	0.21	0.92	7.80	0.03	0.03	1,777.55	0.54	1,631.44
Rollers >51 and <120	Tandem vibratory roller, 10 ton	1	8	100	1032	0.08	1.84	2.48	0.01	0.01	335.21	0.10	0.04	0.95	1.28	0.00	0.00	172.97	0.05	158.75
Tractors/Loaders/Backhoes >51 and <120	Front End Loader 3 CY	3	8	93	1032	0.22	4.99	6.74	0.01	0.01	915.42	0.28	0.11	2.57	3.48	0.01	0.01	472.36	0.14	433.53
Tractors/Loaders/Backhoes >121 and <175	Front End Loader 5 CY	2	8	150	1032	0.12	0.51	7.24	0.02	0.02	966.93	0.30	0.06	0.26	3.74	0.01	0.01	498.94	0.15	457.93
Bore/Drill Rigs >121 and <175	Truck mounted drill rig	1	8	145	1032	0.08	0.33	4.73	0.01	0.01	644.16	0.20	0.04	0.17	2.44	0.01	0.01	332.39	0.10	305.07
Generator Sets >26 and <50	Generators	2	8	50	1032	0.16	3.59	5.35	0.01	0.01	741.71	0.12	0.08	1.85	2.76	0.01	0.01	382.72	0.06	349.84
Other Construction Equipment >51 and <120	Vibrating screen	5	8	100	1032	0.44	10.15	13.70	0.03	0.03	1,842.19	0.56	0.23	5.24	7.07	0.02	0.02	950.57	0.29	872.44
Other Construction Equipment >121 and <175	Vibratory soil compactor	8	8	131	1032	0.47	2.02	28.72	0.06	0.06	3,849.96	1.18	0.24	1.04	14.82	0.03	0.03	1,986.58	0.61	1,823.30
Off-Highway Trucks >176 and <250	3,000 gal water truck	8	8	230	1032	0.74	3.21	27.13	0.10	0.10	6,101.69	1.87	0.38	1.65	14.00	0.05	0.05	3,148.47	0.96	2,889.69
Pumps >26 and <50	Submersible pump	30	24	50	1032	7.05	161.51	240.80	0.47	0.47	33,376.88	5.81	3.64	83.34	124.25	0.24	0.24	17,222.47	3.00	15,748.89
Total						**14.03**	**210.95**	**507.81**	**1.33**	**1.33**	**87,101.04**	**22.17**	**7.24**	**108.85**	**262.03**	**0.69**	**0.69**	**44,944.14**	**11.44**	**41,190.60**

On Road Construction Emissions

	Total Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	37	16.8	1,243	1,032	1,282,982							0.08								431.54
Concrete/Asphalt Truck Trips		25	600	1,032	619,200															1,043.40
Total						0.09 0.30 **0.38**	**10.26**	**4.35**	0.13 0.19 **0.32**	0.05 0.11 **0.16**	**3,138.75**	0.01 **0.08**	0.04 **0.20** 0.15	0.22 **5.29** 5.08	**2.24** 1.69 0.55	0.07 **0.16** 0.10	**0.08** 0.03 0.05	473.19 **1,619.59**	0.04 0.00 **0.04**	**1,474.94**
							0.42 9.84	3.28 1.07			917 2,222									

Concrete and haul trucks assumed to haul material from Keeler at a distance of approximately 25 miles (50 miles round trip).

Total	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Maximum Daily Emissions	**14.41**	**221.21**	**512.16**	**1.65**	**1.49**	**90,239.79**	**22.25**								
Maximum Annual Emissions								**7.44**	**114.15**	**264.27**	**0.85**	**0.77**	**46,563.73**	**11.48**	**42,665.54**

Cement Deep Soil Mixing Alternative
NHD2
Mitigated Emissions

						Emissions Summary (lbs/day)							Emissions Summary (tons per phase)							
Equipment Type	Equipment Category	Number	Usage Factor (hrs/day or miles/day)	Power Rating (hp)	Total Days/VMT	VOC	NOX	CO	PM10	PM2.5	CO2	CH4	VOC	NOX	CO	PM10	PM2.5	CO_2	CH4	Total GHG Emissions (MT CO2e)
Tractors/Loaders/Backhoes >51 and <12(	Backhoe Loade	1	8	93	888	0.07	1.66	2.25	0.00	0.00	305.14	0.09	0.03	0.74	1.00	0.00	0.00	135.48	0.04	124.35
Cranes >176 and <25(	Crane	1	8	240	888	0.07	0.32	2.70	0.01	0.01	613.00	0.19	0.03	0.14	1.20	0.00	0.00	272.17	0.08	249.80
Rubber Tired Dozers > 176 and <25(	Crawler Dozei	4	8	200	888	0.34	1.47	12.42	0.05	0.05	2,830.65	0.87	0.15	0.65	5.51	0.02	0.02	1,256.81	0.39	1,153.51
Off-Highway Trucks >176 and <25(	Dump Truck (12 CY)	4	8	230	888	0.37	1.60	13.56	0.05	0.05	3,050.84	0.93	0.16	0.71	6.02	0.02	0.02	1,354.57	0.42	1,243.24
Scrapers >251 and <50(	Elevating scraper, 23 C.Y	6	8	365	888	1.11	4.82	40.79	0.15	0.15	9,241.40	2.83	0.49	2.14	18.11	0.07	0.07	4,103.18	1.26	3,765.92
Excavators >251 and <50(	Hydraulic Excavator, 396 HF	1	8	396	888	0.16	0.69	5.84	0.02	0.02	1,318.54	0.40	0.07	0.31	2.59	0.01	0.01	585.43	0.18	537.31
Graders >176 and <25(	Motor Gradei	4	8	200	888	0.35	1.50	12.73	0.05	0.05	2,914.46	0.89	0.15	0.67	5.65	0.02	0.02	1,294.02	0.40	1,187.66
Rough Terrain Forklifts >51 and <12(	Rough terrain forklif	1	8	75	888	0.06	1.45	1.96	0.00	0.00	264.11	0.08	0.03	0.64	0.87	0.00	0.00	117.27	0.04	107.63
Other Construction Equipment >251 and <50(	Soil compactor, 232 HF	4	8	232	888	0.41	1.79	15.12	0.05	0.05	3,444.86	1.06	0.18	0.79	6.71	0.02	0.02	1,529.52	0.47	1,403.80
Rollers >51 and <12(	Tandem vibratory roller, 10 to	1	8	100	888	0.08	1.84	2.48	0.01	0.01	335.21	0.10	0.04	0.82	1.10	0.00	0.00	148.83	0.05	136.60
Tractors/Loaders/Backhoes >51 and <12(	Front End Loader 3 CY	3	8	93	888	0.22	4.99	6.74	0.01	0.01	915.42	0.28	0.10	2.21	2.99	0.01	0.01	406.45	0.12	373.04
Tractors/Loaders/Backhoes >121 and <17!	Front End Loader 5 CY	2	8	150	888	0.12	0.51	7.24	0.02	0.02	966.93	0.30	0.05	0.23	3.22	0.01	0.01	429.32	0.13	394.03
Bore/Drill Rigs >121 and <175	Truck mounted drill riç	1	8	145	888	0.08	0.33	4.73	0.01	0.01	644.16	0.20	0.03	0.15	2.10	0.00	0.00	286.01	0.09	262.50
Generator Sets >26 and <5(	Generators	2	8	50	888	0.16	3.59	5.35	0.01	0.01	741.71	0.12	0.07	1.59	2.38	0.00	0.00	329.32	0.05	301.02
Other Construction Equipment >51 and <12(	Vibrating screen	2	8	100	888	0.18	4.06	5.48	0.01	0.01	736.88	0.23	0.08	1.80	2.43	0.01	0.01	327.17	0.10	300.28
Other Construction Equipment >121 and <17!	Vibratory soil compacto	6	8	131	888	0.35	1.51	21.54	0.05	0.05	2,887.47	0.88	0.16	0.67	9.56	0.02	0.02	1,282.04	0.39	1,176.67
Off-Highway Trucks >176 and <25(	3,000 gal water truck	8	8	230	888	0.74	3.21	27.13	0.10	0.10	6,101.69	1.87	0.33	1.42	12.05	0.04	0.04	2,709.15	0.83	2,486.48
Pumps >26 and <5(	Submersible pump	30	24	50	888	7.05	161.51	240.80	0.47	0.47	33,376.88	5.81	3.13	71.71	106.91	0.21	0.21	14,819.33	2.58	13,551.37
Off-Highway Trucks >251 and <50(	Articulated end dump trucks (for CDSM	6	8	481	888	1.16	5.03	42.55	0.15	0.15	9,698.86	2.97	0.52	2.23	18.89	0.07	0.07	4,306.29	1.32	3,952.34
Pumps >251 and <50(	Cement pump (for CDSM)	2	8	450	888	0.70	3.05	25.84	0.09	0.09	6,675.38	0.25	0.31	1.36	11.47	0.04	0.04	2,963.87	0.11	2,699.91
Bore/Drill Rigs >121 and <175	Drill rig with multiaxis mixing augers (for CDSM	2	8	145	888	0.15	0.66	9.46	0.02	0.02	1,288.32	0.39	0.07	0.30	4.20	0.01	0.01	572.02	0.18	525.00
Tractors/Loaders/Backhoes >121 and <17!	Loader (for CDSM)	2	8	150	888	0.12	0.51	7.24	0.02	0.02	966.93	0.30	0.05	0.23	3.22	0.01	0.01	429.32	0.13	394.03
Tractors/Loaders/Backhoes >121 and <17!	Track mounted backhoe (for CDSM	2	8	150	888	0.12	0.51	7.24	0.02	0.02	966.93	0.30	0.05	0.23	3.22	0.01	0.01	429.32	0.13	394.03
Bore/Drill Rigs >121 and <175	Track mounted drill rig for coring (for CDSM	1	8	145	888	0.08	0.33	4.73	0.01	0.01	644.16	0.20	0.03	0.15	2.10	0.00	0.00	286.01	0.09	262.50
Total						**14.24**	**206.95**	**525.93**	**1.38**	**1.38**	**90,929.96**	**21.54**	**6.32**	**91.89**	**233.51**	**0.61**	**0.61**	**40,372.90**	**9.56**	**36,983.03**

On Road Construction Emissions

						Emissions Summary (lbs/day)							Emissions Summary (tons per phase)							
	Total Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	37	16.8	1,243	888	1,103,962							0.08								371.33
Truck Trips	6	0.5	166	48	7,968															13.43
Concrete Truck Trips	9	25	1,450	312	452,400	0.09			0.13	0.05			0.04	0.19		0.06			0.03	762.33
Cement Truck Trips	9	71	4,118	48	197,664	0.08			0.05	0.03		0.00	0.00	0.07	1.46	0.00		407.08	0.00	333.08
Total						0.72 **2.92**	0.42 2.72 **94.43**	3.28 0.29 **13.47**	0.46 **1.95**	0.26 **1.07**	917 615 **22,150.76**	0.02 **0.14**	0.11 **0.20**	3.71 1.62 **5.58**	0.01 **2.04**	0.07 **0.16**	0.02 **0.08**	14.75 **1,625.48**	0.00 0.00 **0.04**	**1,480.16**

Concrete and haul trucks assumed to haul material from Keeler at a distance of approximately 25 miles (50 miles round tri

2.04 23.77 67.51 2.58 7.32 1.31 0.73 5,370 15,250 0.05 0.05 0.40 0.18 0.03 0.00 0.04 0.02 837.65 365.99 0.00

	Emissions Summary (lbs/day)							Emissions Summary (tons per phase)							
Total	VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Maximum Daily Emissions	**17.17**	**301.38**	**539.40**	**3.33**	**2.45**	**113,080.71**	**21.68**								
Maximum Annual Emissions								**6.53**	**97.47**	**235.56**	**0.77**	**0.69**	**41,998.38**	**9.60**	**38,463.19**

16

2

2

Slope Protection
Mitigated Emissions

Equipment Type	Equipment Category	Number	Usage Factor (hrs/day or miles/day)	Power Rating (hp)	Total Days/VMT	Emissions Summary (lbs/day) VOC	NOX	CO	PM10	PM2.5	CO2	CH4	Emissions Summary (tons per phase) VOC	NOX	CO	PM10	PM2.5	CO_2	CH4	Total GHG Emissions (MT CO2e)
Tractors/Loaders/Backhoes >51 and <120	Backhoe Loader	1	8	93	120	0.07	1.66	2.25	0.00	0.00	305.14	0.09	0.00	0.10	0.13	0.00	0.00	18.31	0.01	16.80
Rollers >51 and <120	Vibratory Roller 25 Ton	1	8	100	120	0.08	1.84	2.48	0.01	0.01	335.21	0.10	0.00	0.11	0.15	0.00	0.00	20.11	0.01	18.46
Rubber Tired Dozers > 176 and <250	Crawler Dozer	1	8	200	120	0.08	0.37	3.10	0.01	0.01	707.66	0.22	0.01	0.02	0.19	0.00	0.00	42.46	0.01	38.97
Off-Highway Trucks >176 and <250	Dump Truck (12 CY)	4	8	230	120	0.37	1.60	13.56	0.05	0.05	3,050.84	0.93	0.02	0.10	0.81	0.00	0.00	183.05	0.06	168.01
Excavators >251 and <500	Hydraulic Excavator, 396 HP	1	8	396	120	0.16	0.69	5.84	0.02	0.02	1,318.54	0.40	0.01	0.04	0.35	0.00	0.00	79.11	0.02	72.61
Rough Terrain Forklifts >51 and <120	Rough terrain forklift	1	8	75	120	0.06	1.45	1.96	0.00	0.00	264.11	0.08	0.00	0.09	0.12	0.00	0.00	15.85	0.00	14.54
Other Construction Equipment >251 and <500	Soil compactor, 232 HP	1	8	232	120	0.10	0.45	3.78	0.01	0.01	861.22	0.26	0.01	0.03	0.23	0.00	0.00	51.67	0.02	47.43
Tractors/Loaders/Backhoes >51 and <120	Front End Loader 3 CY	1	8	93	120	0.07	1.66	2.25	0.00	0.00	305.14	0.09	0.00	0.10	0.13	0.00	0.00	18.31	0.01	16.80
Tractors/Loaders/Backhoes >121 and <175	Front End Loader 5 CY	1	8	150	120	0.06	0.25	3.62	0.01	0.01	483.47	0.15	0.00	0.02	0.22	0.00	0.00	29.01	0.01	26.62
Generator Sets >26 and <50	Generators	1	8	50	120	0.08	1.79	2.68	0.01	0.01	370.85	0.06	0.00	0.11	0.16	0.00	0.00	22.25	0.00	20.34
Off-Highway Trucks >176 and <250	3,000 gal water truck	2	8	230	120	0.18	0.80	6.78	0.02	0.02	1,525.42	0.47	0.01	0.05	0.41	0.00	0.00	91.53	0.03	84.00
Total						**1.33**	**12.57**	**48.30**	**0.15**	**0.15**	**9,527.61**	**2.86**	**0.08**	**0.75**	**2.90**	**0.01**	**0.01**	**571.66**	**0.17**	**524.59**
										64.10										

On Road Construction Emissions

	Total Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips	30	16.8	1,008	120	120,960							0.06								40.69
Concrete/Asphalt Truck Trips		25	250	120	30,000								0.01							50.55
Total						0.07 0.12 **0.19**	**4.44**	**3.11**	0.10 0.08 **0.18**	0.04 0.04 **0.09**	**1,669.18**	0.00 **0.07**	0.00 **0.01**	0.02 **0.27**	**0.19**	0.01 **0.01**	**0.01**	44.60 **100.15**	0.00 0.00 **0.00**	**91.24**
							0.34 4.10	2.66 0.44			743 926			0.25	0.16 0.03	0.00	0.00 0.00	55.55		

Concrete and haul trucks assumed to haul material from Keeler at a distance of approximately 25 miles (50 miles round trip).

Total	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Maximum Daily Emissions	**1.52**	**17.01**	**51.40**	**0.34**	**0.24**	**11,196.79**	**2.93**								
Maximum Annual Emissions								**0.09**	**1.02**	**3.08**	**0.02**	**0.01**	**671.81**	**0.18**	**615.83**

Diversion Channel
Mitigated Emissions

Equipment Type	Equipment Category	Number	Usage Factor (hrs/day or miles/day)	Power Rating (hp)	Total Days/VMT	Emissions Summary (lbs/day) VOC	NOX	CO	PM10	PM2.5	CO2	CH4	Emissions Summary (tons per phase) VOC	NOX	CO	PM10	PM2.5	CO_2	CH4	Total GHG Emissions (MT CO2e)
Other Construction Equipment >26 and <50	Vibrator	2	8	50	96	0.09	2.04	3.04	0.01	0.01	413.34	0.13	0.00	0.10	0.15	0.00	0.00	19.84	0.01	18.21
Graders >121 and <175	Grader	1	8	135	96	0.06	0.25	3.61	0.01	0.01	494.69	0.15	0.00	0.01	0.17	0.00	0.00	23.75	0.01	21.79
Rubber Tired Dozers > 176 and <250	Crawler Dozer	1	8	200	96	0.08	0.37	3.10	0.01	0.01	707.66	0.22	0.00	0.02	0.15	0.00	0.00	33.97	0.01	31.18
Off-Highway Trucks >176 and <250	Dump Truck (12 CY)	5	8	230	96	0.46	2.00	16.96	0.06	0.06	3,813.56	1.17	0.02	0.10	0.81	0.00	0.00	183.05	0.06	168.01
Scrapers >251 and <500	Elevating scraper, 23 C.Y.	1	8	365	96	0.19	0.80	6.80	0.02	0.02	1,540.23	0.47	0.01	0.04	0.33	0.00	0.00	73.93	0.02	67.85
Excavators >251 and <500	Hydraulic Excavator, 396 HP	1	8	396	96	0.16	0.69	5.84	0.02	0.02	1,318.54	0.40	0.01	0.03	0.28	0.00	0.00	63.29	0.02	58.09
Other Construction Equipment >251 and <500	Soil compactor, 232 HP	1	8	232	96	0.10	0.45	3.78	0.01	0.01	861.22	0.26	0.00	0.02	0.18	0.00	0.00	41.34	0.01	37.94
Tractors/Loaders/Backhoes >51 and <120	Front End Loader 3 CY	1	8	93	96	0.07	1.66	2.25	0.00	0.00	305.14	0.09	0.00	0.08	0.11	0.00	0.00	14.65	0.00	13.44
Off-Highway Trucks >176 and <250	3,000 gal water truck	1	8	230	96	0.09	0.40	3.39	0.01	0.01	762.71	0.23	0.00	0.02	0.16	0.00	0.00	36.61	0.01	33.60
Total						**1.31**	**8.67**	**48.76**	**0.16**	**0.16**	**10,217.09**	**3.13**	**0.06**	**0.42**	**2.34**	**0.01**	**0.01**	**490.42**	**0.15**	**450.11**

On Road Construction Emissions

	Total Trips	Distance	Average Daily Mileage	Calculated Time - Rounded (days)	Total Mileage	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Worker Trips		16.8	-	96	-							-								-
Concrete/Asphalt Truck Trips		25	-	96	-															-
Total						**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Concrete and haul trucks assumed to haul material from Keeler at a distance of approximately 25 miles (50 miles round trip).

Total	Emissions Summary (lbs/day) VOC	NO_x	CO	PM10	PM2.5	CO2	CH_4	Emissions Summary (tons per phase) VOC	NO_x	CO	PM10	PM2.5	CO_2	CH_4	Total GHG Emissions (MT CO2e)
Maximum Daily Emissions	**1.31**	**8.67**	**48.76**	**0.16**	**0.16**	**10,217.09**	**3.13**								
Maximum Annual Emissions								**0.06**	**0.42**	**2.34**	**0.01**	**0.01**	**490.42**	**0.15**	**450.11**

Equipment Type	Year	Low HP	High HP	TOG (g/bhp-hr)	ROG (g/bhp-hr)	CO (g/bhp-hr)	NOX (g/bhp-hr)	SO2 (g/bhp-hr)	PM10 (g/bhp-hr)	PM2.5 (g/bhp-hr)	CO2 (g/bhp-hr)	CH4 (g/bhp-hr)	Load Factor
Aerial Lifts	2017	6	15	0.248829	0.2091	3.16913	3.46956	0.0054	0.0789	0.0726	554.2451	0.1698	0.31
Aerial Lifts	2017	16	25	0.248829	0.2091	3.16913	3.46956	0.0054	0.0789	0.0726	554.2451	0.1698	0.31
Aerial Lifts	2017	26	50	0.248829	0.2091	3.16913	3.46956	0.0054	0.0789	0.0726	554.2451	0.1698	0.31
Aerial Lifts	2017	51	120	0.169799	0.1427	3.18429	2.36368	0.0049	0.0834	0.0768	498.3428	0.1527	0.31
Aerial Lifts	2017	251	500	0.292438	0.2457	0.99722	4.6577	0.0049	0.1046	0.0962	498.2798	0.1527	0.31
Aerial Lifts	2017	501	750	32.148	0.239	1.059	2.68	0.005	0.079	0.079	568.299	0.021	0.31
Air Compressors	2017	6	15	2.05	0.786	3.599	4.887	0.008	0.272	0.272	568.299	0.07	0.48
Air Compressors	2017	16	25	4.327	0.83	2.564	4.729	0.007	0.243	0.243	568.299	0.074	0.48
Air Compressors >26 and <50	2017	26	50	11.908	1.481	5.604	4.871	0.007	0.371	0.371	568.299	0.133	0.48
Air Compressors	2017	51	120	11.385	0.671	3.772	4.412	0.006	0.35	0.35	568.299	0.06	0.48
Air Compressors	2017	121	175	15.244	0.477	3.207	3.627	0.006	0.194	0.194	568.299	0.043	0.48
Air Compressors	2017	176	250	16.09	0.339	1.162	3.163	0.006	0.098	0.098	568.299	0.03	0.48
Air Compressors	2017	251	500	26.901	0.321	1.123	2.755	0.005	0.092	0.092	568.299	0.029	0.48
Air Compressors	2017	501	750	41.87	0.323	1.123	2.845	0.005	0.094	0.094	568.299	0.029	0.48
Air Compressors	2017	751	1000	63.572	0.362	1.246	4.583	0.005	0.121	0.121	568.299	0.032	0.48
Bore/Drill Rigs	2017	6	15	0.957137	0.8043	4.65158	5.06335	0.0055	0.3508	0.3227	563.9173	0.1728	0.5
Bore/Drill Rigs	2017	16	25	0.957137	0.8043	4.65158	5.06335	0.0055	0.3508	0.3227	563.9173	0.1728	0.5
Bore/Drill Rigs	2017	26	50	0.957137	0.8043	4.65158	5.06335	0.0055	0.3508	0.3227	563.9173	0.1728	0.5
Bore/Drill Rigs	2017	51	120	0.354597	0.298	3.33142	3.68536	0.0047	0.2111	0.1942	485.322	0.1487	0.5
Bore/Drill Rigs >121 and <175	2017	121	175	0.290928	0.2445	3.0013	2.98245	0.0049	0.1313	0.1208	503.7704	0.1544	0.5
Bore/Drill Rigs	2017	176	250	0.20647	0.1735	1.1021	2.5215	0.0048	0.0725	0.0667	494.1381	0.1514	0.5
Bore/Drill Rigs	2017	251	500	0.197407	0.1659	1.11891	2.36747	0.0048	0.0723	0.0665	489.4612	0.15	0.5
Bore/Drill Rigs	2017	501	750	0.184153	0.1547	1.13653	2.15656	0.0049	0.0715	0.0658	505.1248	0.1548	0.5
Bore/Drill Rigs	2017	751	1000	0.143503	0.1206	0.97127	3.02051	0.0049	0.0599	0.0551	498.1225	0.1526	0.5
Cement and Mortar Mixers	2017	6	15	1.075	0.661	3.469	4.145	0.008	0.165	0.165	568.299	0.059	0.56
Cement and Mortar Mixers	2017	16	25	3.466	0.767	2.466	4.567	0.007	0.216	0.216	568.299	0.069	0.56
Concrete/Industrial Saws	2017	16	25	1.532	0.685	2.34	4.332	0.007	0.161	0.161	568.299	0.061	0.73
Concrete/Industrial Saws >26 and <50	2017	26	50	4.816	1.175	4.894	4.652	0.007	0.313	0.313	568.299	0.106	0.73
Concrete/Industrial Saws	2017	51	120	5.61	0.557	3.595	4.086	0.006	0.294	0.294	568.299	0.05	0.73
Concrete/Industrial Saws	2017	121	175	8.602	0.395	3.073	3.316	0.006	0.165	0.165	568.299	0.035	0.73
Cranes	2017	26	50	2.585562	2.1726	7.40804	6.14479	0.0053	0.6199	0.5703	546.7815	0.1675	0.29
Cranes	2017	51	120	1.304913	1.0965	4.71022	9.15389	0.0048	0.6777	0.6235	495.7534	0.1519	0.29
Cranes	2017	121	175	0.828528	0.6962	3.78744	7.36009	0.0049	0.3974	0.3656	501.093	0.1535	0.29
Cranes >176 and <250	2017	176	250	0.667136	0.5606	2.38452	6.65526	0.0049	0.2967	0.273	499.3721	0.153	0.29
Cranes >251 and <500	2017	251	500	0.488095	0.4101	3.54746	5.23184	0.0049	0.2124	0.1954	498.439	0.1527	0.29
Cranes	2017	501	750	0.34114	0.2867	1.63305	4.1579	0.0049	0.1471	0.1353	497.1865	0.1523	0.29
Cranes	2017	1001	9999	0.181003	0.1521	0.97429	2.32212	0.0049	0.0575	0.0529	498.2798	0.1527	0.29
Crawler Tractors	2017	26	50	2.926516	2.4591	8.00596	6.20834	0.0053	0.7116	0.6547	544.6762	0.1669	0.43
Crawler Tractors	2017	51	120	1.010844	0.8494	4.17611	7.141	0.0049	0.6036	0.5553	503.2791	0.1542	0.43
Crawler Tractors	2017	121	175	0.731209	0.6144	3.48322	6.55188	0.0049	0.3636	0.3345	498.1245	0.1526	0.43
Crawler Tractors	2017	176	250	0.511144	0.4295	1.7418	5.75969	0.0049	0.2199	0.2023	499.832	0.1531	0.43
Crawler Tractors	2017	251	500	0.458057	0.3849	2.6349	5.02932	0.0049	0.1946	0.1791	502.422	0.1539	0.43
Crawler Tractors	2017	501	750	0.386074	0.3244	1.5221	4.36108	0.0049	0.1597	0.1469	499.1046	0.1529	0.43
Crawler Tractors	2017	751	1000	0.578206	0.4859	2.10018	7.53226	0.0049	0.2233	0.2055	501.8777	0.1538	0.43
Crushing/Proc. Equipment	2017	26	50	3.684	1.402	5.623	4.827	0.007	0.354	0.354	568.299	0.126	0.78
Crushing/Proc. Equipment	2017	51	120	3.216	0.647	3.791	4.244	0.006	0.33	0.33	568.299	0.058	0.78
Crushing/Proc. Equipment	2017	121	175	4.681	0.468	3.236	3.45	0.006	0.185	0.185	568.299	0.042	0.78
Crushing/Proc. Equipment	2017	176	250	4.974	0.34	1.16	2.987	0.006	0.094	0.094	568.299	0.03	0.78
Crushing/Proc. Equipment	2017	251	500	7.242	0.324	1.118	2.602	0.005	0.088	0.088	568.299	0.029	0.78
Crushing/Proc. Equipment	2017	501	750	11.359	0.323	1.114	2.664	0.005	0.088	0.088	568.299	0.029	0.78
Crushing/Proc. Equipment	2017	1001	9999	29.544	0.378	1.231	4.423	0.005	0.117	0.117	568.299	0.034	0.78
Dumpers/Tenders	2017	16	25	0.821	0.687	2.34	4.362	0.007	0.171	0.171	568.299	0.062	0.38
Excavators	2017	16	25	0.91741	0.7709	4.88904	4.67818	0.0054	0.3319	0.3053	554.9101	0.17	0.38
Excavators	2017	26	50	0.91741	0.7709	4.88904	4.67818	0.0054	0.3319	0.3053	554.9101	0.17	0.38
Excavators	2017	51	120	0.523542	0.4399	3.63939	4.37952	0.0048	0.3103	0.2855	493.409	0.1512	0.38
Excavators	2017	121	175	0.397029	0.3336	3.15091	3.69967	0.0049	0.182	0.1675	498.5222	0.1527	0.38
Excavators	2017	176	250	0.293543	0.2467	1.24911	3.31872	0.0049	0.1051	0.0967	498.4364	0.1527	0.38
Excavators >251 and <500	2017	251	500	0.237788	0.1998	1.19852	2.50715	0.0049	0.0811	0.0746	496.8098	0.1522	0.38
Excavators	2017	501	750	0.249769	0.2099	1.22803	2.71934	0.0048	0.0899	0.0827	494.5496	0.1515	0.38
Forklifts	2017	26	50	2.026819	1.7031	6.67251	5.45035	0.0054	0.5355	0.4927	554.6769	0.17	0.2
Forklifts	2017	51	120	0.799635	0.6719	3.97881	5.81772	0.0049	0.48	0.4416	497.7245	0.1525	0.2
Forklifts	2017	121	175	0.604568	0.508	3.45188	5.36215	0.0049	0.2937	0.2702	498.3344	0.1527	0.2
Forklifts	2017	176	250	0.589964	0.4957	2.0923	5.75116	0.0049	0.2518	0.2316	499.6213	0.1531	0.2
Forklifts	2017	251	500	0.401897	0.3377	2.50803	3.7797	0.0049	0.1613	0.1484	499.927	0.1532	0.2
Generator Sets	2017	6	15	1.857	0.699	3.599	4.847	0.008	0.25	0.25	568.299	0.063	0.74
Generator Sets	2017	16	25	3.476	0.757	2.564	4.729	0.007	0.233	0.233	568.299	0.068	0.74
Generator Sets >26 and <50	2017	26	50	8.107	1.017	4.292	4.522	0.007	0.285	0.285	568.299	0.091	0.74
Generator Sets	2017	51	120	10.557	0.52	3.442	4.072	0.006	0.274	0.274	568.299	0.046	0.74
Generator Sets	2017	121	175	13.162	0.356	2.931	3.347	0.006	0.151	0.151	568.299	0.032	0.74
Generator Sets	2017	176	250	13.548	0.245	1.063	2.91	0.006	0.081	0.081	568.299	0.022	0.74
Generator Sets	2017	251	500	19.649	0.224	1.048	2.579	0.005	0.076	0.076	568.299	0.02	0.74
Generator Sets	2017	501	750	32.544	0.23	1.048	2.66	0.005	0.077	0.077	568.299	0.02	0.74
Generator Sets	2017	1001	9999	82.27	0.301	1.161	4.293	0.005	0.104	0.104	568.299	0.027	0.74
Graders	2017	26	50	3.5783	3.0068	8.97826	6.423	0.005	0.8434	0.776	520.0747	0.1593	0.41
Graders	2017	51	120	1.385767	1.1644	4.81041	9.19125	0.0048	0.7585	0.6978	495.9186	0.1519	0.41
Graders >121 and <175	2017	121	175	0.901	0.7571	3.84518	7.66265	0.0049	0.4304	0.396	506.7478	0.1553	0.41
Graders >176 and <250	2017	176	250	0.471391	0.3961	1.44905	5.52488	0.0049	0.1802	0.1658	503.8022	0.1544	0.41
Graders	2017	251	500	0.397706	0.3342	1.70747	3.55709	0.0049	0.1393	0.1282	498.5996	0.1528	0.41
Graders	2017	501	750	15.127	0.372	1.323	2.835	0.005	0.1	0.1	568.299	0.033	0.41
Off-Highway Tractors	2017	51	120	0.697857	0.5864	3.90108	5.31726	0.0049	0.4229	0.389	501.2453	0.1536	0.44
Off-Highway Tractors	2017	121	175	0.423504	0.3559	3.2589	4.02594	0.0049	0.2049	0.1885	499.2446	0.153	0.44
Off-Highway Tractors	2017	176	250	0.389773	0.3275	1.403	4.38216	0.0049	0.1511	0.139	496.4983	0.1521	0.44
Off-Highway Tractors >501 and <750	2017	501	750	0.294592	0.2475	1.14456	3.32351	0.0049	0.1118	0.1029	497.6181	0.1525	0.44
Off-Highway Tractors	2017	751	1000	0.140776	0.1183	0.98542	2.33951	0.0049	0.0588	0.0541	498.2798	0.1527	0.44
Off-Highway Trucks	2017	121	175	0.525186	0.4413	3.43636	4.23649	0.0048	0.2334	0.2147	495.924	0.152	0.38
Off-Highway Trucks >176 and <250	2017	176	250	0.496493	0.4172	1.75281	4.36785	0.0048	0.1887	0.1736	494.7935	0.1516	0.38
Off-Highway Trucks >251 and <500	2017	251	500	0.387096	0.3253	1.74773	3.66841	0.0049	0.1362	0.1253	501.4368	0.1536	0.38
Off-Highway Trucks	2017	501	750	0.468516	0.3937	2.35644	4.25656	0.0049	0.1702	0.1566	500.1987	0.1533	0.38
Off-Highway Trucks	2017	751	1000	0.430867	0.362	1.54555	5.65254	0.0049	0.1591	0.1463	497.1154	0.1523	0.38

Equipment Type	Year	Low HP	High HP	TOG (g/bhp-hr)	ROG (g/bhp-hr)	CO (g/bhp-hr)	NOX (g/bhp-hr)	SO2 (g/bhp-hr)	PM10 (g/bhp-hr)	PM2.5 (g/bhp-hr)	CO2 (g/bhp-hr)	CH4 (g/bhp-hr)	Load Factor
Other Construction Equipment	2017	6	15	1.480652	1.2442	5.65509	5.42066	0.0054	0.4774	0.4392	558.0007	0.171	0.42
Other Construction Equipment	2017	16	25	1.480652	1.2442	5.65509	5.42066	0.0054	0.4774	0.4392	558.0007	0.171	0.42
Other Construction Equipment >26 and <5(	2017	26	50	1.480652	1.2442	5.65509	5.42066	0.0054	0.4774	0.4392	558.0007	0.171	0.42
Other Construction Equipment >51 and <1:	2017	51	120	0.804436	0.6759	3.88542	6.06955	0.0049	0.4749	0.4369	497.3832	0.1524	0.42
Other Construction Equipment >121 and <:	2017	121	175	0.595557	0.5004	3.33767	5.49424	0.0048	0.2903	0.2671	495.9311	0.152	0.42
Other Construction Equipment >251 and <!	2017	251	500	0.3449	0.2898	2.12114	3.77706	0.0049	0.1382	0.1272	501.1295	0.1535	0.42
Other General Industrial Equipment	2017	6	15	1.605819	1.3493	6.17923	5.27694	0.0054	0.4793	0.4409	555.4081	0.1702	0.34
Other General Industrial Equipment	2017	16	25	1.605819	1.3493	6.17923	5.27694	0.0054	0.4793	0.4409	555.4081	0.1702	0.34
Other General Industrial Equipment	2017	26	50	1.605819	1.3493	6.17923	5.27694	0.0054	0.4793	0.4409	555.4081	0.1702	0.34
Other General Industrial Equipment	2017	51	120	0.785454	0.66	3.99811	5.72138	0.0048	0.4705	0.4328	496.1109	0.152	0.34
Other General Industrial Equipment	2017	121	175	0.520155	0.4371	3.39928	4.53359	0.0049	0.2495	0.2296	498.0641	0.1526	0.34
Other General Industrial Equipment	2017	176	250	0.489435	0.4113	1.78	5.02246	0.0049	0.199	0.183	499.5133	0.153	0.34
Other General Industrial Equipment	2017	251	500	0.397215	0.3338	2.36453	3.9491	0.0049	0.152	0.1399	499.2028	0.153	0.34
Other General Industrial Equipment	2017	501	750	0.260833	0.2192	1.48016	2.59187	0.0049	0.0862	0.0793	499.7673	0.1531	0.34
Other General Industrial Equipment	2017	751	1000	0.29828	0.2506	1.05719	4.7865	0.0049	0.1145	0.1053	498.2798	0.1527	0.34
Other Material Handling Equipment	2017	26	50	1.922269	1.6152	6.63527	5.57447	0.0054	0.5458	0.5022	552.8037	0.1694	0.4
Other Material Handling Equipment	2017	51	120	0.580499	0.4878	3.75788	4.56113	0.0049	0.3412	0.3139	499.8989	0.1532	0.4
Other Material Handling Equipment	2017	121	175	0.508007	0.4269	3.35117	4.48809	0.0049	0.2379	0.2189	498.4537	0.1527	0.4
Other Material Handling Equipment	2017	176	250	0.42771	0.3594	1.51249	4.70454	0.0049	0.163	0.15	497.6755	0.1525	0.4
Other Material Handling Equipment	2017	251	500	0.386945	0.3251	1.86256	3.9709	0.0049	0.1535	0.1413	496.4249	0.1521	0.4
Other Material Handling Equipment	2017	1001	9999	0.201109	0.169	1.01029	3.52015	0.0049	0.0722	0.0665	498.2798	0.1527	0.4
Pavers	2017	16	25	2.059621	1.7307	6.19932	5.43675	0.0054	0.5396	0.4965	556.4528	0.1705	0.42
Pavers	2017	26	50	2.059621	1.7307	6.19932	5.43675	0.0054	0.5396	0.4965	556.4528	0.1705	0.42
Pavers	2017	51	120	0.744072	0.6252	3.75882	5.69243	0.0048	0.4374	0.4024	495.9253	0.152	0.42
Pavers	2017	121	175	0.462819	0.3889	3.06282	4.35312	0.0049	0.2142	0.1971	498.967	0.1529	0.42
Pavers	2017	176	250	0.247933	0.2083	1.03652	3.80866	0.0049	0.0997	0.0918	499.5617	0.1531	0.42
Pavers	2017	251	500	0.199578	0.1677	0.97942	2.48674	0.0048	0.0874	0.0805	491.7843	0.1507	0.42
Paving Equipment	2017	16	25	1.102141	0.9261	4.80403	4.72756	0.0054	0.3592	0.3305	548.6481	0.1681	0.36
Paving Equipment	2017	26	50	1.102141	0.9261	4.80403	4.72756	0.0054	0.3592	0.3305	548.6481	0.1681	0.36
Paving Equipment	2017	51	120	0.670017	0.563	3.74146	5.20745	0.0049	0.3905	0.3593	500.1649	0.1532	0.36
Paving Equipment >121 and <175	2017	121	175	0.407568	0.3425	3.07321	3.89633	0.0049	0.1946	0.1791	497.148	0.1523	0.36
Paving Equipment	2017	176	250	0.342633	0.2879	1.333	4.12109	0.0049	0.1415	0.1302	498.7323	0.1528	0.36
Plate Compactors	2017	6	15	0.79	0.661	3.469	4.142	0.008	0.161	0.161	568.299	0.059	0.43
Pressure Washers	2017	6	15	1.927	0.699	3.599	4.847	0.008	0.25	0.25	568.299	0.063	0.3
Pressure Washers	2017	16	25	3.053	0.757	2.564	4.729	0.007	0.233	0.233	568.299	0.068	0.3
Pressure Washers	2017	26	50	6.126	0.76	3.632	4.355	0.007	0.24	0.24	568.299	0.068	0.3
Pressure Washers	2017	51	120	6.031	0.444	3.283	3.888	0.006	0.233	0.233	568.3	0.04	0.3
Pressure Washers	2017	121	175	22.349	0.346	2.91	3.349	0.006	0.149	0.149	568.299	0.031	0.3
Pressure Washers	2017	176	250	8.288	0.102	0.986	0.317	0.006	0.009	0.009	568.299	0.009	0.3
Pumps	2017	6	15	1.713	0.786	3.599	4.887	0.008	0.272	0.272	568.299	0.07	0.74
Pumps	2017	16	25	4.745	0.83	2.564	4.729	0.007	0.243	0.243	568.299	0.074	0.74
Pumps >26 and <50	2017	26	50	11.12	1.104	4.514	4.578	0.007	0.301	0.301	568.299	0.099	0.74
Pumps	2017	51	120	12.49	0.546	3.495	4.134	0.006	0.287	0.287	568.299	0.049	0.74
Pumps	2017	121	175	15.466	0.376	2.975	3.4	0.006	0.159	0.159	568.299	0.033	0.74
Pumps	2017	176	250	15.375	0.26	1.08	2.958	0.006	0.084	0.084	568.299	0.023	0.74
Pumps >251 and <500	2017	251	500	24.243	0.239	1.062	2.613	0.005	0.079	0.079	568.299	0.021	0.74
Pumps	2017	501	750	40.958	0.244	1.062	2.695	0.005	0.08	0.08	568.299	0.022	0.74
Pumps	2017	1001	9999	124.604	0.313	1.177	4.343	0.005	0.106	0.106	568.299	0.028	0.74
Rollers	2017	6	15	1.425352	1.1977	5.14727	5.09771	0.0054	0.4357	0.4008	555.0199	0.1701	0.38
Rollers	2017	16	25	1.425352	1.1977	5.14727	5.09771	0.0054	0.4357	0.4008	555.0199	0.1701	0.38
Rollers	2017	26	50	1.425352	1.1977	5.14727	5.09771	0.0054	0.4357	0.4008	555.0199	0.1701	0.38
Rollers >51 and <120	2017	51	120	0.690109	0.5799	3.71315	5.4114	0.0049	0.3921	0.3607	500.1525	0.1532	0.38
Rollers	2017	121	175	0.373471	0.3138	2.98069	3.87384	0.0049	0.1804	0.1659	497.9088	0.1526	0.38
Rollers	2017	176	250	0.326364	0.2742	1.40849	3.92097	0.0049	0.1294	0.1191	499.7021	0.1531	0.38
Rollers	2017	251	500	0.353236	0.2968	2.68487	3.84047	0.0049	0.1501	0.1381	505.8318	0.155	0.38
Rough Terrain Forklifts	2017	26	50	1.318488	1.1079	4.83344	4.90253	0.0054	0.3821	0.3515	554.6234	0.1699	0.4
Rough Terrain Forklifts >51 and <120	2017	51	120	0.322506	0.271	3.31778	3.41759	0.0049	0.1816	0.1671	499.1682	0.1529	0.4
Rough Terrain Forklifts	2017	121	175	0.231401	0.1944	2.86636	2.90167	0.0049	0.1121	0.1031	497.7766	0.1525	0.4
Rough Terrain Forklifts	2017	176	250	0.175965	0.1479	1.02362	2.47389	0.0049	0.0592	0.0544	499.0007	0.1529	0.4
Rough Terrain Forklifts	2017	251	500	0.216551	0.182	0.96636	3.56771	0.0048	0.0792	0.0728	493.3362	0.1512	0.4
Rubber Tired Dozers > 121 and <175	2017	121	175	1.074198	0.9026	4.14895	9.12915	0.0049	0.5248	0.4828	499.4096	0.153	0.4
Rubber Tired Dozers > 176 and <250	2017	176	250	0.840865	0.7066	2.65514	7.67081	0.0049	0.3755	0.3454	501.5475	0.1537	0.4
Rubber Tired Dozers	2017	251	500	0.787455	0.6617	5.52569	7.33345	0.0049	0.3407	0.3134	505.8493	0.155	0.4
Rubber Tired Dozers	2017	501	750	0.625767	0.5258	2.76746	7.17226	0.0049	0.2601	0.2393	499.3665	0.153	0.4
Rubber Tired Dozers	2017	751	1000	9.018	0.602	2.56	6.013	0.005	0.195	0.195	568.299	0.054	0.4
Rubber Tired Loaders	2017	16	25	2.32856	1.9566	7.65953	5.95377	0.0054	0.6328	0.5822	553.5831	0.1696	0.36
Rubber Tired Loaders	2017	26	50	2.32856	1.9566	7.65953	5.95377	0.0054	0.6328	0.5822	553.5831	0.1696	0.36
Rubber Tired Loaders	2017	51	120	0.900842	0.757	4.17083	6.23569	0.0048	0.5296	0.4872	491.8531	0.1507	0.36
Rubber Tired Loaders	2017	121	175	0.620654	0.5215	3.5175	5.19525	0.0049	0.2895	0.2663	497.3533	0.1524	0.36
Rubber Tired Loaders	2017	176	250	0.443532	0.3727	1.4172	4.75473	0.0048	0.162	0.149	495.9499	0.152	0.36
Rubber Tired Loaders	2017	251	500	0.439436	0.3692	2.06046	4.25314	0.0048	0.1603	0.1475	492.2764	0.1508	0.36
Rubber Tired Loaders	2017	501	750	0.436922	0.3671	1.70044	4.05049	0.0047	0.1599	0.1471	484.3661	0.1484	0.36
Rubber Tired Loaders	2017	751	1000	0.493245	0.4145	1.45641	6.55319	0.0049	0.1918	0.1765	496.8966	0.1522	0.36
Scrapers	2017	51	120	0.896722	0.7535	4.20744	7.17946	0.005	0.551	0.5069	511.1123	0.1566	0.48
Scrapers	2017	121	175	0.748819	0.6292	3.70478	6.67066	0.0049	0.3594	0.3306	505.3309	0.1548	0.48
Scrapers	2017	176	250	0.74607	0.6269	2.64676	7.39867	0.0048	0.3327	0.306	494.5231	0.1515	0.48
Scrapers >251 and <500	2017	251	500	0.505877	0.4251	3.33699	5.33951	0.0049	0.2143	0.1971	498.4571	0.1527	0.48
Scrapers	2017	501	750	0.386598	0.3248	2.29479	4.21648	0.0049	0.1558	0.1433	498.6929	0.1528	0.48
Signal Boards	2017	6	15	1.04	0.661	3.469	4.142	0.008	0.161	0.161	568.299	0.059	0.82
Signal Boards	2017	26	50	10.695	1.158	4.785	4.59	0.007	0.306	0.306	568.299	0.104	0.82
Signal Boards	2017	51	120	11.32	0.553	3.566	4.059	0.006	0.29	0.29	568.299	0.049	0.82
Signal Boards	2017	121	175	15.322	0.388	3.044	3.305	0.006	0.161	0.161	568.299	0.035	0.82
Signal Boards	2017	176	250	17.83	0.33	1.323	3.452	0.007	0.101	0.101	686.695	0.029	0.82
Skid Steer Loaders	2017	16	25	0.676461	0.5684	3.91907	4.11272	0.0054	0.2175	0.2001	556.7144	0.1706	0.37
Skid Steer Loaders	2017	26	50	0.676461	0.5684	3.91907	4.11272	0.0054	0.2175	0.2001	556.7144	0.1706	0.37
Skid Steer Loaders	2017	51	120	0.303772	0.2553	3.31863	3.28618	0.0049	0.1766	0.1625	498.3256	0.1527	0.37

Equipment Type	Year	Low HP	High HP	TOG (g/bhp-hr)	ROG (g/bhp-hr)	CO (g/bhp-hr)	NOX (g/bhp-hr)	SO2 (g/bhp-hr)	PM10 (g/bhp-hr)	PM2.5 (g/bhp-hr)	CO2 (g/bhp-hr)	CH4 (g/bhp-hr)	Load Factor
Surfacing Equipment	2017	26	50	1.10469	0.9282	4.60324	5.0643	0.0055	0.3651	0.3359	564.4772	0.173	0.3
Surfacing Equipment	2017	51	120	0.604716	0.5081	3.55587	4.94212	0.0049	0.3373	0.3103	498.36	0.1527	0.3
Surfacing Equipment	2017	121	175	0.541755	0.4552	3.00273	5.39296	0.0049	0.2638	0.2427	496.2741	0.1521	0.3
Surfacing Equipment	2017	176	250	0.325463	0.2735	1.3431	4.46793	0.0049	0.1291	0.1187	501.8465	0.1538	0.3
Surfacing Equipment	2017	251	500	0.242435	0.2037	1.3962	3.10636	0.0049	0.1026	0.0944	496.885	0.1522	0.3
Surfacing Equipment	2017	501	750	0.190932	0.1604	1.00272	2.76955	0.0049	0.0904	0.0832	499.7117	0.1531	0.3
Sweepers/Scrubbers	2017	6	15	2.037349	1.7119	6.7185	5.62558	0.0054	0.5817	0.5352	554.5133	0.1699	0.46
Sweepers/Scrubbers	2017	16	25	2.037349	1.7119	6.7185	5.62558	0.0054	0.5817	0.5352	554.5133	0.1699	0.46
Sweepers/Scrubbers	2017	26	50	2.037349	1.7119	6.7185	5.62558	0.0054	0.5817	0.5352	554.5133	0.1699	0.46
Sweepers/Scrubbers	2017	51	120	0.857444	0.7205	4.01005	6.0202	0.0049	0.5202	0.4786	500.4555	0.1533	0.46
Sweepers/Scrubbers	2017	121	175	0.845582	0.7105	3.78429	7.42433	0.0049	0.3946	0.363	499.4066	0.153	0.46
Sweepers/Scrubbers	2017	176	250	0.610026	0.5126	2.08973	6.50894	0.0048	0.2642	0.2431	496.2444	0.152	0.46
Tractors/Loaders/Backhoes	2017	16	25	1.421071	1.1941	5.68921	5.10958	0.0053	0.4331	0.3985	544.9286	0.167	0.37
Tractors/Loaders/Backhoes	2017	26	50	1.421071	1.1941	5.68921	5.10958	0.0053	0.4331	0.3985	544.9286	0.167	0.37
Tractors/Loaders/Backhoes >51 and <120	2017	51	120	0.595595	0.5005	3.7818	4.8087	0.0049	0.3616	0.3327	502.7952	0.1541	0.37
Tractors/Loaders/Backhoes >121 and <175	2017	121	175	0.420865	0.3536	3.19961	3.87876	0.0048	0.1973	0.1815	493.912	0.1513	0.37
Tractors/Loaders/Backhoes	2017	176	250	0.346619	0.2913	1.30369	4.04062	0.0049	0.1318	0.1213	496.8449	0.1522	0.37
Tractors/Loaders/Backhoes	2017	251	500	0.323689	0.272	1.73851	3.48988	0.0049	0.122	0.1123	497.1129	0.1523	0.37
Tractors/Loaders/Backhoes	2017	501	750	0.35268	0.2963	1.64567	3.86196	0.0048	0.1394	0.1283	492.9529	0.151	0.37
Trenchers	2017	6	15	1.367315	1.1489	5.19682	5.16614	0.0054	0.4488	0.4129	557.4601	0.1708	0.5
Trenchers	2017	16	25	1.367315	1.1489	5.19682	5.16614	0.0054	0.4488	0.4129	557.4601	0.1708	0.5
Trenchers	2017	26	50	1.367315	1.1489	5.19682	5.16614	0.0054	0.4488	0.4129	557.4601	0.1708	0.5
Trenchers	2017	51	120	0.906302	0.7615	3.96827	6.67876	0.0049	0.5232	0.4813	501.9916	0.1538	0.5
Trenchers	2017	121	175	0.638299	0.5363	3.43391	5.92725	0.0048	0.3003	0.2763	493.7642	0.1513	0.5
Trenchers	2017	176	250	0.577948	0.4856	2.03655	6.19428	0.0049	0.2501	0.2301	499.2281	0.153	0.5
Trenchers	2017	251	500	0.315778	0.2653	1.96603	3.44157	0.0049	0.1289	0.1186	497.0197	0.1523	0.5
Trenchers	2017	501	750	0.135465	0.1138	0.97168	1.42958	0.0049	0.0457	0.0421	501.1831	0.1536	0.5
Welders	2017	6	15	1.973	0.786	3.599	4.887	0.008	0.272	0.272	568.299	0.07	0.45
Welders	2017	16	25	3.785	0.83	2.564	4.729	0.007	0.243	0.243	568.299	0.074	0.45
Welders	2017	26	50	14.392	1.372	5.239	4.768	0.007	0.35	0.35	568.299	0.123	0.45
Welders	2017	51	120	10.06	0.63	3.675	4.328	0.006	0.332	0.332	568.299	0.056	0.45
Welders	2017	121	175	17.561	0.442	3.124	3.562	0.006	0.183	0.183	568.299	0.039	0.45
Welders	2017	176	250	14.942	0.31	1.133	3.105	0.006	0.094	0.094	568.299	0.028	0.45
Welders	2017	251	500	19.705	0.29	1.102	2.713	0.005	0.088	0.088	568.299	0.026	0.45

	Low HP	High HP	ROG (g/bhp-hr)	CO (g/bhp-hr)	NOX (g/bhp-hr)	PM10 (g/bhp-hr)	PM2.5 (g/bhp-hr)
Tier 4	25	49	0.12	4.1	2.75	0.008	0.008
Tier 4	50	74	0.12	3.7	2.74	0.008	0.008
Tier 4	75	119	0.06	3.7	0.26	0.008	0.008
Tier 4	120	174	0.06	3.7	0.26	0.008	0.008
Tier 4	175	299	0.06	2.2	0.26	0.008	0.008
Tier 4	300	599	0.06	2.2	0.26	0.008	0.008
Tier 4	600	750	0.06	2.2	0.26	0.008	0.008
Tier 4	751	2000	0.06	2.6	2.24	0.016	0.016

Great Valley Air Basin 2018 On-Road Emission Factors

VEH	FUEL	MDLYR	SPEED (Miles/hr)	POP (Vehicles)	VMT (Miles/day)	Percent VMT	TRIPS (Trips/day)	ROG_RUNEX (gms/mile)	CO_RUNEX (gms/mile)	NOX_RUNEX (gms/mile)	CO2_RUNEX (gms/mile)	PM10_Total (gms/mile)	PM2_5_Total (gms/mile)	CH4 (gms/mile)	N2O (gms/mile)
LDA	GAS	AllMYr	AllSpeeds	36,884	1,405,274	66.44%	231,517	0.023	0.918	0.104	302.194	0.047	0.019		
LDA	DSL	AllMYr	AllSpeeds	391	15,146	0.72%	2,386	0.033	0.351	0.222	288.299	0.063	0.036		
LDT1	GAS	AllMYr	AllSpeeds	4,575	128,707	6.09%	26,660	0.103	3.507	0.419	363.115	0.049	0.021		
LDT1	DSL	AllMYr	AllSpeeds	9.02720448	155	0.01%	44	0.180	1.256	1.278	385.737	0.179	0.147		
LDT2	GAS	AllMYr	AllSpeeds	15,669	564,983	26.71%	97,612	0.037	1.402	0.218	412.231	0.047	0.019		
LDT2	DSL	AllMYr	AllSpeeds	18.845346	828	0.04%	120	0.024	0.205	0.139	363.377	0.054	0.027		
Total				57,547	2,115,092		358,339								
Average								0.032	1.200	0.155	335.225	0.047	0.020	0.028	0.037

Source: EMFAC 2014

VEH	FUEL	MDLYR	SPEED (Miles/hr)	POP (Vehicles)	VMT (Miles/day)		TRIPS (Trips/day)	ROG_RUNEX (gms/mile)	CO_RUNEX (gms/mile)	NOX_RUNEX (gms/mile)	CO2_RUNEX (gms/mile)	PM10_Total (gms/mile)	PM2_5_Total (gms/mile)	CH4 (gms/mile)	N2O (gms/mile)
T7 tractor	DSL	AllMYr	AllSpeeds	102	12,214		0	0.225	0.808	7.452	1683.253	0.145	0.080	0.0051	0.0048

Source: EMFAC 2014