Air Quality/Greenhouse Gas Study
Panamint Valley Limestone
Lime Kiln and Processes

Trona, California
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Prepared By:
Paul Ervin
Biostream Inc.
Tom Snowden/Richard Wilson
WZI

Under the California Environmental Quality Act and Federal Conformity Guidelines (August 2016) Panamint Valley Limestone Inc. (PVL) is required to provide information related to the impact on Air Quality from the development, construction and operation of their 819 ton per day Limestone to Lime conversion (quick lime) plant. The facility will be constructed in proximity to the Community of Trona, CA.

The Mojave Desert Air Quality Management District (MDAQMD) is the jurisdictional authority with direct oversight of air quality issues at this site.

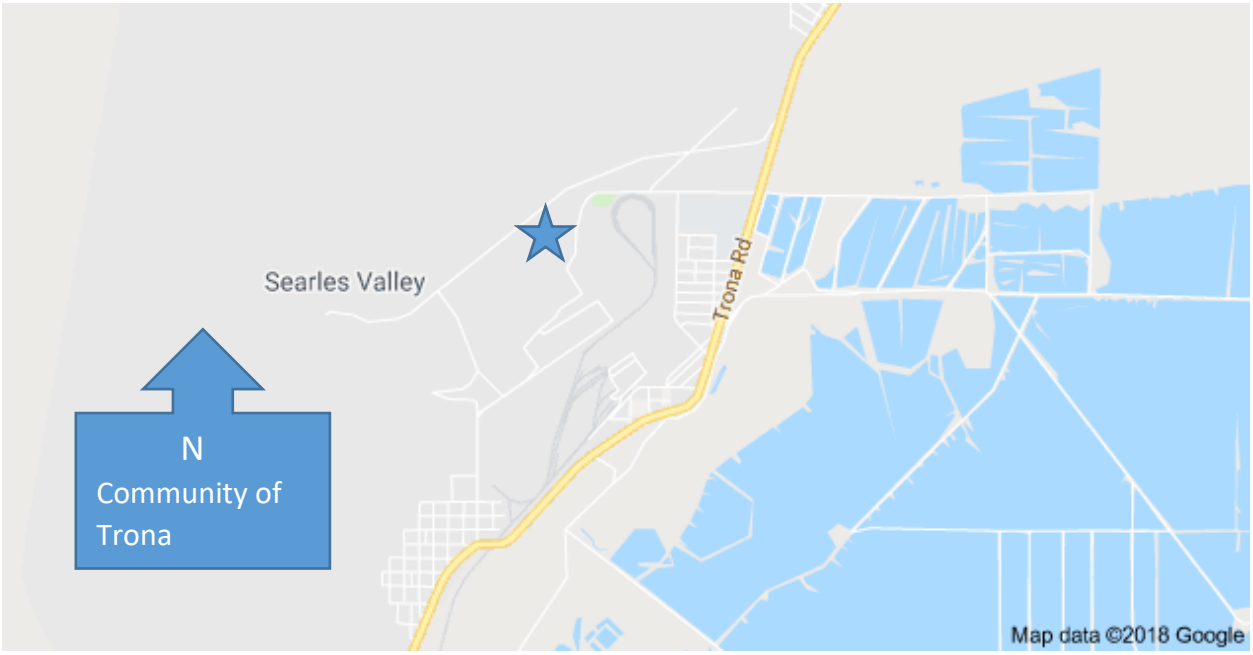
Mojave Desert Air Quality Management District[1]

District Boundaries:

The Mojave Desert Air Quality Management District is geographically the second largest of the state's 35 air districts. As the air pollution control agency for San Bernardino County's High Desert and Riverside County's Palo Verde Valley, the District has primary responsibility for regulating stationary sources of air pollution located within its jurisdictional boundaries. Air Monitoring staff operates and maintains six monitoring stations (*Barstow, Hesperia, Phelan, Trona, Twentynine Palms, & Victorville*) within the District's 20,000 + mile jurisdiction. The following map shows the MDAQMD jurisdictional boundaries:

[1] MDAQMD CEQA Guidelines Page 4 August 2016

Panamint Valley Limestone lime plant lies in proximity to the Community of Trona, CA. The map below shows the location of the facility:



Air Quality Standards

The MDAQMD has many Ambient Air Quality Standards[2]: Non-attainment Designations and Classification Status.

The United States Environmental Protection Agency and the California Air Resources Board have designated portions of the District non-attainment for a variety of pollutants, and some of those designations have an associated classification. Please refer to Table 1 for a chart of these designations and classifications.

Table 1 - Designations and Classifications

Ambient Air Quality Standard	MDAQMD
One-hour Ozone (Federal) – standard has been revoked, this is historical information only	Proposed attainment in 2014; historical classification Severe-17 (portion of MDAQMD outside of Southeast Desert Modified AQMA is unclassified/attainment)
Eight-hour Ozone (Federal 84 ppb (1997)	Subpart 2 Nonattainment; classified Severe-15 (portion of MDAQMD outside of Western Mojave Desert Ozone Nonattainment Area is unclassifiable/attainment)
Eight-hour Ozone (Federal 75 ppb (2008)	Nonattainment, classified Severe-15
Ozone (State)	Nonattainment; classified Moderate
PM10 24-hour (Federal)	Nonattainment; classified Moderate (portion of MDAQMD in Riverside County is unclassifiable/attainment)
PM2.5 Annual (Federal)	Unclassified/attainment
PM2.5 24-hour (Federal)	Unclassified/attainment
PM2.5 (State)	Nonattainment (portion of MDAQMD outside of Western Mojave Desert Ozone Nonattainment Area is unclassified/attainment)
PM10 (State)	Nonattainment
Carbon Monoxide (State and Federal)	Unclassifiable/Attainment
Nitrogen Dioxide (State and Federal)	Unclassifiable/Attainment
Sulfur Dioxide (State and Federal)	Attainment/unclassified
Lead (State and Federal)	Unclassifiable/Attainment
Particulate Sulfate (State)	Attainment
Hydrogen Sulfide (State)	Unclassified (Searles Valley Planning Area is nonattainment)
Visibility Reducing Particles (State)	Unclassified

[2] MDAQMD CEQA Guidelines Page 4 August 2016

Attainment Plans[3]

The District has adopted a variety of attainment plans for non-attainment pollutants. Please refer to Table 2 for a chart of these attainment plans.

Table 2 – MDAQMD Attainment Plans

Name of Plan	Date of Adoption	Standard(s) Targeted	Applicable Area	Pollutant(s) Targeted	Attainment Date*
Federal 8-Hour Ozone Attainment Plan (Western Mojave Desert Nonattainment Area)	9-Jun-08	Federal eight hour ozone (84 ppb	Western Mojave Desert Nonattainment Area (MDAQMD portion)	NOx and VOC	2019 (revised from 2021)
2004 Ozone Attainment Plan (State and Federal)	26-Apr-04	Federal one hour ozone	Entire District	NOx and VOC	2007
Attainment Demonstration, Maintenance Plan, and Redesignation Request for the Trona Portion of the Searles Valley PM10 Nonattainment Area	25-Mar-96	Federal daily and annual PM10	Searles Valley Planning Area	PM10	N/A
Triennial Revision to the 1991 Air Quality Attainment Plan	22-Jan-96	State one hour ozone	Entire District	NOx and VOC	2005
Mojave Desert Planning Area Federal Particulate Matter Attainment Plan	31-Jul-95	Federal daily and annual PM10	Mojave Desert Planning Area	PM10	2000
Searles Valley PM10 Plan	28-Jun-95	Federal daily and annual PM10	Searles Valley Planning Area	PM10	1994
1991 Air Quality Attainment Plan	26-Aug-91	State one hour ozone	San Bernardino County portion	NOX and VOC	1994

*Note: A historical attainment date given in an attainment plan does not necessarily mean that the affected area has been re-designated to attainment; please refer to Table 1. In addition, the tables for the Southeastern Mojave Desert were removed.

[3] MDAQMD CEQA Guidelines Page 4 August 2016

Significance Thresholds[4]

Any project is significant if it triggers or exceeds the most appropriate evaluation criteria. The District will clarify upon request which threshold is most appropriate for a given project; in general, the emissions comparison (criteria number 1) is sufficient: 1. Generates total emissions (direct and indirect) in excess of the thresholds given in Table 6; 2. Generates a violation of any ambient air quality standard when added to the local background; 3. Does not conform with the applicable attainment or maintenance plan(s) 1; 4. Exposes sensitive receptors to substantial pollutant concentrations, including those resulting in a cancer risk greater than or equal to 10 in a million and/or a Hazard Index (HI) (non-cancerous) greater than or equal to 1.

A significant project must incorporate mitigation sufficient to reduce its impact to a level that is not significant. A project that cannot be mitigated to a level that is not significant must incorporate all feasible mitigation. Note that the emission thresholds are given as a daily value and an annual value, so that multi-phased project (such as project with a construction phase and a separate operational phase) with phases shorter than one year can be compared to the daily value.

Table 3 – Significant Emissions Thresholds

Criteria Pollutant	Annual Threshold (tons)	Daily Threshold (pounds)
Greenhouse Gases (CO2e)	100,000	548,000
Carbon Monoxide (CO)	100	548
Oxides of Nitrogen (NOx)	25	137
Volatile Organic Compounds (VOC)	25	137
Oxides of Sulfur (SOx)	25	137
Particulate Matter (PM10)	15	82
Particulate Matter (PM2.5)	12	65
Hydrogen Sulfide (H2S)	10	54
Lead (Pb)	.6	3

<u>Impacts from construction</u>

PVL will retain an Engineering, Procurement and Construction (EPC) firm to manage the construction responsibilities of their Lime plant. Additionally, they will monitor, and review all construction activities to mitigate any violations of air quality standards. During construction PVL will coordinate with the Construction Manager on a daily basis to minimize impacts.

This analysis also includes emissions calculations for the construction of the project's off-site components, including the following:

1. A water conveyance pipeline that would be about 3,730 feet in length
2. An electric pole line that would be 3,730 feet in length
3. A natural gas pipeline that would be 7,900 feet in length.

[4] MDAQMD CEQA Guidelines Page 9 August 2016

Additionally, in order to supply a portion of the water required to operate the PVL Lime Plant, a well will be installed, which has been included in both the operational and construction emissions analyses. The well can be installed in 5 days, with two vehicles on site (one drill rig, one employee vehicle).

Construction Plan

Construction characteristics used to analyze air quality impacts are as follows:
Phase Name, Duration, Equipment, Quantity, and Trips

1. Site Preparation

Earth work (60 working days) mobilize equipment, grading and scraping and lime pit/utilities excavation.

2. Roads and Drive ways

Temporary road surface preparation, all asphalt (28 working days).

3. Concrete work

Lime plant concrete – 75 days
Powder plant concrete – 40 days
Office, lab & control room concrete – 20 days
Solar sta. concrete - 12 days
Misc. concrete – 75 days

4. Mechanical work

Lime plant steel erection – 80 days
Powder plant steel erection – 20 days
Building construction – 100 days
Mechanical equipment placement – 100 days
Piping – 90 days

Table 4 – Construction Emissions[5]

Significant Emission Rate Thresholds During Construction (2019 - 2020)								
	Units	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**VOC**	**GHG [CO2e]**
Thresholds	Daily [lbs]	137	548	137	82	65	137	548,000
	Annual [tons]	25	100	25	15	12	25	100,000
Emitted	Daily [lbs]	70.7	72.2	0.2	12.6	4.8	9.6	21,658
	Annual [tons]	12.9	13.2	0.04	2.3	0.9	1.7	3953

[5] WZI citations: Panamint Valley Lime -Panamint Valley Lime Emissions RW819 tpd Final.xls 1/17/20.

5. Dust Control

Dust from construction activities will be addressed on a case by case basis. Each activity will be assessed and have controls applied when necessary. Some of those control measures will be:

1. A 4,000 gallon water truck onsite at all times, to be used for watering down construction roadways, excavations and soil movement.
2. Dust control fencing in areas of high wind.
3. Dirt pick up, vacuuming will be filtered prior to discharge into the environment.

Impacts from Operations

The Air Quality emissions were modeled using the following assumption: Operations of the Lime plant will occur on a 24 hour per day, seven days a week basis, 365 days per year.

All plant operations will be monitored and staffed continuously while the plant is running. The process will be controlled by a state of the art computer system which will monitor and collect process data on a continuous basis. Process monitoring and data collection will also be available for management review via on line monitoring 24 hours per day.

As required by the MDAQMD, PVL will install, operate and maintain any continuous emissions monitoring as required by regulation, including emissions from combustion and other sources.

The process will consist of:

1. *Limestone Sizing/Screening* – this will consist of conveying raw limestone through a vibrating screen system that will separate out "under sized" material and only allow "accepts" to enter the calcining process.

   This system will have a feed hopper, three conveyors, a silo, vibrating screen and a storage bunker for maintaining cull undersized material.

2. *Vertical Kiln* – this system will consist of kiln feed conveyors, discharge conveyors, roller crusher. The kiln will be fired on natural gas and will operate at a heat input of 56 mmbtu/hr. Exhaust from the kiln will be directed through a fabric filter and the combustion process will be controlled by an automated system.

3. *Lime cooling and classifying* – As the calcined lime leaves the kiln it will pass through an air stream provided by the kiln blower system. This air will be the cooling medium for the hot lime.

4. *Hydrated Lime process* – this system will take a portion of the calcined "Lime" and inject water back into the material to "hydrate" it. It will have a silo, several vibratory and pneumatic conveyors, water injection system, slaking and screening equipment.

   All conveyors will be enclosed and equipped with dust pick up and collection points throughout the plant. These systems will be discharged through approved filters in order to mitigate particulate matter emissions.

5. *Shipping and Receiving* –Raw limestone material will be shipped to the site daily where it will be stored in a silo prior to feeding into the system. Finished Lime product will be handled in silo systems and out loaded as 1) Lime powder, 2) Hydrated Lime powder and 3) bulk bag and retail bagging of all Lime powders.

   Estimated truck trips and origin/destination of trips- (819 tons per day throughput):

   - 33 truckloads of material (at 25 tons per loads) will travel 29 miles (one way) from the quarry to the plant.

   - Approximately 22 truckloads of finished product will leave the site daily to market.

   - Two stock piles will be used to deliver rock to the kiln at any time.
     Limestone rock will be hauled to the plant and stock piled Monday through Friday. When no trucks are hauling from the Quarry (Saturday and Sunday), stock piles will be used to feed the plant with automated belt conveyors and an under pile reclaimer. The piles will be maintained at 10,000 tons each to have some reserve just in case the Limestone Quarry is down for repairs. These stock piles will give us 24 days of material onsite. This rock will be sized from 1" to 3.5". This size rock is used for dust control in other applications. These piles will not create any dust from being stored.

Production Well

As stated under the construction emissions discussion above, the PVL Lime Plant will drill a well to supply a portion of the water on site. The operational emissions analysis presented below incorporates the emissions that the 26-50 gallon per minute from the well pump test.

Mobile Equipment

The plant operations and maintenance will require the following mobile equipment on a daily basis.

- 2-300 hp diesel wheel loaders – CARB Tier IV approved emissions controls.
- 2-50 hp diesel fork lifts CARB - Tier IV approved emissions controls
- Diesel powered Emergency Generator 500kW - CARB approved emissions controls

Additional Mitigation Measures

- 4,000 gallon water truck onsite at all times for dust control.
- Bulk delivery trucks replaced with Hydrogen or Electric Tractors (as they become available and financially feasible).
- Wind breaks/fencing in areas of high wind induced dusting.

Table 5 – Operational Emissions

Significant Emission Rate Thresholds During Operation (Starting 2020)								
	Units	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**VOC**	**GHG [CO2e]**
Threshold	Daily [lbs]	137	548	137	82	65	137	548,000
	Annual [tons]	25	100	25	15	12	25	100,000
Emitted	Daily [lbs]	111.6	38.4	0.9	80.8	12.1	16.8	871,959
	Annual [tons]	18.7	6.9	0.2	13.4	6.0	3.0	159,133

As identified in Table 5 above, this project will not exceed any significance thresholds for any criteria pollutant as prescribed in the MDAQMD. The thresholds for GHG will be exceeded. This is discussed further under Greenhouse Gas Emissions Thresholds of Significance below.

General Area Impacts

Because this will be the only Lime manufacturing project in California, one of the greatest benefits will be the elimination of leakage (emission impacts from outside sources) due to manufacturing all of this product within the state boundaries.

Per California Air Resources Board:
"Emissions Leakage Risk: Introducing an environmental regulation in one jurisdiction can cause production costs and prices in that jurisdiction to increase relative to costs in jurisdictions that do not introduce comparable regulations. This can precipitate a shift in demand away from goods produced in the implementing jurisdiction toward goods produced elsewhere. As a result, the reduction in production and emissions in the implementing jurisdiction is offset by increased production and emissions elsewhere. The offsetting increase in emissions is called emissions leakage. AB 32 directs ARB to design all GHG regulations to minimize leakage to the extent feasible (HSC § 38562(B)(8))."

As an example, most lime is being imported into California. There are several active Lime plants that serve the California lime market, which would be within PVL's sphere of influence. Four of the above plants are Lime manufacturers with the most influence in the California lime markets.

One of these facilities, which is located closest to the Southern California markets, would be in direct contact with markets in that area and indirectly with other markets within the State of California. It is believed that output from the PVL plant will also be used within most of the same market regions.

The emission profile for the plant closest to the PVL Lime Plant shows greater emissions in several areas where the PVL project reflects a lower carbon, and less transportation, impact than the older technologies utilizing high carbon fuels and transportation. This result is mainly due to PVL utilizing utility grade Natural Gas as the fuel for the kiln operations (versus coal and pet coke). In addition, the PVL plant will maintain an overall lower emissions profile for the same amount of material processed and shipped. By locating this plant within the State, PVL will be reducing overall emissions in the state in the following manner.

Table 6 – Comparison of PVL Lime Plant to Nearest Competitor

Lime Plant Component	PVL Lime Plant	Nearest Competitor
Fuel Supply	Utility grade natural gas	Coal and/or Petroleum coke
Transportation (Raw Product)	Shorter distance—conversion to electric or hydrogen vehicles (future).	Longer distance–diesel powered trucks.

Based on the data presented above, neither construction nor operational emissions would result in exceedance of significance thresholds for any criteria pollutants (with or without mitigation). With the mitigation provided above, emissions impacts have been minimized to the greatest extent feasible resulting in a less than significant impact under this issue.

Sensitive Receptors

Due to the rural location of this project, there are no medical facilities in close proximity. However, the closest residence is 2,100 ft from the PVL site location, while the closest school to the PVL site is Trona Elementary School, which is about 2,570 ft from the project site.

Greenhouse Gas Thresholds of Significance[6]

Global Climate Change (GCC) is defined as the change in average meteorological conditions on the earth with respect to temperature, precipitation, and storms. Many scientists believe that the climate shift taking place since the industrial revolution (1900) is occurring at a quicker rate and magnitude than in the past. Scientific evidence suggests that GCC is the result of increased concentrations of greenhouse gases in the earth's atmosphere, including carbon dioxide, methane, nitrous oxide, and fluorinated gases. Many scientists believe that this increased rate of climate change is the result of greenhouse gases resulting from human activity and industrialization over the past 200 years.

An individual project like the Project evaluated in this GHG Analysis cannot generate enough greenhouse gas emissions to effect a discernible change in global climate. However, the Project may participate in the potential for GCC by its incremental contribution of greenhouse gasses combined with the cumulative increase of all other sources of greenhouse gases, which when taken together constitute potential influences on GCC.

Significance Thresholds

California has passed several bills and the Governor has signed at least three executive orders regarding greenhouse gases. GHG statues and executive orders (EO) include Assembly Bill (AB) 32, State Bill (SB) 1368, EO S-03-05, EO S-20-06 and EO S-01-07.

AB 32 is one of the most significant pieces of environmental legislation that California has adopted. Among other things, it is designed to maintain California's reputation as a "national and international leader on energy conservation and environmental stewardship." It will have wide-ranging effects on California businesses and lifestyles as well as far reaching effects on other states and countries. A unique aspect of AB 32, beyond its broad and wide-ranging mandatory provisions and dramatic GHG reductions are the short time frames within which it must be implemented. Major components of the AB 32 include:

- Require the monitoring and reporting of GHG emissions beginning with sources or categories of sources that contribute the most to statewide emissions.
- Requires immediate "early action" control programs on the most readily controlled GHG sources.
- Mandates that by 2020, California's GHG emissions be reduced to 1990 levels.
- Forces an overall reduction of GHG gases in California by 25-40%, from business as usual, to be achieved by 2020.
- Must complement efforts to achieve and maintain federal and state ambient air quality standards and to reduce toxic air contaminants.

Statewide, the framework for developing the implementing regulations for AB 32 is under way. In response to the requirements of SB97, the State Resources Agency developed guidelines for the treatment of GHG emissions under CEQA. These new guidelines became state laws as part of Title 14 of the California Code of Regulations in March, 2010. The CEQA Appendix G guidelines were modified to include GHG as a required analysis element. A project would have a potentially significant impact if it:

[6] PVL Greenhouse Gas Significance.doc, 08/14/2018, Richard Wilson

- Generates GHG emissions, directly or indirectly, that may have a significant impact on the environment, or,
- Conflicts with an applicable plan, policy or regulation adopted to reduce GHG emissions.

Project GHG Impacts

The Mojave Desert AQMD sets a quantitative significance threshold for Greenhouse Gases below which a project is considered less than significant.

Table 7a – Project GHG Emissions (Construction)

MDAQMD Threshold (T CO2e/yr)	Project Impacts (T CO2e/yr)	Significant Impact?
100,000	3,953	NO

Table 7b – Project GHG Emissions (Operations)

MDAQMD Threshold (T CO2e/yr)	Project Impacts (T CO2e/yr)	Significant Impact?
100,000	159,133	**YES**

The project has two main sources of greenhouse gas emissions: stationary source combustion, and vehicular transportation emissions. The stationary source GHG emissions will **exceed the threshold for the California AB-32** cap-and-trade program, making the facility a mandatory cap-and-trade entity. The facility will comply with this adopted policy or regulation for the reduction of GHG emissions.

Based on conversations with the CARB, the benefits of the developing the PVL Lime Plant project outweigh the project's impacts as a new source contributing to regional greenhouse gas emissions. This is because the project's is located within the State in which many of the PVL Lime Plant's customers will be served. There are 18 active Lime plants West of the Rocky Mountains, and of those, 11 are captive facilities where the lime is used in house for Sugar production. It is assumed that about seven of the plants would be within PVL's sphere of influence.[7] Four of the above plants are Lime manufacturers with the most influence in the California lime markets. One of these facilities is located closest to the Southern California markets and would be in direct contact with markets in that area and indirectly with other markets within the State of California. It is believed that output from the PVL plant will also be used within most of the same market regions.

The majority of all lime that comes into California would use the Las Vegas to Kramer Junction corridor and as shown in Table 8, by intersecting this route from Trona, there would be a significant reduction in overall vehicle emissions. This "leakage" is what the CARB has expressed interested in reducing. The data shown in Table 8 utilizes the Las Vegas to Kramer Junction corridor because this is the route the majority of Lime suppliers would use to transport lime on the west coast. Very little (if any lime of this grade) comes in from other routes of entry into California. Lhoist was selected as a target location because they are the largest and closest supplier east of the proposed PVL Lime

[7]USGS Mineral Industries Survey, at http://www.lime.org or by calling (703) 243-5463

Plant, making them the logical choice with which to compare reductions in transportation emissions from a plant in California versus a plant east of California, with the intent that a majority of PVL Lime would serve a majority of the customer base in California once in operation.

Table 8: EMISSIONS REDUCTION CALCULATION: IN STATE (PVL) VS OUT OF STATE (LHOIST)

	Vehicle Type	Quantity	Tons/ Load	Round-Trip Distance (mi)	Ton per Mile	CO_2 (g/ton /mi)	CH_4 (g/ton /mi)	N_2O (g/ton/ mi)	CO_2	CH_4	N_2O	
Trona, CA To Kramer Junction, CA	Heavy Duty Diesel Vehicle	44.4	25	62	124	1,430	0.015	0.0048	157,460	1.65	0.53	grams /day
Lhoist, Las Vegas, NV to Kramer Junction, CA				214	428				543,492	5.70	1.82	
Assumptions: 1. Identical conditions (equipment, loads, traffic, etc.) Notes: * Ton-mile calculation reflects tonnage transported and returned empty									6.56	0.00007	2.20 E-05	Kg/hr
									22.65	0.00024	7.60 E-05	
									1.39	2.51 E-05	8.04 E-06	MT/yr
									8.27	8.67 E-05	2.77 E-05	
									Comparative Percent Reduction: 71.03%			

As previously stated, there are no Lime Plants located within California, and as such the reduction in transportation that would occur as a result of the PVL Lime Plant's proximity to its customer base is substantive, such that the proposed project's operational emissions profile would net 71% reduction from business-as-usual, and 2.3 metric ton quantitative reduction in CO2e from reducing the vehicle miles travelled to transport Lime products to customers.

The emission profile for the closest plant—which happens to be the plant with the most influence—indicates that there are several areas where the PVL project reflects a lower carbon, and less transportation impacts when compared to the nearby Lime Plants, which utilize older technologies utilizing high carbon fuels and require greater transportation to reach their respective markets.

PVL Lime will mitigate excess GHG emissions by acquiring and retiring 60,000 tons of permanent CO2 credits.

Other reductions:

In addition to the reductions shown in Table 8 and stated above, there are several other measures that reduce overall emissions on a plant/plant comparison basis.

1. The Kiln will use utility grade natural gas. Out of state lime producers use either coal or petroleum coke, which produce greater contributions to GHG emissions than natural gas does.
2. The Kiln technology is a “state of the art” vertical dual chamber versus rotary type.
3. The plant will convert all its raw material hauling fleet to zero emissions technology (Tesla, Hydrogen, etc.) making for additional reductions as the technology becomes available and cost effective. (These reductions weren’t included in the AQ/GHG Report).
4. The use of certified emission reduction credits where needed.

Based on the reduced emissions that would result from developing the PVL Lime Plant within the state of California, impacts under these issues are anticipated to be less than significant.

References:

Biostream and WZI citations:

MDAQMD CEQA Guidelines Page 4 August 2016.

MDAQMD CEQA Guidelines Page 9 August 2016

Panamint Valley Lime - Emissions Summary REVD.xls (1), 03/28/2019, Updated 011520, Panamint Valley Lime Emissions RW819 tpd Final.xls 1/17/20 (WZI)

https://www.arb.ca.gov/regact/2010/capandtrade10/capv4appj.pdf

USGS Mineral Industries Survey, http://www.lime.org or by calling (703) 243-5463.

Part 70 Operating Permit Source: 3 Page 2 of 54 Paul Durr (702) 455-1677 CLARK COUNTY DEPARTMENT OF AIR QUALITY.

PVL Greenhouse Gas Significance.doc, 08/14/2018, Richard Wilson WZI