



## **AIR POLLUTION PREVENTION PLAN FOR THE BISHOP PAIUTE RESERVATION**

**Prepared by  
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# AIR POLLUTION PREVENTION PLAN FOR THE BISHOP PAIUTE RESERVATION

## TABLE OF CONTENTS

EXECUTIVE SUMMARY ..... 1

ACKNOWLEDGEMENTS ..... 4

1. BACKGROUND, LOCATION AND HISTORY ..... 6

- a. Location of Bishop Reservation
- b. Meteorology
- c. Air Quality on the Bishop Paiute Reservation

2. REDUCING AIR POLLUTION ON THE BISHOP RESERVATION ..... 12

- a. Residential Trash Burning
- b. Residential Wood Burning for Home Heating
- c. Burning Vegetative Waste
- d. Barren and Sparse Vegetation Areas
- e. Dirt Roads
- f. Paved Roads
- g. Other Vehicle Emissions

APPENDIX – Burn Permit

### LIST OF MAPS

Map 1. Owens Valley Map Satellite View ..... 6

Map 2. Bishop Reservation and the Town of Bishop, California ..... 7

### LIST OF FIGURES

Figure 1. Particulate Matter - Bishop Paiute Reservation 2005-2018.....10

Figure 2. Particulate Matter by Month - Bishop Paiute Reservation 2005-2018.....11

### LIST OF TABLES

Table 1. PM-10 from On-Reservation Sources..... 2

Table 2. Potential Impact of the Pollution Prevention Strategy on PM-10 Emissions..... 3

Table 3. Air Quality Monitoring Data Summary Bishop Paiute Reservation 2005-2018.....9

Table 4. Emissions from Residential Trash Burning ..... 12

## **AIR POLLUTION PREVENTION PLAN FOR THE BISHOP PAIUTE RESERVATION**

### **EXECUTIVE SUMMARY**

The Bishop Paiute Reservation is located in the Owens Valley in eastern California, near the Nevada border. The reservation itself comprises 875 contiguous acres and is flanked by the City of Bishop to the East. It is surrounded by private lands and by lands owned by the Los Angeles Department of Water and Power. Approximately 1,350 people live on the Reservation.

The Bishop Paiute Reservation is located within Great Basin Unified Air Pollution Control District (GBUAPCD), which includes all of Inyo, Mono, and Alpine Counties. These are all rural counties with few large stationary sources of air pollution. The air quality in the District is generally good, although there are several important exceptions. The principal pollutants of concern both on and off the reservation are PM-10 and PM-2.5, particulate matter that is less than 10 microns in diameter (8 to 10 times smaller than a human hair) and less than 2.5 microns in diameter, respectively. The two most important sources of particulate matters are dust and smoke, with smoke particles being smaller and generally falling in the PM-2.5 range.

Particulate matter is a concern due to its impacts on health. Small particles can be inhaled and become lodged in the human lung. Both chronic and short-term exposure to particulate pollution increase the risk of premature mortality. Mortality risk is particularly increased for people with pre-existing cardiac and respiratory conditions. In addition, cardiac and respiratory illness and asthma are aggravated by particulate pollution.

The Tribe's Environmental Management Office (EMO) has conducted source and emission inventory (EI) studies in 2002, 2012, and 2019, focusing on PM-10 because the reservation has historically been ringed by PM-10 non-attainment areas; additionally, air quality monitoring activities by the Tribe and by GBUAPCD have focused on PM-10 due to its regulatory importance. Therefore, the results in this Air Pollution Prevention Plan also focus on PM-10 emissions. The revisions of the EIs provided both PM-2.5 and PM-10 emission estimates and have guided current pollution prevention efforts. The EI report is available at <http://www.bishoptribeemo.com/library.htm>.

In the Owens Valley, the principal mode of PM-10 pollution is windblown dust, with the Owens Dry Lake located only 60 miles away, being historically the largest PM-10 source in the nation. However, a number of additional on-reservation sources were identified in a recent source and emissions inventory. Reducing emissions from these on-reservation sources is addressed in this plan. They are listed from highest to lowest priority, which has remained consistent since the 2012 revised EI.

- a. Emissions from residential trash burning (highest priority for regulation in concert with solid waste ordinance)
- b. Smoke from residential wood burning for home heating
- c. Fugitive dust from dirt roads
- d. Fugitive dust from paved roads
- e. Fugitive dust from wind erosion of open spaces
- f. Emissions from vegetative waste
- g. Vehicle emissions
- h. Gaseous emissions – non-mobile sources

Estimates of PM-10 and PM-2.5 emissions from these on-reservation sources are given below in Table 1. Among the sources of air pollution on the reservation, residential trash burning has been identified as the highest priority source for reducing on-reservation emissions. Trash burning is also a source of dioxins, a toxic air contaminant and has is regulated by the California Air Resources Board. Residential wood burning for home heating is the next highest priority source for reducing on-reservation emissions. This report addresses methods for reducing emissions, primarily PM-10, from these on-reservation sources. The corresponding tabulated data for PM2.5 is included for reference below, as it represents a portion of PM-10.

**Table 1a. PM-10 From On-Reservation Sources**

SOURCE	PM-10 (Kg/year)	PM-10 (tons/year)
Residential Trash Burning	780	.86
Backyard (Vegetation) Burning	472	.52
Smoke from Residential Wood Burning for Home Heating	12,345	13.61
Open Area Wind Erosion – barren parcels	452	.50
Open Area Wind Erosion – sparse vegetation	590	.650
Fugitive Dust from Dirt Roads	12,532	13.81
Entrained Paved Road Dust	141.7	0.156
Other Vehicle PM-10 including Service Station	6.1	0.007

**Table 1b. PM-2.5 From On-Reservation Sources**

SOURCE	PM-2.5 (Kg/year)	PM-2.5 (tons/year)
Residential Trash Burning	714	.77
Backyard (Vegetation) Burning	364	.40
Smoke from Residential Wood Burning for Home Heating	12,345	13.61
Open Area Wind Erosion – barren parcels	68	.075
Open Area Wind Erosion – sparse vegetation	88	0.10
Fugitive Dust from Dirt Roads	1,247	1.37
Entrained Paved Road Dust	44.16	0.049
Other Vehicle PM-2.5 including Service Station	3.91	0.004

## AIR POLLUTION PREVENTION RECOMMENDATIONS

Pollution prevention must focus on the largest and most toxic sources on the reservation. Using the source and emission inventory as a guide the following measures are recommended. The potential impact on pollution for each category is calculated to estimate the maximum possible impact. A summary of the potential reductions for each source is shown in Table 2 below.

Table 2 summarizes the potential impact of the pollution prevention strategies discussed in this Plan, and shows the effects on PM-10 emissions by source. If all measures are implemented, PM-10 emissions could be reduced by nearly 50 percent. The principal impacts would come from replacing standard wood stoves with EPA certified stoves and paving roughly 4 miles of dirt road segments.

**Table 2. Potential Impact of the Pollution Prevention Strategy on PM-10 Emissions (using figures from the 2019 Source and Emissions Inventory)**

SOURCE	Current PM-10 (tons/year)	PM-10 after Pollution Prevention Implemented (tons/year)	Percentage Reduction in PM-10	Summary
Residential Trash Burning	0.86	0	100%	The primary goal is to reduce dioxin and other air toxics emissions by eliminating all plastics and residential garbage from burn barrels. Assumes all trash burning ceases. The current approach utilizes broadcast and case education on burn permits and toxics, to restrict materials to cardboard and non-glossy paper and allowing burning only during times and days when smoke dispersion is good.
Smoke from Residential Wood Burning for Home Heating	13.61	2.6	80.9%	Gradual replacement of standard wood stoves with less emissive heating methods. Assumes all standard wood stoves are replaced by EPA-certified stoves. Greater reductions could be obtained by replacing units with lower emission devices such as pellet stoves, propane furnaces or kerosene heaters. Revise known inventory of stove replacements between CDD and Air Program to estimate current reduction potential.
Vegetative Waste	0.52	0.28	46.4%	Amendment to the burn permit system in 2018 addressed larger scale burns with additional requirements. Reductions are possible through education encouraging residents to dispose of yard waste mechanically by EMO staff, and under the Natural Resources Program, enacting large-scale fuels reduction activities, such as the recent WUI grants. Reduction assumes 40 acres of parcels historically treated for fuel loads via burning would need to be treated mechanically instead, per year.
Fugitive Dust – Barren and Sparse Vegetation Areas	1.15	0.79	31%	Included since 2012 EI. Tribe could adopt standards/practice for visible emissions. Tribe could require dust controls at horse corrals.
Fugitive Dust from Dirt Roads	13.81	0.156	99%	Paving/resurfacing. Assumes all (inventoried) dirt roads are surfaced with a material that will reduce dust emissions to a level comparable to paved roads.
Entrained Paved Road Dust	0.156	No change	0%	No specific on-reservation measure proposed.
Other Vehicle PM-10	0.005	0	100%	Reservation residents comply with state of California vehicle emission requirements. Tribe continues pursuing fleet replacement, repower, and retrofit opportunities, and assumes retirement or replacement (even with new diesel) for vehicles subject to 2020 registration restrictions.
<b>TOTAL</b>	<b>30.11</b>	<b>3.981</b>	<b>86.8%</b>	<b>Assumes that all measures are implemented.</b>

## **AIR POLLUTION PREVENTION PLAN FOR THE BISHOP PAIUTE RESERVATION**

### **ACKNOWLEDGEMENTS**

We would like to express our appreciation to a number of people who provided assistance with this report.

Thomas Gustie III and other BPT Environmental Management Office staff and other Tribal Staff have shared information and data over the years which contributed greatly to this report, and the preceding 2019 Source and Emissions Inventory (2019 EI). The previous revisions of the Plan were completed by the former Air Quality Specialist, Toni Richards, Ph.D.

The staff of the Great Basin Air Pollution Control District helped with a number of aspects with the 2004 plan- Duane Ono carefully reviewed those drafts and provided detailed comments and helpful suggestions, and Chris Lanane provided endless hours of technical support on air quality and meteorological monitoring issues.

Mr. Scott Weaver provided revised calculations for the 2019 EI sections 4. Wind Erosion of Open Areas, 5. Dirt Roads, 6. Entrained Dust from Paved Roads, and 7. On-road Motor Vehicle Emissions, which are carried in part into this report.

We also want to express our special thanks to Gary Lance and Doug McDaniel from US EPA Region 9 Air Division for their helpful comments on the 2004 plan.

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## AIR QUALITY ON THE BISHOP PAIUTE RESERVATION SOURCE AND EMISSIONS INVENTORY

### 1. BACKGROUND, LOCATION AND HISTORY

#### a. Location of Bishop Reservation

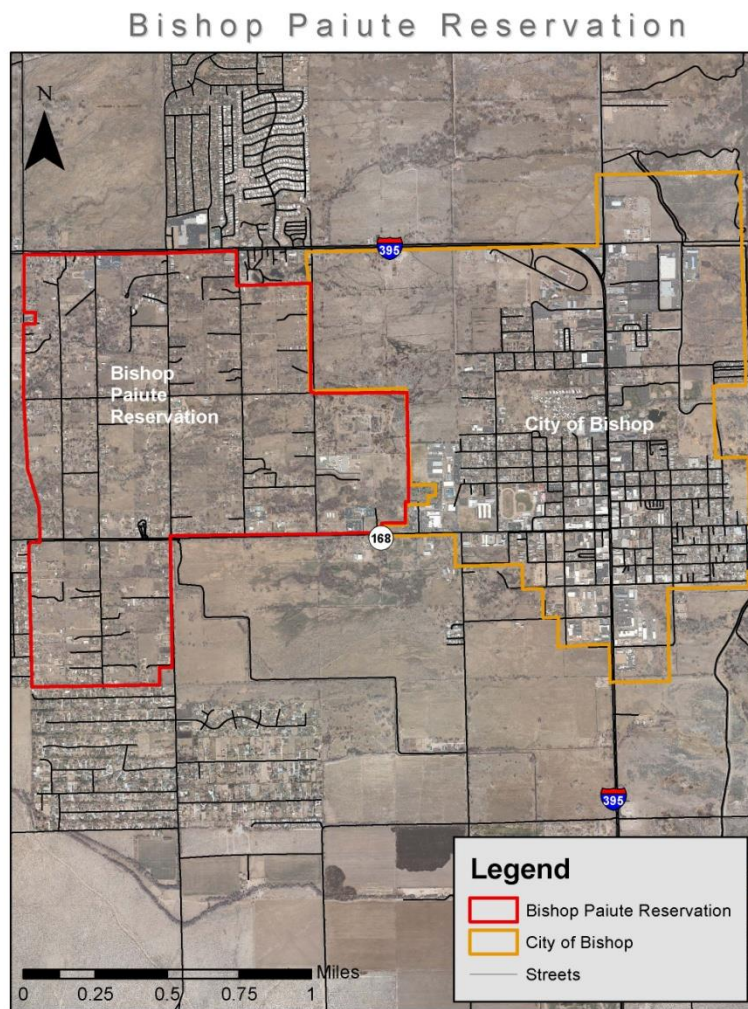
The Bishop Paiute Reservation is located in the Owens Valley in eastern California, near the Nevada border. The area is sometimes known as “the deepest valley” it is flanked by two 14,000-foot ranges – the Sierra Nevada to the west and the White Mountains to the east, and sometimes as Payahuunadü, ‘the land of flowing water’. The region includes some of the most spectacular scenery in the United States. Both mountain ranges are comprised of National Forest and National Park lands that include substantial wilderness areas and multiple Class I air-sheds (areas designated under the Federal Clean Air Act for Protection from Significant Deterioration). From time immemorial, the Paiute People have been shepherds of the Valley from crest to crest. The Bishop Paiute Tribe continues to maintain that interest by helping protect the air quality in this magnificent landscape. Map 1 depicts the Owens Valley.

**Map 1. Owens Valley Satellite View**



The Reservation is flanked by the City of Bishop to the east, and surrounded by private lands and by lands owned by the Los Angeles Department of Water and Power. The Bishop Paiute Reservation comprises 879 contiguous acres, with over 600 registered households, roughly 92% being native households. Nearly all of the land on the Reservation is assigned to individual families, with a limited number of acres set aside for public and commercial facilities. Despite substantial population growth since the creation of the Reservation in 1939, many of the assigned lands are in agriculture (pasture or alfalfa, primarily) or are open lands, and residential assignments may be densely populated. Map 2 shows the Reservation.

**Map 2. Bishop Paiute Reservation**



Bishop Paiute Reservation  
Environmental Management Office  
50 Tu Su Lane  
Bishop, CA 93514



## b. Meteorology

The Owens Valley is at the western edge of the Great Basin, and western basin and range province. The climate is high desert, and precipitation can vary widely from one year to the next, and the annual total can be dependent on as little as a single storm. Winter is the wettest season and is storm-driven. January typically has the most precipitation that may be in the form of snow. Summer precipitation is dependent on monsoonal flow. Fall precipitation is highly variable.

Due to the desert climate, daily temperatures can vary by 40 to 50 degrees. Typically, July is the hottest month with maximum temperatures reaching or exceeding 100°F. January is the coldest month with minimum temperatures in the single digits or teens. Historical data from Bishop Airport show the record high as 110 degrees F and the record low as - 8 degrees F (<https://www.wrh.noaa.gov/vef/climate/BishopClimateBook/ClimateofBishop.pdf> 2016.)

Winds are the driving force behind much of the air pollution in the Owens Valley. On the Bishop Reservation, our data demonstrates that wind gusts in excess of 35mph may generate episodic high dust conditions resulting in high levels of PM-10. Winds can also drive wild fires or can bring smoke from distant fires into the valley, impacting PM-2.5 levels. Winds can also transport ozone from the Central Valley. In any month maximum wind gusts can exceed 40mph and in most months, particularly in the winter and spring. Average winds are around 20mph. Average winds do not vary substantially from year to year, and high gusts are observed in all years.

The Air Program published a study *Weather History on the Bishop Paiute Reservation 1925 – 2011*, found at: <http://www.bishoptribeemo.com/Library/Air%20Quality%20Studies/Weather%20History%201925-2011%202.5.14.pdf>.

The Bishop Paiute Tribe's weather station collects and publishes online real time data, going back to 2005. The tribal data is currently available for analysis at: <http://www.bishoptribeemo.com/monitoring.htm>, [https://aq5.epa.gov/aqsweb/documents/data\\_mart\\_welcome.html](https://aq5.epa.gov/aqsweb/documents/data_mart_welcome.html) (AQS direct client (for AQS users) and [www.QREST.net](http://www.QREST.net).

Additionally, meteorological monitoring data and resources in the Owens Valley can also be found at: <https://www.gbuapcd.org/cgi-bin/downloadData> for Great Basin Unified Air District monitoring in Owens Valley locations, validate data sets; <https://www.wrh.noaa.gov/vef/climate/BishopClimateBook/index.php> Bishop Airport station Climate Book; <https://www.wmrc.edu/weather/default.html> for White Mountain Research Center Weather Page

## c. Air Quality on the Bishop Paiute Reservation

In 2003, the Tribe initiated monitoring for particulate matter less than 10 microns in aerodynamic diameter (PM-10). Monitoring for particulate matter less than 2.5 microns in aerodynamic diameter (PM-2.5) began in 2004. O<sub>3</sub> monitoring began in 2007. The Bishop Tribe's monitors are continuous FEM, and are all located at the Environmental Management Office-A building, shown in Map 2 above.

Summary information is shown in Table 3 below. Exceedances of the Tribal and State 24-hour standard for PM-10 ( $50 \mu\text{g}/\text{m}^3$ ) have been observed in all years since the inception of monitoring. 2008, 2014, 2015, and 2018 have had either 1 or multiple exceedances of the Tribal and state 24-hour standard for PM-2.5 ( $35 \mu\text{g}/\text{m}^3$ ). The exceeding PM-2.5 values in these years were all associated with wildfires and/or were during fire season. 2008 also saw exceedances of the O<sub>3</sub> standards (90ppb for 1 hour and 70ppb for 8 hours); however, these were attributed to stratospheric intrusion associated with frontal passage.

**Table 3. Air Quality Monitoring Data Summary Bishop Paiute Reservation 2005-2018**

Year	PM-10 micrograms per cubic meter		PM-2.5 micrograms per cubic meter		Ozone parts per billion	
	24-hour max	Hourly max	24-hour max	Hourly max	8-hour max	Hourly max
2005	55	553	31	98		
2006	113	377	29	97		
2007	70	711	27	157	56	67
2008	91	1,077	39	95	82	93
2009	121	902	32	87	69	72
2010	71	940	29	123	64	70
2011	123	1,426	26	175	54	60
2012	81	698	30	85	49	53
2013	106	424	26	75	44	48
2014	87	421	37	141	47	61
2015	128	430	85	252	42	47
2016	64	388	32	101	56	62
2017	86	771	27	87	55	63
2018	197	743	138	210	52	75

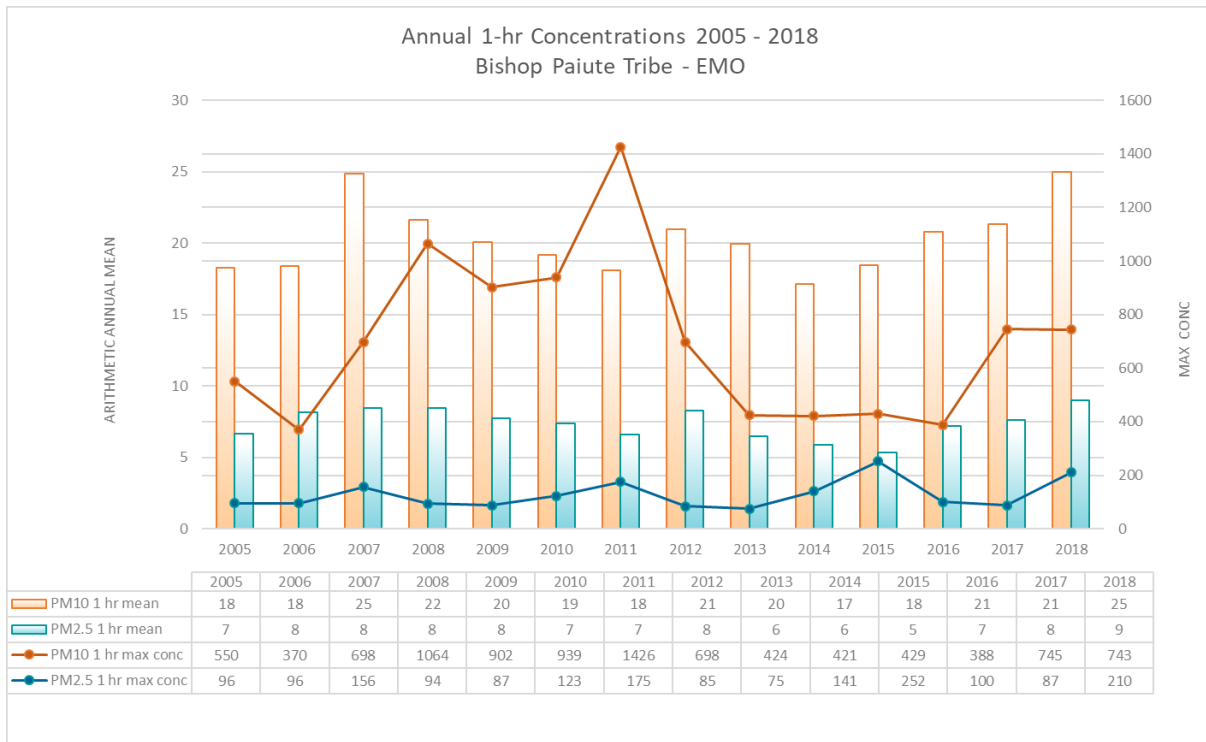
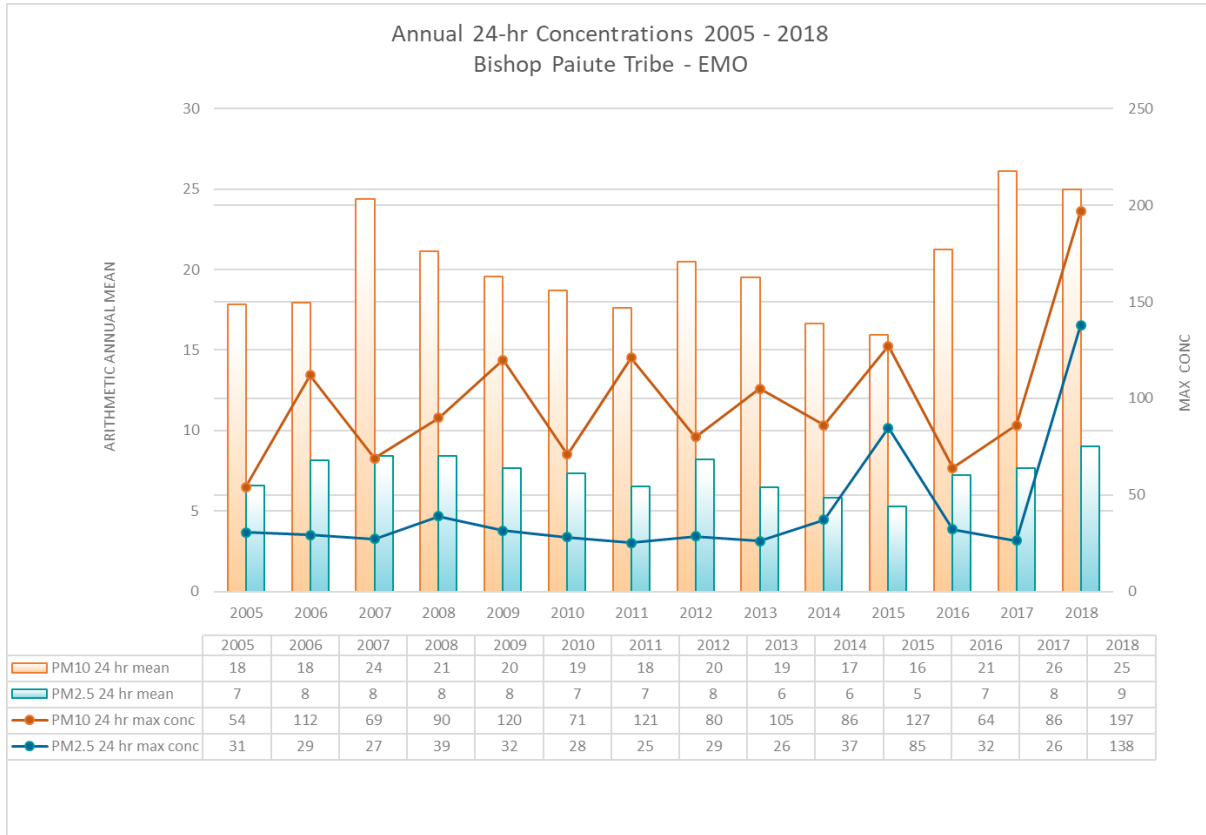
NOTE: The Bishop Tribe's air quality standards (and state standards) for particulate matter for PM and ozone are:  
 PM-10 24-hour  $50 \mu\text{g}/\text{m}^3$   
 PM-2.5 24-hour  $35 \mu\text{g}/\text{m}^3$   
 Ozone 1-hour 90ppb 8-hour 70ppb. Numbers in chart are rounded.

The Bishop Paiute Reservation is located only 60 miles north of the largest source of PM-10 in the nation, the Owens Dry Lake. Historically PM-10 has been the primary pollutant of concern for the surrounding Great Basin Unified Air Pollution Control District. Studies by the Tribe's Air Program have shown the impact of the dry lake on reservation air quality. ("Where does the dust come from?" This study can be found on the Air Program website [http://www.bishoptribeemo.com/index\\_air.htm](http://www.bishoptribeemo.com/index_air.htm) under "library.") Other sources include dirt roads and barren lands on an off the Reservation.

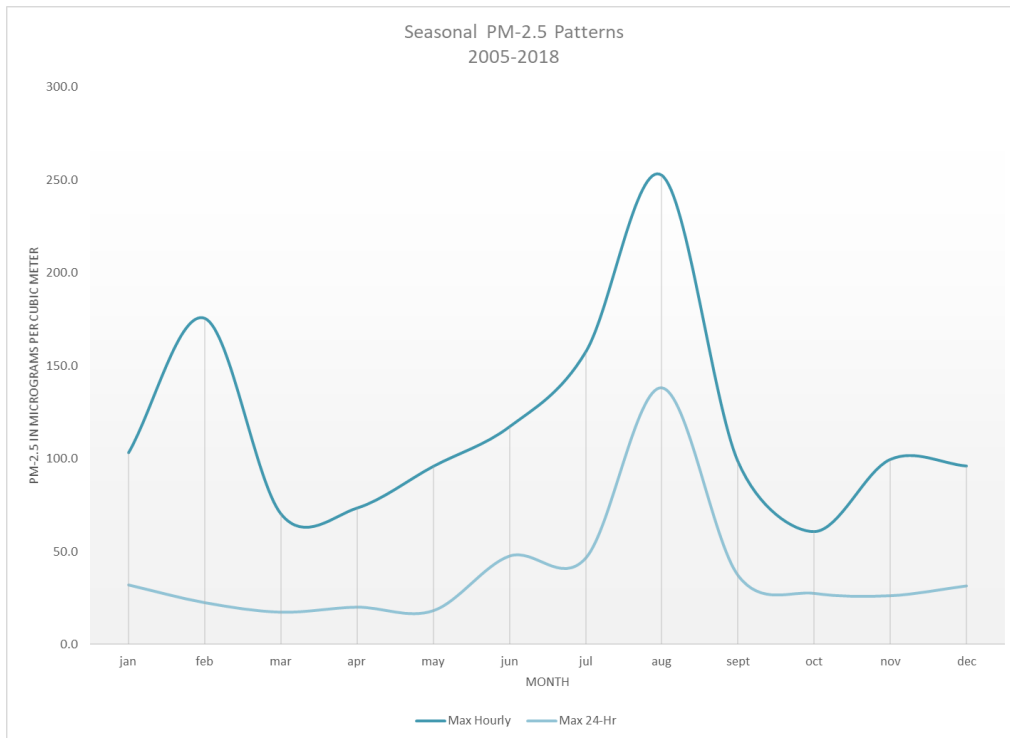
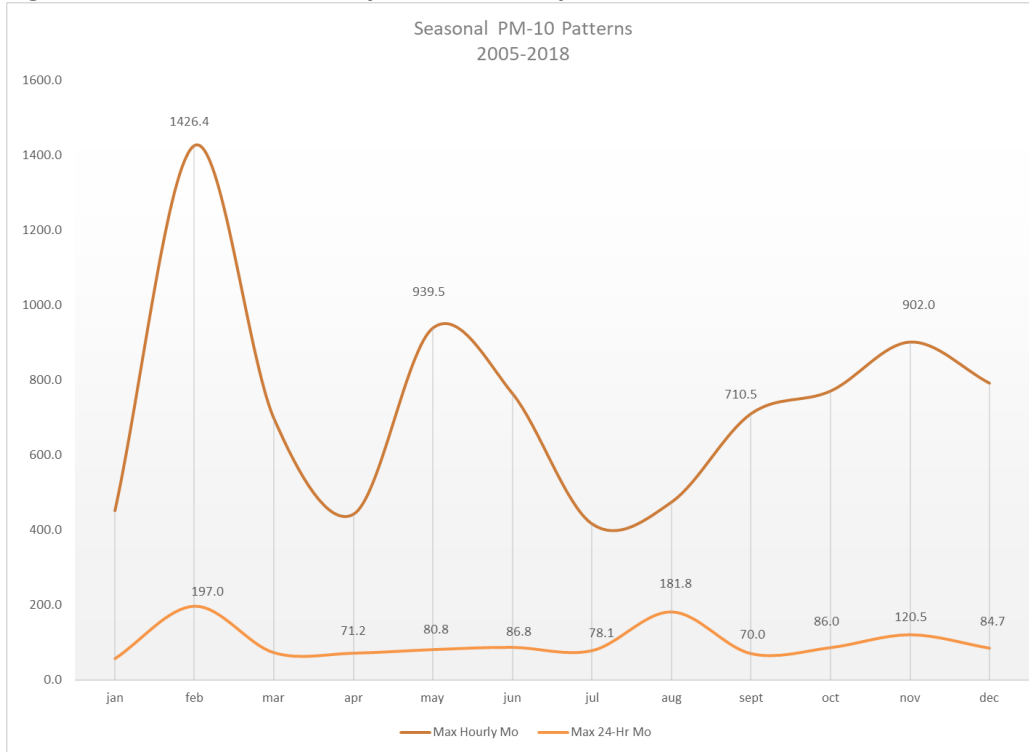
In the winter, wood burning for home heating is the primary source of particulate matter less than 2.5 microns. In the summer, off-reservation wild fires are the primary source. 24-hour average PM-2.5 concentrations are generally low during the observation period, although in every year hourly values have reached or exceeded  $75 \mu\text{g}/\text{m}^3$ . The seasonal patterns reflect the two sources mentioned above.

As the graph below shows, high PM-10 concentrations have been observed in all years, with at least one exceedance of the Tribal 24-hour standard in every year. Hourly maxima have exceeded  $400 \mu\text{g}/\text{m}^3$  in all years except 2006 and 2016. The highest 24-hour concentrations recorded are associated with wind and/or dust storms, usually with frontal passage, and can be observed outside of the summer months, notably November and February.

**Figure 1. Particulate Matter - Bishop Paiute Reservation 2005-2018**



**Figure 2. Particulate Matter by Month - Bishop Paiute Reservation 2005-2018**



## 2. REDUCING AIR POLLUTION ON THE BISHOP RESERVATION

### a. Residential Trash Burning

#### Emissions

The source and emission inventory identified residential trash burning as the highest priority source for pollution prevention due to the toxicity of these emissions. In addition, a 2001 survey showed considerable support for measures to control allowable times for burning and acceptable materials for burning and for the development of recycling alternatives.

In 2009, the Tribe conducted a subsequent general survey. The goal was to personally interview all households on the Reservation to get results as close to a census as possible for use in planning and funding applications. A total of 525 households were surveyed, representing 1,232 Reservation residents. Households were asked about back yard trash incineration, open burning of vegetative waste and wood burning for home heating. The 2009 general survey results averaged 2.3 residents per household, based on a high number of respondents reporting 1-person households. In the prior EI report, an average of 2 people per household was assumed for purpose of these emissions calculations. In 2016, the Air Program interviewed the Tribe's Community Development (Housing) Director to complete the NTAA's 2016 Indoor Air Quality Needs Assessment, in which an estimate of 6 people per household was made. In 2019, the Air Quality Specialist investigated the average and total of 1-person households again with Housing and some other Tribal departments' staff, and a new estimate of 3 people was made. Waste stream proportional numbers were also updated; the methods for calculating the current emissions estimates are described in detail in the [2019 EI](#).

Emissions from residential trash burning are summarized in Table 4 below. Although residential trash burning is a relatively small source of particulate, the emission of a variety of toxic compounds, particularly dioxins, make it a source that is important to control for pollution prevention. In addition to these health concerns, residential trash burning presents a substantial nuisance factor and a recent survey (reported in the Source and Emission Inventory) showed substantial community support for restricting this practice.

**Table 4. Emissions from Residential Trash Burning**

Pollutant	Total Emissions (g)
Dioxins (EPA Series 1, 1997 Testing)	4.95
Dioxins (EPA Series 2, 2000 Testing)	0.15
1,3-Butadiene	4,364.58
Benzene	30,283.15
PAHs4	1,390.98
PCBs	4.02

#### Pollution Prevention Activities

##### 1. Burn Permit Program and Education

In March 2003, with the support of the Tribal Environmental Protection Agency (TEPA) Board, the Tribal Council adopted a burn permit system governing all open burning, thus steps were already taken at the time of the original version of this Plan (referred to as the Plan). This permit was developed in collaboration with the Great Basin Unified Air Pollution Control District, the Bishop Rural Fire Protection District, and the California Department of Forestry. It was designed to be part of a larger educational effort to ensure that reservation residents burn only on allowable burn days (days when the barometric

pressure is such that smoke will dissipate), at allowable times (in the mornings when smoke will have the opportunity to dissipate during the day and when inversions are less likely), and restricts burning to allowable materials (cardboard and non-glossy paper). The permit program also promotes fire safety by educating tribal members regarding safe burning practices, and adhering to the burn days and times for fire safety reason such as the potential for high winds in the afternoons and dry fuels in summer. It is included in Appendix A.

The Air Quality Specialist is responsible for assisting reservation residents in completing the permit. Each time the Air Quality Specialist issues a permit, the Specialist emphasizes the importance of adhering the restrictions specified in the permit. In the case of burn barrels, the risks of toxic emissions are particularly emphasized. This information is backed up with regular newsletter articles. Community reception of this new procedure has been good to date, although there continues to be some instances of burning outside of burn days and times. The principal evidence has been a drastic reduction in calls to the Bishop Rural Fire Protection District for burning on “no-burn” days. Future efforts were, at the time of the original Plan, to include drafting a general Air Quality Ordinance to address a range of issues, plus education. However, to date, EMO has arranged to insert the air-quality related conditions into the draft ordinances for Fire Safety and Solid Waste, and allow remaining coverage under the in-effect Nuisance and Environmental ordinances. Prohibition of burning trash is stated in the draft Solid Waste Ordinance and Code, which EMO and the TEPA Board have been drafting since 2017 (currently in review by legal counsel).

## 2. Recycling and Solid Waste Transfer Station

In the Spring of 2003, the Environmental Management Office in cooperation with the Community Development Department investigated the costs of implementing a recycling (including plastics) and solid waste transfer station. This was based on strong community support for recycling shown in a recent survey of reservation residents. The proposed facility was presented to the Tribal Planning Commission and to the Council. While there was considerable support for such a facility, a suitable location was never identified. The proposed facility was to have an attendant to ensure that materials for disposal were appropriately separated and offer the following services:

- Residential waste disposal (dumpsters)
- Vegetative waste disposal (a chipper)
- Recycling of bottles and cans (bins)
- Motor vehicle oil disposal

As of 2020, for various reasons including feasibility, a transfer station on the reservation has not been pursued as an option. Some reservation residents are customers of local waste disposal services to the transfer station which is within a couple miles from the Reservation. Because of the proximity of the Reservation to the town of Bishop and the County transfer station, Reservation residents are of similar (more and less depending on the non-tribal neighborhood) distance to the Sunland (Inyo County landfill) as City and County residents are. Additionally, funding or subsidies for the station would have to be constantly available for its continued operation, which would likely require usage fees and/or other costs to residents. Federal or other funding has proven to be not guaranteed, in the case of at least 1 other Tribal recycling center in the Owens Valley. The landfill has a chipper and hosts twice-annual vegetative waste amnesty (no-fee) days.

## Pollution Reduction Potential

Emissions from residential trash burning have the potential to be completely eliminated if all residential trash burning is eliminated on the reservation. However, the measures instituted to date, particularly



the burn permit system are focused on eliminating materials that are likely to emit the most toxic pollutants from burn barrels and on allowing burning only during those days and times when smoke dispersion is good. The guidelines in the current burn permit system follow the guidelines developed by the California Air Resources Board for low population density areas that are outside of incorporated areas, allowing only cardboard and non-glossy paper in burn barrels. (Vegetative waste is also covered by the permit and is discussed below.)

The treatment or assumption of toxin-emitting materials as separate from paper and cardboard (i.e. burnable materials) within household waste streams accounts for the difference/reduction in emissions estimates over the revisions of the EI. Increases reflect only an increase in estimated household size. The revisions of the EI reflect only updates in national estimates of those proportions, as the Reservation-wide survey which attempted to probe household practices with burning has not been repeated. As any trash burning which continues to the present writing is outside of the permitting system, and thus not tracked by EMO, and complaints are sporadic and may or may not be communicated to EMO it is impractical to gain updated estimates of emissions related to trash burning by additional updated metrics.

#### **b. Residential Wood Burning for Home Heating**

##### Emissions

Smoke from residential wood burning has historically been the largest source of particulate on the reservation, and now estimated as very close second behind windblown dust from dirt roads, accounting for 13.61 TPY of Particulate matter (see Table 1). Information on residential home heating emissions is described in detail in the 2019 EI, and is still taken from the 2009 general household survey described earlier. This data source is carried through to the current EI revision, as the survey has not been repeated. Based on that survey, 330 households used standard wood stoves or fireplace inserts, 13 used an EPA rated stove with a catalytic converter, and 51 used pellet stoves. The survey also showed that standard wood stoves and fireplace inserts used 967.5 cords of wood, the EPA devices used 43 cords of wood, and the pellet stoves burnt 72,160 kilograms of pellets. The EI found that the majority of particulate emissions from home heating are contributed by standard wood stoves, according to the calculated estimates or categorical totals of PM10 below. This is not surprising since 63% of reservation residents report using a standard wood stove, with each household burning nearly 3 cords per year.

Standard wood stoves: 11,842 kg/year

Wood stoves with catalytic converter: 351 kg/year

Pellet stoves: 152 kg/year

Total: 14,345 kg/year or 13.61 TPY

Between 2003 and 2005, the Air Program contributed data from the Tribal air monitoring station's data to the Community Development Department (CDD, or Housing) as part of a discussion of the feasibility of developing a phased program of wood stove replacement. In 2019, the first (in at least 10 years) exceedance of the Tribal 24-hour Standard for PM2.5, which is often largely smoke, occurred outside of wild fire events or "season", and instead occurred in winter. Only a ~2 TPY reduction of PM10 is estimated since the original 2004 Plan.

### Pollution Prevention Activities

#### Woodstove Replacement

The majority of woodstove related activity on the Reservation is enacted by CDD, who work with local certified installers. Availability of funding and installation support for woodstove replacements on a large scale on the reservation- and skilled/certified installation manpower- were, and still are, the limiting factors in achieving replacements. Additionally, individuals on the reservation may apply to be waitlisted through GBUAPCD for vouchers and incentives distributed among the states (not available to Tribal governments to distribute), as confirmed with GBUAPCD staff in 2019. EPA does not allocate funding for woodstove replacements on reservations.

For its part, the Air Program has relied on outreach and education heavily throughout the years, including newsletters, posted bulletins, emails, reports to the TEPA Board, and direct education. Material includes BurnWise guides, the 2015 EPA certification list (posted), instructions on efficient burning and wood moisture testing, carbon monoxide safety, and periodic updates of particulate pollution levels recorded at the station, especially in the winter. The Air Quality Specialist began attending Wood Smoke Work Group calls with NTAA, and attended the Woodstove Workshop remotely in 2020, sharing information with the Tribal Community.

The first step to accurately re-assess emissions estimates and reductions potential would be for CDD and EMO to share data to complete a revised inventory of stove types and usage on the Reservation, after the EPA certified stove performance standards (for manufacture and resale) go to the higher/"final" tier of specifications in May 2020 (which may have an affect on some purchasing by private parties of these, or the prior tier of 2015 – 2020 EPA-certified stoves). The inventory should consider 2015 – 2020 EPA compliant stoves as compliant/certified for this study, or be differentiated in the calculations.

#### Pollution Reduction Potential

Pollution reduction potential can be calculated by assuming that all standard wood stoves are replaced by EPA-certified stoves. The potential is assumed for the last inventory known and published within the Air Program. The impact on annual PM-10 emissions is given below, using emission factors from the recent EI revisions:

14,345 kg/year (13.61 TPY) total PM10 for home heating with stoves- 11,842 kg/year PM10 for standard woodstoves = 2,503 kg/year or 2.6 TPY  
(or 80.9% reduction or 11.01 TPY)

### **c. Burning Vegetative Waste**

#### Emissions

Emissions from vegetative waste are a moderately small source of particulate on the reservation, estimated to account for .52 TPY of PM-10 (see Table 1).

#### Pollution Prevention Activities

##### 1. Burn Permit Program and Education

Burning vegetative waste is handled through the burn permit program that covers all open burning on the Reservation. See the discussion of residential trash burning above. In spring 2018, the burn permit application and system was revised to disqualify regular permits for categories "> 1 acre", "other", or piles larger than the specified piles on the permit as described, and instead require a site visit by an EMO staff member for drafting a special permit for the larger projects. This change revealed that some

subsequently inspected large pre-burn sites lacked fire safety site clearances, adequate water sources, or other logistics, and nearly all of the permits issued since then are for burns claimed by applicants to be within the standard (smaller) categories. The burn permit procedure helps ensure that burning takes place during the days and times when smoke is most likely to disperse and in a manner to ensure fire safety. Pile and plot area sizes are (now more so) limited, and burning in increments (controlled burning) is encouraged to proactively manage hazardous fuels build up (as large fires generate significant smoke).

## 2. Fuels Reduction

The Tribe's Natural Resources Program regularly partners with CalFire to source labor crews who perform mechanical thinning and removal of fuels on the Reservation, including some residence. The Natural Resources Program has also enacted fuels reduction activities across the Reservation under several Wildland Urban Interface and other similar revolving grants, reducing or controlling the overall fuel loading in the last couple decades using mechanical removal (mowing, thinning, chipping), focusing on prioritized parcels.

### Pollution Reduction Potential

Smoke from burning vegetative waste could be eliminated if vegetative fuels were disposed of via mechanical treatments. However, some cases, such as burning fields and along irrigation ditches and fence lines do not lend themselves to this approach. Manpower and equipment for effective mechanical treatment may not be accessible to residents, who practice burning as a means of fuels reduction. Actual fuel loads depend on the status of recent land use for any given parcels, and meteorological (precipitation) and hydrological (groundwater) conditions.

During the busiest months of the WUI activities, crews can treat average of 7 acres/month. Post-treatment observations show that 12 acres treated can yield 14 tons of vegetative waste. The 2019 EI utilized an estimate of total vegetation mass burned annually on the reservation at 45,281 kg/year, or roughly 50 tons/year (49.9 tons). Though the annual rate of treatment may appear to exceed and thus account for the total burned annually, it does not in reality because areas treated under the WUI (which is enacted only part of the year) may be non-residential or unmanaged parcels which were not being previously managed by controlled burning, meaning they would likely be additional quantities of fuel load to what is burned on a rolling basis; in other words, the actual potential fuel load availability on the reservation exceeds the total which actually receives treatment via burning.

Where treatment under WUI or CalFire crews intersects parcels historically permitted for burning, reduction in emissions could be assumed (however, this would only be effective for the year or couple years following treatment, and may negate the effort of reducing larger-scale hazardous fuels build up on unmanaged parcels). Burn permits are issued for addresses on the reservation, and addresses may represent the lot, section of lot, or even lot plus a bordering lot for burning purposes, which may be from .25 acre to 1 acre. Acreage size per address, i.e. per applicant, could be recorded with the burn permit, so that an ordering of parcels by size could be applied to the permits pool (which could also be achieved by geocoding the burn permit database, which has been suggested for EMO's continuation of the program). Using the following logic, it can be assumed that if the Tribe wanted to reduce PM10 emissions from backyard burning of vegetation by roughly half, it would take mechanically treating over 40 acres per year of parcels which are conventionally treated with burning.

14 tons vegetation/ 12 acres = 1.16 tons/acre average potential vegetation displaced from combustible mass by mechanical treatments

Assume a smaller yield for managed parcels historically treated with burn piles- 50% by default (with no data recorded specifically for mechanical treatments on such parcels)  $.5 \times 1.16 \text{ tons/acre} = .58 \text{ tons/acre}$   
If 10 acres of parcels from the burn permit database were selected for mechanical treatments per year:  
 $10 \times .58 \text{ tons vegetation} = 5.8 \text{ tons of vegetation displaced from burning}$   
 $49.9 \text{ tons (2019 EI total)} - 5.8 \text{ tons} = 44.1 \text{ tons vegetation burned annually, or 11.6\% reduction}$   
If 20 acres... a 23.2% reduction... etc., 40 acres... a 46.4% reduction.

#### **d. Barren and Sparse Vegetation Areas**

##### Emissions

Fugitive dust from “open” areas, i.e. barren or sparse vegetation, were estimated in the 2012 and 2019 EIs. Using June of 2016 satellite imagery (Google Earth), EMO staff visually surveyed land use on the Reservation. The results of this survey showed that 80.48 acres within the reservation can be classified as “sparse vegetation” and 14.07 acres can be classified as “barren space”. Both have the potential of producing particulate emissions due to wind erosion. The EI describes in detail the methods of calculation for wind erosion, which utilizes a calculated peak 2-minute average wind speed to approximate the fastest mile (the primary interest being wind speeds typically in the 30 mph range, which if sustained over a 2-minute period would travel about a mile). Reservation wind and precipitation data were then reviewed for the three-year period from 2016 through 2018 to determine days when peak winds were greater than a given threshold velocity. In reviewing those data, the Tribal station’s PM-10 data were also checked to provide verification that winds of this magnitude were indeed associated with elevated PM-10 readings. An average erosion potential for the base years was calculated. For these data years, the count of peak winds and dry days identified were an overall decrease from the count in the 2012 Emissions Inventory. The final estimation is a combined 1.15 TPY of PM-10 for barren and sparse areas.

##### Pollution Prevention Activities

For sparse vegetation areas, vegetation cover is largely determined by hydrological and meteorological conditions, and then by land use. Overall, the reservation historically has high groundwater levels relative to surrounding areas, and thickets of vegetation with dense root systems such as willows and cottonwoods, and areas of standing water, more commonly raise issues requiring action than sparse areas do. Area polygons recently counted as “sparse” may have been “barren” in drought years. Areas which are overgrazed, or grubbed for development or construction, may become “barren” temporarily. To date, the Tribe has not had to impose actions on overgrazing for dust, as the irrigation system provides ample water in the irrigation season. Agricultural burning (of fields) is conducted with the intention of causing sparse or barren vegetation; however, the results of such burning are generally short-term, as regrowth occurs at least once every year. The Tribe also encourages defensible space around homes, which is an intentional lack of vegetation for fire safety purposes. Therefore, fugitive dust prevention activities for (consistent) sparse vegetation areas are not a primary concern for the Tribe.

Barren areas may be in transition, or have vehicle and animal traffic. Land uses covered by the EI barren/sparse polygon count include horse corralling and riding, truck and equipment yards, parking lots, broad driveways, curbs, and staging yards or open dumps. Construction is a land use which rapidly but temporarily produces barren areas, which may not be counted in EI base years because of the short duration (and regular heavy water application for dust control). With the exception of some dirt road areas, no quantifications of emissions to distinguish between these land uses on the reservation have been attempted by the Tribe (Inclusion of some dirt road segments which were shown as being

surrounded by barren areas, into the updated barren areas polygon set, may result in some variation of total emissions, as these segments are then excluded from vehicle travel calculations, though they contribute to the size of areas subject to windblown dust calculations). Dirt sidewalks are not included in the EI due to polygon capturing methods; however, they can visually be confirmed to be a source for some fugitive dust in high wind events.

Horse riding is a private, typically commercial pursuit by a small number of reservation residents with “arenas” large and trafficked enough to produce relatively high dust emissions for a residence. Open dumping may or may not be associated with a lack of vegetation, but may see increased vehicle traffic to access the dumps. Recent construction sites are closely watched for their durations, including visible emissions evaluations by certified staff, are communications regarding extra water applications as needed. Project staff receive regular updates and weather hazard warnings for wind events, and receive individual demonstration of the Tribe’s particulate monitoring and weather monitoring station, and online data dashboard. The Tribe has been addressing open dumping in its current GAP (general assistance program) with EPA Region 9. Remaining actions may include requiring dust control systems (such as sprinklers) to be applied at the horse arenas prior to wind events, mimicking the regular water applications applied at the tribal constructions sites especially prior to wind events, and adopting a tribal standard for visible dust emissions determinable by staff trained in Visible Emissions Evaluations.

#### Pollution Reduction Potential

Horse corrals and equipment yards: Examination of the barren areas of the 2019 EI identifies a total area of 4.9 acres as mechanically cleared for horse corrals or non-residential equipment yards/lots. Visible Emissions Evaluations (VEEs) on active construction sites on the reservation 2019 – 2020 demonstrate that even with high winds, water application can achieve up to 100% reduction of visible dust emissions, depending on the watering schedule and construction activities. Due to the many limitations of watering for these applications, 50% is a safer estimate of potential reductions if these areas were kept watered to the extent possible, though the actual would be higher if watering was done prior to high wind events (assuming no riding or activity during), which account for the majority of windblown emissions.

4.9/14 acres = 35% of barren areas (3 sparse shrub polygons identified for this land use excluded)  
 $35\% \times .5 \text{ TPY total est. emissions for barren parcels} = .175 \text{ TPY reduction}$   
 $.175 \text{ TPY} \times 50\% \text{ est. reduction} = .0875 \text{ TPY reduction}$

VEE standard: Visible Emissions certification and practice has been shown to be a feasible instrument of determination of and direct feedback for fugitive dust emissions on the reservation from 2019 – 2020, with certified staff since 2018. The certification through CARB is likely to remain available in the long-term for minimal (travel related) costs, though is not guaranteed for any individual. Multiple individuals per organization may certify. Potential emissions reductions could vary greatly depending on VEE practices and standards adopted, though ultimately water application by an invested party would be the likely best means of reducing emissions, and would need to be available and feasible, as it is on construction projects. VEE may be a possible instrument for the Tribe to require as-needed dust controls on any given activity subjective to an evaluation. Though on a given activity/evaluation reduction may be total if the party were compliant, overall reductions are likely to be small, if 1 certified person available during a wind event were able to cover 2 of the 40 barren area polygons from the 2019 EI (totaling 14 acres), assuming those parties applied water, 5% is a reasonable estimate for the entire reservation. (A similar figure of 7% is reached by assuming 1/14 acres. The highest reductions may come from applying any VEE standards/practice to persistent, well-known dust activities which may have a

long-term solution besides frequent water application, weighting the overall reductions, which is not what is calculated here).

Total potential reduction with dust control or VEE:

2/40 parcels = 5% of barren areas evaluated

50% reduction estimate + 5% of barren areas =  $55\% \times 0.5$  TPY est. for barren parcels in EI = .275 TPY

.275 TPY est. reductions via VEE as needed + .0875 TPY reduction if corrals/yards watered = .36 TPY total potential reduction for barren areas

.36 TPY potential reductions / .5 TPY EI est. for barren areas = 72.5% OR

.36 TPY potential reductions / 1.15 TPY EI est. for barren and sparse shrub areas = 31%

#### **e. Dirt Roads**

##### Emissions

Fugitive dust from dirt roads is the largest contributor to PM-10 on the reservation, accounting for 13.81 TPY (see Table 1). This is despite the small number of miles of dirt road (4.34 miles of unpaved roads were identified in 2019 using updated methods). Calculations in the 2012 and 2019 EIs estimated emissions using distances of dirt road segments, meteorological data for the base years such as precipitation and wind, and vehicle miles driven on the roads, which accounts for the number of residences served by each road segment (including an increase since 2012 from 2 to 3 people average per household). So the factors contributing to how much dust comes off dirt roads are various and may change over the years. To add to the effect of a moving target, some of the barren areas described in the above section with calculations applied for wind erosion may or do also receive vehicle traffic. All barren road, driveway, or lot areas are counted for, but depending on the dimensions, may be counted for wind erosion (barren areas) rather than vehicle miles travelled.

##### Pollution Prevention Activities

Potential impact of surfacing these road segments is substantial. The extension of Winuba Lane, Billy Williams Drive, and a church driveway were paved since the initial Plan, and the total houses served by dirt road segments decreased between the latest EI revisions. However, new dirt road segments and an increased (by 1) average household number estimate also occurred between the EI revisions. A resurfacing project for a major parking lot, planned in cooperation with the Great Basin Unified Air Pollution Control District, was completed between the most recent EI revisions, and in 2019, the Tribe did further resurfacing of remaining dirt lots at the Tribal Headquarters, leaving only the south strip dirt, which is used as a staging area for low-use or retired vehicles.

##### Pollution Reduction Potential

Pollution prevention potential can be calculated assuming that the resurfacing measures can reduce emissions to those comparable to paved roads that are used as local connectors.

Current total PM-10 Emissions from dirt roads per year:	13.81 TPY
PM-10 emissions if all dirt roads are re-surfaced:	0.156 TPY

Paving these roads would essentially remove all particulate emissions (99 percent reduction).

**f. Paved Roads**Emissions

Paved roads on the Reservation include roads maintained by the Tribe, and roads maintained by other entities. Highway 395, which borders the Reservation to the north, and Highway 168, which intersects the Reservation on the south, are both maintained by CalTrans District 9. The remainder is maintained by the Inyo County Department of Public Works. The Inyo County roads include the majority of roads that cross the Reservation. Consequently, there are only a total of 1.46 miles of paved roads on the Bishop Reservation that are not already included in the existing Inyo County emissions inventory. These roads are maintained by the Bureau of Indian Affairs and are identified in the Tribe's 1996 Transportation Plan. (Payahuupu Way and Nuumu Way were constructed and paved since the initial Plan; see their inclusion in the discussion in above section for paved road sections.)

In the 2019 EI, emissions were estimated using a method accounting for estimated vehicle miles travelled by average number of household drivers over segment distances, mitigation by rain with localized meteorological data, and standard emissions factors, resulting in a total of 0.156 TPY PM10 for roads maintained by the Tribe.

Pollution Prevention Activities

Because the travel on the paved roads includes traffic from both reservation and non-reservation residents, at present no activities for the purpose of pollution prevention are planned for this source. In 2018-2019, CalTrans District 9 installed curbs, sidewalks and traffic lights were at Tu Su Lane and Line Street, and at See Vee Lane and Line Street and See Vee Lane and Highway 395.

Pollution Reduction Potential

No systemic change in emissions estimates for entrained is anticipated, unless the factors in the calculation were altered in future EIs (such as household locations and distributions for vehicle miles travelled), or unless a systemic increase in precipitation were to occur enough to cover base years of future EIs. The Tribal Public Works researched sidewalk installations as part of a Safety Study in 2017 – 2018, among other transportation related safety projects. Dirt sidewalks have not as of yet been accounted for in the Tribe's EIs, as they are not part of the calculation used; however, it can be assumed that some amount of fugitive dust would be reduced with paved sidewalks.

**g. Other Vehicle Emissions**Emissions

Values from the CARB inventory published in 2012 for Inyo County were presented in the 2019 EI, and the Reservation's share of these emissions is calculated using the ratio of Reservation VMT versus Inyo County VMT, resulting in a total of 4.2 kg/year of PM10, or 0.005 TPY. (The 2019 EI summary tables combined PM10 emissions from vehicles and from the service station for a combined total of .007 TPY, due to the small numbers, for ease of inventorying, though they are separate in the calculations.)

Pollution Prevention Activities

Reservation residents must comply with state of California motor vehicle requirements which historically are some of the most stringent in the nation. Traffic from both reservation and non-reservation residents is present. No pollution prevention activities enacted by the Tribe are planned for private/personal vehicles; see also section f. above.

The Tribal fleet must also comply with California requirements, including registration restrictions on older diesel engines enacted for 2020. The Tribe periodically pursues incentive, voucher, trust, grant, or other type of financial instruments to replace, repower, retrofit older vehicles. Examples include a DERA funded school bus project and a VW Settlement for Tribes funded pick up truck project.

#### Pollution Reduction Potential

The potential for emissions reductions in this source category generally lies with the state of California, which tightened registration rules on older large diesel vehicles for 2020, impacting at least a few known non-residential use large vehicles on the reservation. Reductions in PM10 from this action are not quantified as of yet. Reductions for DERA, VW and other similar projects within the Tribe's own fleet are estimated using EPA Diesel Emissions Quantifier (DEQ) if they are diesel vehicle projects, and are estimated per vehicle. The 2019 *replacement* project (new diesel for old diesel) for a class 4-5 truck was estimated to reduce emissions annually by .009 TPY (short) of PM2.5 (the estimates from the DEQ don't include PM10). Because the PM2.5 estimated reductions for 1 vehicle, using the EPQ DEQ, exceed the total annual PM10 estimated emissions for all vehicles on the reservation as per the 2019, it can be assumed that a 100% reduction of that (latter) figure could be achieved by retiring or even replacing the vehicles subject to the new CARB restriction.



## **APPENDIX – BURN PERMIT**

**Burn Permit information:** [http://www.bishoptribeemo.com/burn\\_permits.htm](http://www.bishoptribeemo.com/burn_permits.htm)

**Fillable permit (as of April 1, 2020)**

<http://www.bishoptribeemo.com/Burn%20Permit%202020%20Final.pdf>