San Joaquin Air Quality and Active Transportation Specific Plan

CRP 463 Senior Project

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Acknowledgements

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Introduction

The City of San Joaquin is a small, incorporated city located in Fresno County, California. The City lies in the heart of California's central valley, surrounded by the Sierra Nevada mountains to the East, and the Coastal Range mountains to the West. The nearest large city is Fresno, located approximately 30 miles to the northeast. The incorporated City is approximately 1 square mile in size, sitting 170 feet above sea level. The surrounding landscape is primarily made up of agricultural land, with similarly sized communities located throughout. The City's main thoroughfares, Colorado Road and Manning Avenue, link San Joaquin to the state and interstate highway systems respectively. A rarely used branch line of the San Joaquin Valley Railroad also runs directly through the city, providing regional links for industrial rail operations.

The focus of our project is to improve the overall air quality in San Joaquin. Specifically, we will focus on the PM2.5 pollutant, as we have the ability to make the largest impact with this pollutant. Additionally, we chose PM2.5 because it poses major health risks to the community when there are high levels of it. The primary contributors of PM2.5 are automobiles, geography, and weather. Due to the fact that we can't change the weather, we will be discussing methods that can reduce the reliance on single occupancy vehicles. These methods include the development of pedestrian and bicycle infrastructure as well as improving the area's regional transport services.

San Joaquin was founded in the early 1900s as a small agricultural community. In 1920, the City was incorporated as a general law city. Over the subsequent years, San Joaquin has developed a traditional street grid layout and largely served as a hub for the region's agricultural industry. Throughout its history, San Joaquin has remained a small community focused on agricultural and industrial activity.

In 2020, San Joaquin had a population of 4,142, less than 1% of Fresno County's population. Between 2010 and 2020, San Joaquin's population increased by 3.5%, compared to a 9.8% increase for Fresno County and a 6.7% increase for California as a whole (Department of Finance, 2020). Figure 1.1 illustrates this comparison in population growth. In 2019, San Joaquin's population was fairly young, mostly under 34 years of age. Figure 1.2 shows a population pyramid breaking down San Joaquin's 2019 population by age and gender. In 2019, the ethnic composition of San Joaquin was primarily Hispanic or Latino, accounting for 97% of the City's total population. The second and third largest ethnic groups were White and Black or African American, although these two groups only accounted for 3% of the City's population collectively. Figure 1.3 shows the ethnic breakdown of San Joaquin. In 2019, San Joaquin's median household income was $29,293, which was 56% of Fresno County's, and only 39% of California's. Figure 1.4 shows a comparison of Median Household Incomes in San Joaquin.

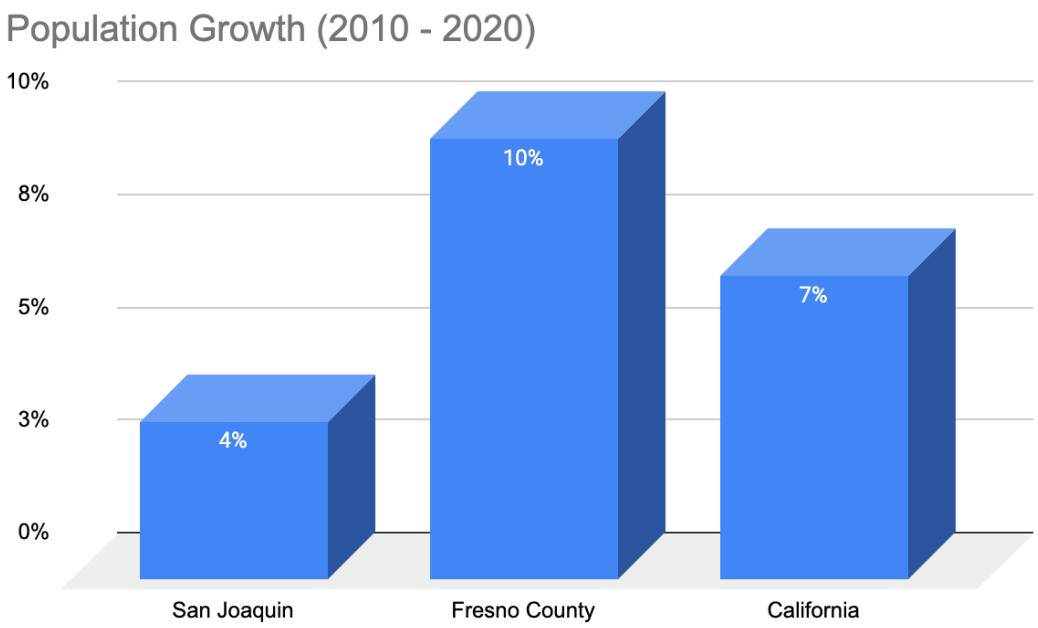

Figure 1.1: Population Change Comparison.

Source: CA Department of Finance, 2020.

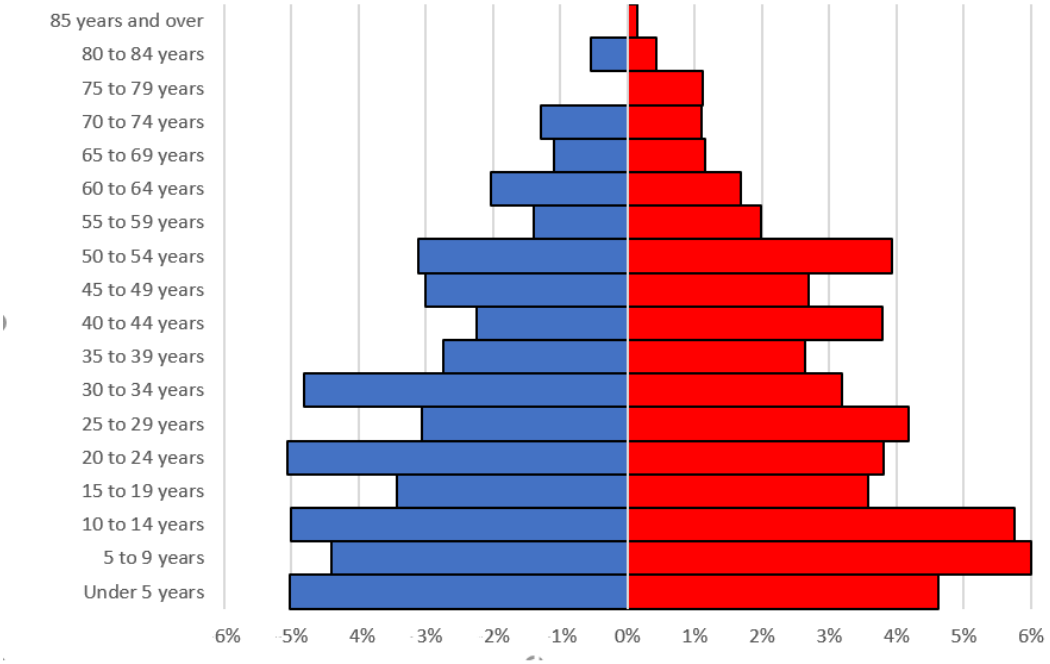

Figure 1.2: San Joaquin Population Pyramid, 2019.

Source: American Community Survey 5-Year Estimates, 2019.

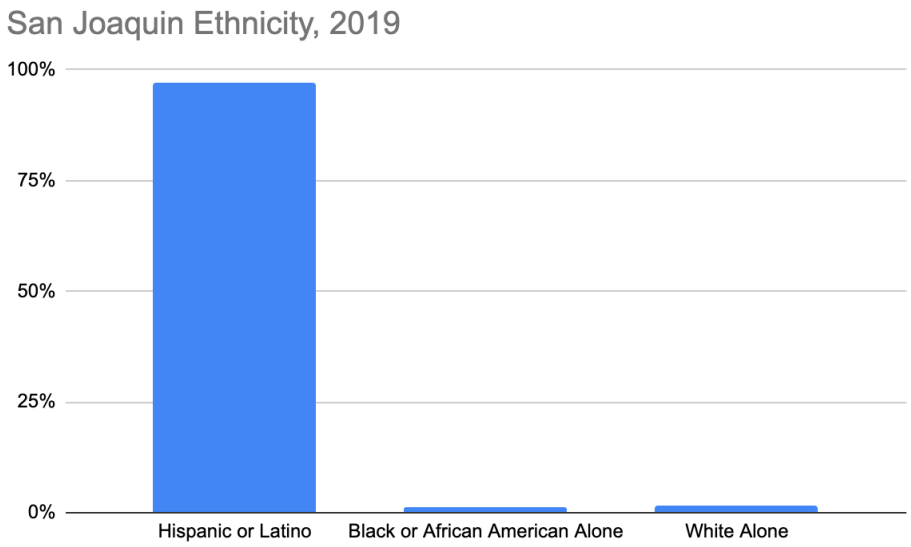

Figure 1.3: San Joaquin Ethnic Composition, 2019.

Source: American Community Survey 5-Year Estimates, 2019.

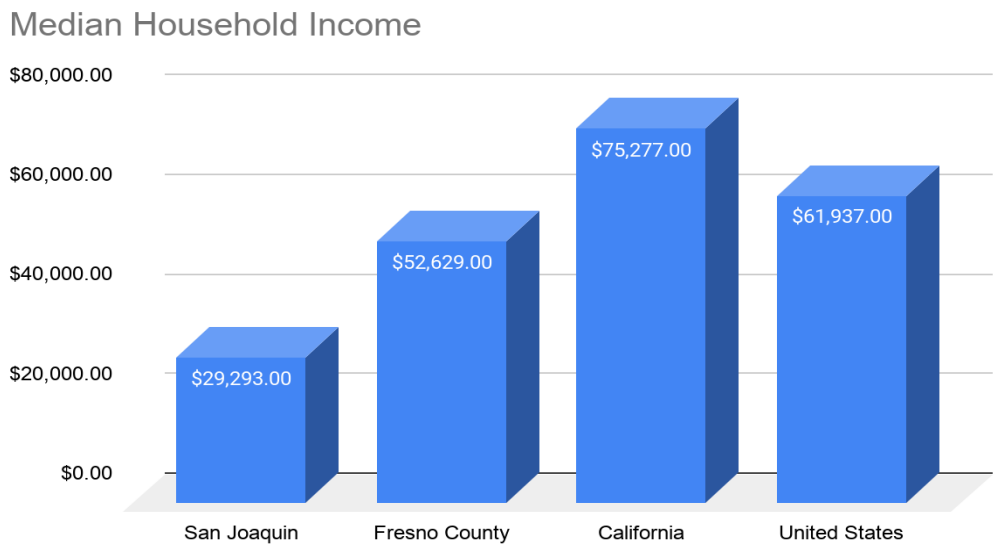

Figure 1.4: Comparison of Median Household Income, 2019.

Source: American Community Survey 5-Year Estimates, 2019.

Land Use

The land use pattern in the City is a collection of subdivisions connected by commercial strip-lined arterial corridors, Colorado and Manning avenue. The parcels are laid out in regular-sized blocks in a grid form. The main land uses are residential, commercial, industrial, public facility, and open space within the city boundary. Other lands in the City's sphere of influence serve agriculture primarily.

Figure 1.5 shows the general location and distribution of each land use designation in the City and the connected airport. It shows that the City's central corridor, Colorado Avenue, is the City's general commercial area's primary location. Among those are several industrial uses. The residential areas are spread throughout the City. A few vacant parcels spread in residential areas and a few in the Colorado Avenue's commercials.

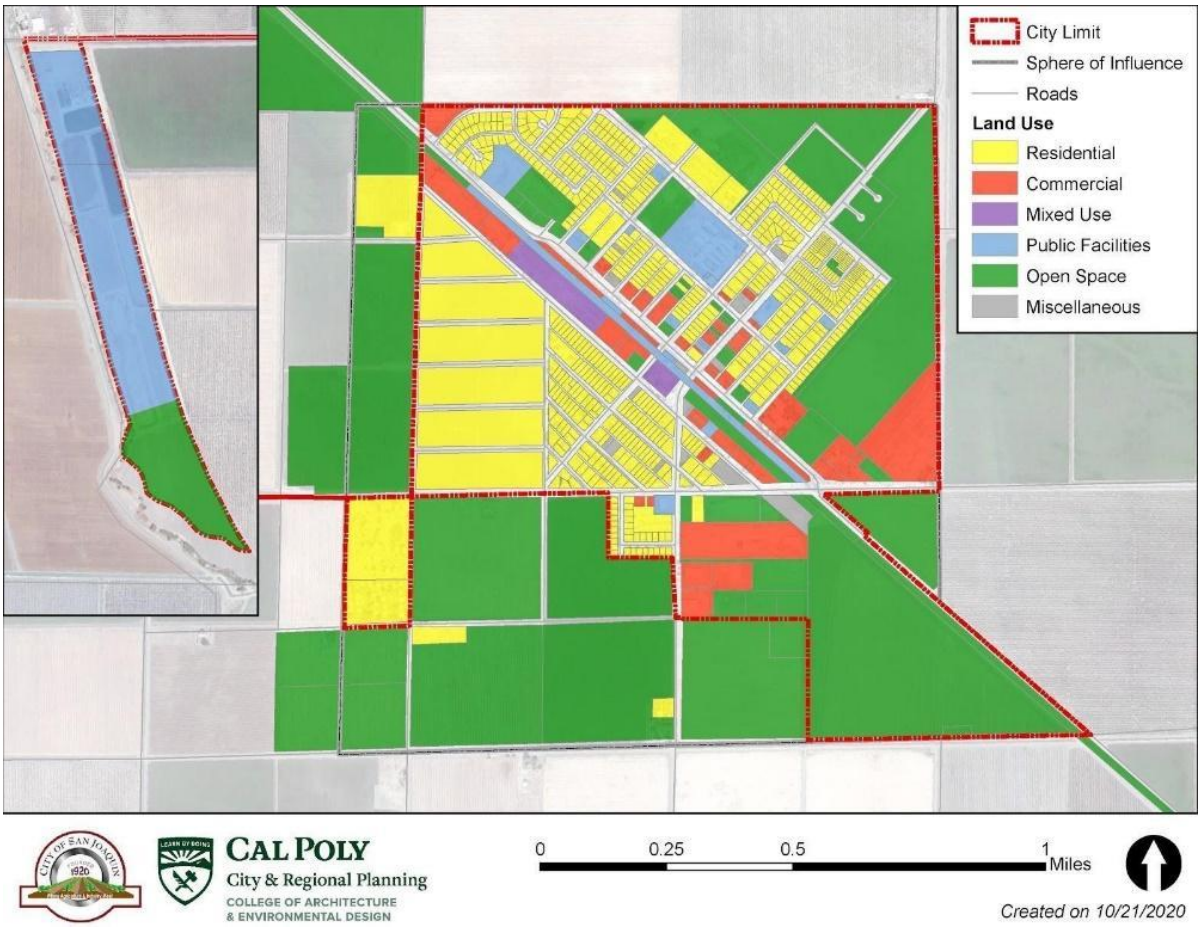

Figure 1.5: Existing land uses

Transportation

The existing conditions in San Joaquin include major thoroughfares, transportation routes, and terminals. This section assesses the layout of the circulation systems in San Joaquin. The most heavily used circulation system in San Joaquin is the roadways. The City of San Joaquin also has public transportation and bike lanes.

Arterial roads handle the highest volume of cars in the city. These are the primary roads for travel through the City of San Joaquin. The arterial roads in San Joaquin are Manning Avenue and Colorado Avenue. Manning Avenue connects the city to Interstate 5 and State Highway 99 and runs east to west. Manning Avenue is a four-lane road with a speed limit of 35 miles per hour and has bike lanes along portions of the road. Colorado Ave runs at a 45° angle to Manning Ave and also has four lanes.

The city of San Joaquin is serviced by the Fresno County Rural Transit Agency. This Transit Agency provides bus service to San Joaquin. The route that services San Joaquin is the San Joaquin Intercity Transit. This route runs between the cities of Mendota, Kerman, San Joaquin, and Halfway. San Joaquin Transit runs three times a day in each direction. Traveling between San Joaquin and the city of Fresno does require a transfer in Kerman. To get from Kerman to Fresno you would have to take the Westside Transit.

Within the city limits, the city provides a dial-ride service for people with disabilities. This service is only for trips within the city limits of San Joaquin. Those who want to use the service do have to call ahead of time to plan their trip.

There are two streets with bike lanes in the city of San Joaquin. Colorado Avenue and Manning Avenue both have non protected bike lanes. These two roads are the arterial roadways in San Joaquin.

The City of San Joaquin has sidewalks on most of the roads in the center of the city. The arterial roads have sidewalks but need more crosswalks. The city could also use more controlled intersections that have crosswalks. The residential areas have more sidewalks than other areas of the city. Most of the sidewalks in the city are in fair to good condition. The residential areas near the center of town have the sidewalks that are in the best condition. This allows for residents of San Joaquin to walk more places and to not have to drive as much. It is important that the sidewalks in population centers are maintained and continue to expand.

Air Quality Standards

The federal and state governments set Ambient Air Quality Standards for six pollutants: Ozone (O_3), Particulate Matter (PM), Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), and Lead (Pb). California has set additional standards for four other pollutants: Visibility Reducing Particles, Sulfates, Hydrogen Sulfide, and Vinyl Chloride (SJVAPCD, 2005). These standards are intended to protect the health and wellness of the public.

The San Joaquin Valley Air Pollution Control District (SJVAPCD), also referred to as the Valley Air District, is the regulatory agency responsible for air quality issues in the San Joaquin Valley air basin, which includes Fresno County and San Joaquin. The Valley Air Board is responsible for establishing regulations on stationary air pollution sources, those include manufacturing and industrial facilities, while the California Air Resources Board and U.S. Environmental Protection Agency regulate mobile air pollution sources, those of which include transportation and motor vehicles.

The California Ambient Air Quality Standards and Federal Ambient Air Quality Standards for the monitored pollutants are listed in Table 1.1. At the Federal level, the pollutants monitored are: Ozone (O_3), Particulate Matter (PM), Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), and Lead (Pb). The health effects caused by these criteria pollutants are listed in Table 1.2.

Federal Standards

The Clean Air Act (CAA), established in 1963 later amended in 1970, required the EPA to set National Ambient Air Quality Standards (NAAQS) for several problem air pollutants based on human health and welfare criteria. Two types of NAAQS have been established: primary standards, which protect public health, and secondary standards, which protect public welfare. California established its own set of standards, California Ambient Air Quality Standards (CAAQS), as the state is required to develop and implement air pollution control plans that meet or exceed the stringency of the NAAQS. In 1990 the CAA was amended, changing the deadlines for attaining NAAQS, as well as the remedial actions required of states that do not meet federal standards. Under the Clean Air Act, states that do not meet federal standards are designated as nonattainment. Areas in nonattainment are required to prepare the State Implementation Plan (SIP) which contains strategies and measures to attain NAAQS (SJVAPCD, 2005).

State Standards

The California Clean Air Act (CCAA) was established in 1988 and provides a planning framework for attainment of California Ambient Air Quality Standards (CAAQS). The criteria pollutants are grouped into attainment areas and nonattainment areas. For all nonattainment areas the pollutant is grouped into different levels of severity, those being moderate, serious, severe, and extreme. For all nonattainment pollutants, attainment plans are required to demonstrate a five percent per year reduction in nonattainment air pollutants or their precursors, averaged every consecutive three-year period, unless an approved alternative measure of progress is developed. The CCAA grants air districts the responsibility to monitor air basins that are in violation of CAAQS. Air basins in violation must prepare an air quality attainment plan (AQAP) that lays out a program to attain the CCAA mandates (SJVAPCD, 2005).

Regional Standards

The San Joaquin Valley Air Pollution Control District has jurisdiction over the San Joaquin Valley air basin since 1991 as the single governing body ensured a more effective way of managing regional air quality. Under the federal CAA and CCAA amendments, air districts are required to implement transportation control measures and are encouraged to adopt indirect source control programs to reduce mobile emissions. The Valley Air District has adopted nonattainment plans for ozone, PM2.5 and PM10 because the air basin does not meet California air quality standards for the 8 hour standard for ozone and fine particulate matter (PM2.5) and does not meet Federal air quality standards for 1-hour (SJVAPCD, 2005).

Table 1.1: Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1]		National Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6]	Method[7]
Ozone (O3)[8]	1-hour	0.09 ppm	Ultraviolet Photometry	--	Same as Primary Standard	Ultraviolet Photometry
	8-hour	0.070 ppm		0.070 ppm ^1		
Respirable Particulate Matter (PM10)[9]	24-hour	50 µg/m3	Gravimetric or Beta Attenuation	150 µg/m3	Same as Primary Standard	Inertial Seperation and Gravimetric Analysis
	Annual	20 µg/m3		--		
Fine Particulate Matter (PM2.5)[9]	24-hour	--	--	35 µg/m3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual ^2	12 µg/m3	Gravimetric or Beta Attenuation	12 µg/m3	15 µg/m3	

Table 1.1 Ambient Air Quality Standards						
Carbon Monoxide (CO)	1-hour	20 ppm	Non-Dispersive Infrared Photometry (NDIR)	35 ppm	--	Non-Dispersive Infrared Photometry (NDIR)
	8-hour	9.0 ppm		9.0 ppm	--	
Nitrogen Dioxide (NO2)[10]	1-hour	0.18 ppm	Gas Phase Chemiluminescence	0.100 ppm ^2	--	Gas Phase Chemiluminescence
	Annual	0.030 ppm		0.053 ppm	Same as Primary Standard	
Sulfur Dioxide (SO2)[11]	1-hour	0.25 ppm	Ultraviolet Fluorescence	0.075 ppm ^2	--	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3-hour	--		--	0.5 ppm	
	24-hour	0.04 ppm		0.14 ppm	--	
Lead[12,13]	30-day	1.5 µg/m3	Atomic Absorption	--	--	High Volume Sampler and Atomic Absorption
	3-month	--		0.15 µg/m3	Same as Primary Standard	
Vinyl Chloride[12]	24-hour	0.01 ppm	Gas Chromatography	--	--	--
Visibility-Reducing Particles[14]	10-mile visibility	0.07 per kilometer	Beta Attenuation and Transmittance through Filter Tape	--	--	--
Sulfates	24-hour	25 µg/m3	Ion Chromatography	--	--	--
Hydrogen Sulfide	1-hour	0.03 ppm	Ultraviolet Fluorescence	--	--	--
Source: San Joaquin Valley Air Pollution Control District (2005)						

Table 1.2: Heath Effects of Criteria Pollutants	
Pollutant	**Effects on Health and the Environment**
Ozone (O3)	Respiratory symptoms Worsening of lung disease leading to premature death Damage to lung tissue Crop, forest and ecosystem damage Damage to a variety of materials, including rubber, plastics, fabrics, paint and metals

Table 1.2: Health Effects of Criteria Pollutants	
PM2.5 (particulate matter less than 2.5 microns in aerodynamic diameter)	Premature death Hospitalization for worsening of cardiovascular disease Hospitalization for respiratory disease Asthma-related emergency room visits Increased symptoms, increased inhaler usage
PM10 (particulate matter less than 10 microns in aerodynamic diameter)	Premature death & hospitalization, primarily for worsening of respiratory disease Reduced visibility and material soiling
Nitrogen Oxides (NOX)	Lung irritation Enhanced allergic responses
Carbon Monoxide (CO)	Chest pain in patients with heart disease Headache Light-headedness Reduced mental alertness
Sulfur Oxides (SOX)	Worsening of asthma: increased symptoms, medication usage, and emergency room visits
Lead	Impaired mental functioning in children Learning disabilities in children Brain and kidney damage
Hydrogen Sulfide (H2S)	Nuisance odor (rotten egg smell) At high concentrations: headache & breathing difficulties
Sulfate	Same as PM2.5, particularly worsening of asthma and other lung diseases Reduces visibility
Vinyl Chloride	Central nervous system effects, such as dizziness, drowsiness & headaches Long-term exposure: liver damage & liver cancer
Visibility Reducing Particles	Reduced airport safety, scenic enjoyment, road safety, and discourages tourism
Source: California Air Resources Board (2020)	

Asthma

The health effects that stem from exposure to PM 2.5 center on the respiratory system. These include premature mortality, increased hospital admissions for heart or lung causes, acute and chronic bronchitis, asthma attacks, emergency room visits, respiratory symptoms, and restricted activity days. Prolonged exposure to the pollutant can result in premature death and reduced lung function growth in children. Childhood asthma rates in Fresno County are 18.6 percent of children as of March, 2018.

Attainment Status

The California Air Resources Board is required to designate different areas within the state as either “attainment”, “nonattainment”, or “unclassified” for all pollutants that require a state standard. For an “attainment” designation, an area must not have a pollutant exceed state standard levels. A “nonattainment” designation means that a pollutant exceeds the state standard level. A “unclassified” designation means there is not enough data to support either an “attainment” or “nonattainment” designation. Current state and federal designations for each criteria pollutant are shown in Table 1.3 below.

Table 1.3: San Joaquin Valley Attainment Status

Pollutant	**Designation/Classification**	
	Federal Standards[a]	State Standards[b]
Ozone - One hour	No Federal Standard[f]	Nonattainment/Severe
Ozone - Eight hour	Nonattainment/Extreme[e]	Nonattainment
PM 10	Attainment[c]	Nonattainment
PM 2.5	Nonattainment[d]	Nonattainment
Carbon Monoxide	Attainment/Unclassified	Attainment/Unclassified
Nitrogen Dioxide	Attainment/Unclassified	Attainment

Table 1.3 San Joaquin Valley Attainment Status		
Sulfur Dioxide	Attainment/Unclassified	Attainment
Lead (Particulate)	No Designation/Classification	Attainment
Hydrogen Sulfide	No Federal Standard	Unclassified
Sulfates	No Federal Standard	Attainment
Visibility Reducing Particles	No Federal Standard	Unclassified
Vinyl Chloride	No Federal Standard	Attainment

[a] See 40 CFR Part 81

[b] See CCR Title 17 Sections 60200-60210

[c] On September 25, 2008, EPA redesignated the San Joaquin Valley to attainment for the PM10 National Ambient Air Quality Standard (NAAQS) and approved the PM10 Maintenance Plan.

[d] The Valley is designated nonattainment for the 1997 PM2.5 NAAQS. EPA designated the Valley as nonattainment for the 2006 PM2.5 NAAQS on November 13, 2009 (effective December 14, 2009).

[e] Though the Valley was initially classified as serious nonattainment for the 1997 8-hour ozone standard, EPA approved Valley reclassification to extreme nonattainment in the Federal Register on May 5, 2010 (effective June 4, 2010).

[f] Effective June 15, 2005, the U.S. Environmental Protection Agency (EPA) revoked the federal 1-hour ozone standard, including associated designations and classifications. EPA had previously classified the SJVAB as extreme nonattainment for this standard. EPA approved the 2004 Extreme Ozone Attainment Demonstration Plan on March 8, 2010 (effective April 7, 2010). Many applicable requirements for extreme 1-hour ozone nonattainment areas continue to apply to the SJVAB

Source: San Joaquin Valley Air Pollution Control District, 2020.

Regional Air quality

The City of San Joaquin is located within the San Joaquin Valley Air Basin. The hot weather, surrounding mountains, and periods of stagnant air all contribute to forming and trapping pollutants. Due to these conditions and the agricultural practices, construction projects, and transportation that take place within the Air District, ozone and both forms of particulate matter are easily formed and built up causing this regional nonattainment for those criteria pollutants.

Air pollution in the San Joaquin Valley results from emissions generated in the Valley as well as from emissions and secondary pollutants transported into the Valley. The majority of the Valley‘s summer and winter air pollution is caused by locally generated emissions. The Valley Air District plans and implements control measures in an effort to obtain the “attainment” designation for both the NAAQS and CAAQS. The Valley Air District has developed plans to achieve “attainment” status in both particulate matter, plan adopted in 2018, and ozone, plan adopted in 2020.

Non-Attainment Criteria Pollutants

Respirable Particulate Matter (PM 10): a complex mixture of solids and aerosols composed of small droplets of liquid, dry solid fragments, and solid cores with liquid coatings all with varying shape and chemical composition that are 10 microns or less in diameter. A diameter of 10 microns or less allow the particles to be inhaled into the lungs with adverse health effects. These particles include dust from construction sites, landfills and agriculture, wildfires and brush/waste burning, industrial sources, wind-blown dust from open lands, pollen, fragments of bacteria, and emissions from combustion of gasoline, oil, diesel fuel or wood. (CARB, 2020).

Fine Particulate Matter (PM2.5): As with PM10, PM2.5 are a complex mixture of solids and aerosols composed of small droplets of liquid, dry solid fragments, and solid cores with liquid coatings all with varying shape and chemical composition that have a diameter of 2.5 microns or less. These emissions stem just from the combustion of gasoline, oil, diesel, and wood. (CARB, 2020).

Ozone: Ozone, an important component of smog, is a highly reactive and unstable gas capable of damaging living cells, such as those present in the linings of the human lungs. This pollutant forms in the atmosphere through complex reactions between chemicals directly emitted from vehicles, industrial plants, consumer products and many other sources. Ozone is a powerful oxidant – its actions can be compared to household bleach, which can kill living cells upon contact. It forms in greater quantities on hot, sunny, calm days. In metropolitan areas of California, ozone concentrations frequently exceed existing health-protective standards in the summertime. (CARB, 2020).

Vehicle emissions

The total exhaust emissions from a vehicle trip are dependent upon the trip length, the speed of a trip, vehicle type and age, and the “time-in-mode” characteristics of the trip. The implication of this emissions pattern is that once a vehicle has been started and driven for a few minutes, much of the damage to air quality has already occurred (SJVAPCD, 2005). Therefore, reducing the overall number of trips generated is important to reducing mobile source emissions and improving air quality in the region. Although the rate of release drops over time, total emissions released over longer trips are still greater than total emissions for shorter trips. So if a region‘s VMT rises, its overall vehicle emissions rise as well. By reducing the number of trips generated in the City, air pollutant emissions are reduced as well. Proximity of services, accessibility to alternative modes of travel are key factors influencing trip length and total vehicle miles traveled (SJVAPCD, 2005). The Air District and the City are responsible for seeking ways to minimize air quality impacts of local growth and development. Strategies for reducing vehicle emissions include planning multi-modal transportation systems that meet the community transportation needs while moving away from single occupancy vehicles, design streets to encourage walking and biking, and facilitate transit to smaller communities.

Case Studies

San Joaquin is a small town that is highly dependent on automobile transit. Due to this and a variety of other factors, the community suffers from amounts of ozone, PM10, and PM2.5 that exceed both state and federal standards. To alleviate this problem, the most straightforward solution is to reduce the amount of automobiles on the roads. The cases were selected to either address similar geographic and pollutant issues or focused on alternative modes of transportation. The Hanford air quality element was selected due to the city of Hanford residing in the San Joaquin Valley Air Pollution Control District (SJVAPCD) and faced similar out of attainment standards for ozone, PM10, and PM2.5. Though larger in size than San Joaquin, the geographic and pollutant similarities were the reasons Hanford was chosen. The City of Clovis Active Transportation Plan was chosen because it not only shared the same issue of ozone, PM10, and PM2.5 pollutants as well as being in the SJVAPCD, but this was an example of a successfully executed active transportation plan. Though quite a bit larger than San Joaquin, the active transportation plan was chosen with the intent of scaling down to match the needs of a much smaller city.

Hanford, CA

Hanford, California has a population of about 56,000 people. This city is within Kings County, California and falls under the jurisdiction of the San Joaquin Valley Air Pollution Control District. The Hanford Air Quality Element is a separate document that was created in 2010 and amended the 2002 general plan. Though a separate document, it works in tangent with the elements of the general plan. The City of Hanford, like much of the San Joaquin Valley is out of attainment for ozone, PM10, and PM2.5.

The City of Hanford and the City of San Joaquin share similarities in both geography and levels of PM2.5. Hanford however has much more impact on planning decisions in its county as it is the county seat and has a substantially larger population than San Joaquin. The hot, dry summers along with the topography of the San Joaquin Valley are key factors to both communities facing air quality problems.

The Air Quality Element in the Hanford general plan is now more than a decade old with the data that was used to determine the course of action is even older. This poses the question as to whether this data is still reliable, and while certainly outdated it still illustrates current conditions in Hanford and the San Joaquin Valley when concerning air quality. The region is still in nonattainment for ozone, PM10, and PM2.5 so the methods proposed at mitigation are still relevant. The goals, objectives, policies, and programs addressing air quality still apply to the current conditions in the community.

The Air Quality document covers everything relating to air quality that it needs to and is a good example of how to address air quality particularly in the San Joaquin Valley. Due to the many constraints that many communities in the valley face, they will be affected similarly when it comes to air quality and the problems that stem from it. Solutions to address these problems going forward include creating a public outreach program and improving regional transit.

City of Clovis Active Transportation Plan

Clovis, California is a city located in Fresno County with a total area of 25.53 square miles. The City has a population of around 110,000 people with a population density of 4,108 people per square mile. Clovis is very similar in geography to San Joaquin, as they are both located within the San Joaquin Valley. In order to complement the Transportation Element of the General Plan, Clovis decided to create an Active Transportation plan with the help of community meetings and feedback. The Clovis Active Transportation plan seeks to create a city that is more easily accessible for non-motorized transportation, such as walking, bicycling, and wheelchair use. The plan discusses how it will create a complete system of trails and paths accessible to all residents as well as how it will be funded.

The Clovis Active Transportation Plan has different sections for biking, walking, and wheelchair transportation. The biking section discusses the difference between different forms of bicycle lanes as well as bicycle parking. There are four different types of bikeways categorized by their structure. Class I bikeways are separated paths meant for exclusive use by bicycles and pedestrians. These are the most expensive to build and maintain. Class II bikeways are defined portions of the roadway that are designated exclusively for bicyclists by striping, signage, and pavement markings. Class III bikeways are similar to Class II, but they appear as more of a shoulder to the roadway. Class IV bikeways are physically separated from motor traffic by a barrier, and better suited for streets with a high volume of traffic. In terms of bicycle parking, there are two different classifications, short-term and long-term. Short-term parking is meant for customers at stores or other users who park for less than two hours. Short-term parking generally looks like bicycle racks. Long-term parking is meant for longer stays and is typically used by employees at work, students, or anyone who leaves their bike at a transit station. These parking facilities are primarily secure and protected from weather, such as bike lockers or sheltered enclosures. Signage is also important to consider when building bicycle and pedestrian facilities, as it allows people to know where they are in relation to other places. Additionally, lighting is important as it increases visibility which promotes safety.

In order to fund the implementation of this plan, the City of Clovis received money from a few different places. Fixing America's Surface Transportation Act (FAST) is a federal surface transportation funding program that is distributed to federal and state surface transportation funds. Measure C is another source of funding aimed at improving Fresno County's transportation system. It is allocated to cities based on population. With funding from these sources, as well as at least ten more, Clovis has been able to make major improvements to their bicycle and pedestrian infrastructure.

The Clovis Active Transportation Plan covers all of the necessary elements for improving the accessibility of non-motorized transportation. The implementation of this plan is where things get interesting. The City made a few maps of the existing

pedestrian network to identify areas that could use renovation. Using this specific area approach, the City located where to put new trails and sidewalks, as well as bicycle parking stations. The plan looks at maintenance and installation costs for all new infrastructure. Clovis created Table 1.4 in order to determine the applicability of separated bikeways in different situations.

Table 1.4: Applicability of Separated Bikeways

Criterion	Less Applicable	More Applicable	Most Applicable
Traffic Speed	< 25 mph	< 35 mph	< 45 mph
Traffic Volume		< 20,000 ADT	> 20,000 ADT
Large Truck Volume	None	Low	High
Number of Traffic Lanes	2	4	> 4
Access Control and Intersection Spacing	Low	Medium	High
Bicycle Crash History	None	Low	High
Bicycle Volume		Low	High
Pedestrian Volume		Low	High
Bus Stop		Low Frequency	High Frequency
Loading Zone		Occasional / Off Peak	Many / Peak Hour
Parking		Low Turnover	High Turnover
Accessible Parking		Yes	No

Source: Fehr & Peers, 2016.

ADT: Average Daily Trips
Mph: Miles per Hour

Overall, the Active Transportation Plan of Clovis provides a good example of a plan intended to improve the accessibility of pedestrian and bicyclist traffic around the city. By using the approach of improving specific areas, the City creates a cohesive system of trails, paths, and sidewalks that connect throughout the city. By utilizing Table 1.4, the City can determine when to provide a separated path for bicyclists and when to simply use the shoulder. Additionally, the City has many different sources of funding for this plan, as well as plans for how to spend the money. The plan is applicable to our project as it provides a framework for how to improve pedestrian and bicycle access in and around a city.

Planning Strategies

This section will describe the measures that could be implemented in San Joaquin to improve the overall accessibility for pedestrians and bicyclists in the city as well as reducing PM2.5. These strategies come from the case studies mentioned previously and the existing city documents. The aim for all of the strategies is to reduce automobile use thereby reducing PM2.5 production and promoting an active transportation system. As San Joaquin is a small city, traveling throughout the community would best be served by pedestrian right of ways and bike paths for cyclists.

Bike Paths

In order to encourage biking as opposed to driving, there must be designated bike paths that are easily accessible. Depending on people's level of comfort with biking, there are different levels of bike paths that can be constructed. As we studied in the Clovis Active Transportation Plan, there are four different classes of bike paths. For San Joaquin, it would make the most amount of sense to designate the shoulders of the streets for bike-only traffic. This is because the streets in San Joaquin are small and have a relatively low volume of traffic, which makes them safer and easier for bicyclists to navigate. For this plan, we propose that the main thoroughfares, Manning and Colorado Ave, incorporate Class II bikeways. This means that the shoulders of the streets are designated exclusively for bicyclists with striping, signage, and pavement markings. Additionally, we propose that the other streets in San Joaquin incorporate Class III bikeways, which essentially take the form of a shoulder to the road for bicyclists. We propose that these strategies should live within the Circulation Element of the General Plan. With these changes to the streets of San Joaquin, it will be much more accessible and safe for bicyclists to travel around the city.

Sidewalks

With sidewalks on every street, it would be much easier for people to prioritize walking instead of driving. One major factor that will encourage people to walk would be to plant trees that create shade on main pedestrian thoroughfares. If there were more trees, it would be more comfortable to walk around in the shade. Additionally, the incorporation of more trees into the city would improve the air quality. They would block PM10 as well as filter the air. Another factor that could encourage non-motorized transportation would be more streetlights. This would improve the overall safety of the area and allow people to travel at night with more confidence. We propose that these strategies should be instituted into the Circulation Element of the General Plan.

Public Outreach Program

In an effort to educate the public on the effects single occupancy vehicle trips have on air quality, a public outreach program is recommended to be created. This effort will be spearheaded by the local government of San Joaquin with assistance from the California Air Resources Board and The San Joaquin Valley Air Pollution Control District. This will serve as both educate the public of adverse health effects caused by air quality, particularly PM2.5, as well as inform citizens of the alternative forms of transportation that exist to them. This program will exist as a separate document coming directly from the city government through meetings held with the public. While the changes are first being made, there will be an active effort to make the public aware and encourage residents to interact with the information. After this initial push, the information will move to the City of San Joaquin and the County of Fresno websites.

Regional Transit

The current condition of regional transit service to San Joaquin is fairly poor so an improvement to that service would be of great importance. As it stands now, San Joaquin is serviced by the regional bus service only three times a day in both directions with no direct route to Fresno. The route runs only as far as Kerman so multiple routes would need to be taken which drastically increases travel time. There does exist a dial a ride service for people with disabilities however this only runs in the city limits. An expansion to this service, either trip frequency to the city or more direct trip routes, would help to decrease dependency on single occupancy vehicle trips. The expansion of service will be addressed with the City's General Plan Circulation Element.

Conclusion

In order to remedy the air quality problems that San Joaquin faces, it is imperative to reduce the frequency in which people use single occupancy vehicles. Less automobile traffic will result in a lower level of the PM2.5 pollutant. The strategies that we have proposed to lessen the reliance on cars include a public outreach program, the development of better pedestrian and bicycle infrastructure, and the improvement of the area's regional transport services. With the implementation of these strategies, it is likely that the amount of PM2.5 in San Joaquin will decrease and the air quality will improve.

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