

4.0 ENVIRONMENTAL IMPACT ANALYSIS

This section discusses the possible environmental effects of the proposed Single-Use Carryout Bag Ordinance for the specific issue areas that were identified through the Initial Study and NOP process as having the potential to experience significant impacts. “Significant effect” is defined by the *CEQA Guidelines* §15382 as “a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. An economic or social change by itself shall not be considered a significant effect on the environment, but may be considered in determining whether the physical change is significant.”

The assessment of each issue area begins with a discussion of the setting relevant to that issue area. Following the setting is a discussion of the ordinance’s impacts relative to the issue area. Within the impact analysis, the first subsection identifies the methodologies used and the “significance thresholds,” which are those criteria adopted by the City, other agencies, universally recognized, or developed specifically for this analysis to determine whether potential impacts are significant. The next subsection describes each impact of the proposed Ordinance, mitigation measures for significant impacts, and the level of significance after mitigation. Each impact under consideration for an issue area is separately listed in bold text, with the discussion of the impact and its significance following. Each bolded impact listing also contains a statement of the significance determination for the environmental impact as follows:

Class I, Significant and Unavoidable: An impact that cannot be reduced to below the threshold level given reasonably available and feasible mitigation measures. Such an impact requires a Statement of Overriding Considerations to be issued if the project is approved.

Class II, Significant but Mitigable: An impact that can be reduced to below the threshold level given reasonably available and feasible mitigation measures. Such an impact requires findings to be made.

Class III, Not Significant: An impact that may be adverse, but does not exceed the threshold levels and does not require mitigation measures. However, mitigation measures that could further lessen the environmental effect may be suggested if readily available and easily achievable.

Class IV, Beneficial: An impact that would reduce existing environmental problems or hazards.

Following each environmental impact discussion is a listing of recommended mitigation measures (if required) and the residual effects or level of significance remaining after the implementation of the measures. In those cases where the mitigation measure for an impact could have a significant environmental impact in another issue area, this impact is discussed as a residual effect.

The impact analysis concludes with a discussion of cumulative effects, which evaluates the impacts associated with the proposed Ordinance in conjunction with other adopted and pending carryout bag ordinances.



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4.1 AIR QUALITY

This section analyzes the proposed Single-Use Carryout Bag Ordinance's long-term impacts to local and regional air quality. The analysis focuses on air quality impacts associated with carryout bag manufacturing facilities and the impacts associated with truck trips that deliver carryout bags in Sunnyvale. Impacts related to global climate change are addressed in Section 4.3, *Greenhouse Gas Emissions*.

4.1.1 Setting

a. Characteristics of Air Pollutants. The City of Sunnyvale is located within the San Francisco Bay Area Air Basin (Basin). The Bay Area Air Quality Management District (BAAQMD) is the regional government agency that monitors and regulates air pollution within the Basin. Pollutants that are monitored within Santa Clara County and compared to State and Federal Standards include ozone, carbon monoxide, nitrogen dioxide and suspended particulates. The general characteristics of these pollutants are described below.

Ozone. Ozone is produced by a photochemical reaction (triggered by sunlight) between nitrogen oxides (NO_x) and reactive organic gases (ROG). Nitrogen oxides are formed during the combustion of fuels, while reactive organic gases are formed during combustion and evaporation of organic solvents. Because ozone requires sunlight to form, it mostly occurs in concentrations considered serious between the months of April and October. Ozone is a pungent, colorless, toxic gas with direct health effects on humans, including respiratory and eye irritation and possible changes in lung functions. Groups most sensitive to ozone include children, the elderly, persons with respiratory disorders, and people who exercise strenuously outdoors.

Carbon Monoxide. Carbon monoxide (CO) is a colorless, odorless, poisonous gas that is found in high concentrations only near the source. The major source of carbon monoxide is automobile traffic. Elevated concentrations, therefore, are usually only found near areas of high traffic volumes. Carbon monoxide's health effects are related to its affinity for hemoglobin in the blood. At high concentrations, carbon monoxide reduces the amount of oxygen in the blood, causing heart difficulties in people with chronic diseases, reduced lung capacity and impaired mental abilities.

Nitrogen Dioxide. Nitrogen dioxide (NO₂) is a by-product of fuel combustion, with the primary source being motor vehicles and industrial boilers and furnaces. The principal form of nitrogen oxide produced by combustion is nitric oxide (NO), but NO reacts rapidly to form NO₂, creating the mixture of NO and NO₂ commonly called NO_x. Nitrogen dioxide is an acute irritant. A relationship between NO₂ and chronic pulmonary fibrosis may exist, and an increase in bronchitis in young children at concentrations below 0.3 parts per million (ppm) may occur. NO₂ absorbs blue light and causes a reddish brown cast to the atmosphere and reduced visibility. It can also contribute to the formation of PM₁₀ and acid rain.

Suspended Particulates. PM₁₀ is particulate matter measuring no more than 10 microns in diameter, while PM_{2.5} is fine particulate matter measuring no more than 2.5 microns in diameter. Suspended particulates are mostly dust particles, nitrates and sulfates. Both PM₁₀



and PM_{2.5} are by-products of fuel combustion and wind erosion of soil and unpaved roads, and are directly emitted into the atmosphere through these processes. Suspended particulates are also created in the atmosphere through chemical reactions. The characteristics, sources, and potential health effects associated with the small particulates (those between 2.5 and 10 microns in diameter) and fine particulates (PM_{2.5}) can be very different. The small particulates generally come from windblown dust and dust kicked up from mobile sources. The fine particulates are generally associated with combustion processes as well as being formed in the atmosphere as a secondary pollutant through chemical reactions. Fine particulate matter is more likely to penetrate deeply into the lungs and poses a health threat to all groups, but particularly to the elderly, children, and those with respiratory problems. More than half of the small and fine particulate matter that is inhaled into the lungs remains there. These materials can damage health by interfering with the body's mechanisms for clearing the respiratory tract or by acting as carriers of an absorbed toxic substance.

b. Current Air Quality. The San Francisco Bay Area Air Basin monitoring station located nearest to Sunnyvale is the Sunnyvale monitoring station, located at 910 Ticonderoga Drive in Sunnyvale. However, only ozone data is available from the Sunnyvale monitoring station, and data for 2009 and 2010 is not available. Therefore, data for ozone, PM₁₀, NO₂, and CO was taken from the next nearest monitoring station, located on Jackson Street in San Jose, approximately 10 miles east of Sunnyvale. Table 4.1-1, on the following page, indicates the number of days each of the standards has been exceeded at these stations. As shown, the ozone concentration exceeded the state standard once in 2008 and five times in 2010, and exceeded the federal standard once in 2010. The PM₁₀ concentration exceeded state standards once in 2008 and did not exceed the state standard in 2009 or 2010. The PM_{2.5} concentration exceeded federal standards on five days 2008 and three days in 2010 but did not exceed the federal standard in 2009. There were no exceedances of either the state or federal standards for NO₂ or CO at the San Jose - Jackson Street monitoring station from 2008 through 2010.

c. Air Quality Management. Under state law, the BAAQMD is required to prepare a plan for air quality improvement for pollutants for which the District is in non-compliance. The Bay Area 2010 Clean Air Plan (CAP) provides a comprehensive plan to improve Bay Area air quality and protect public health. The legal impetus for the CAP is to update the most recent ozone plan, the Bay Area 2005 Ozone Strategy, to comply with state air quality planning requirements as codified in the California Health & Safety Code. Although steady progress in reducing ozone levels in the Bay Area has been made, the region continues to be designated as non-attainment for both the one-hour and eight-hour state ozone standards. In addition, emissions of ozone precursors in the Bay Area contribute to air quality problems in neighboring air basins. Under these circumstances, state law requires the CAP to include all feasible measures to reduce emissions of ozone precursors and reduce transport of ozone precursors to neighboring air basins (BAAQMD, September 2010).

The Bay Area was recently designated as non-attainment for the national 24-hour fine particulate matter (PM_{2.5}) standard, and BAAQMD is required to prepare a PM_{2.5} State Implementation Plan (SIP) pursuant to federal air quality guidelines by December 2012. The 2010 CAP is not a SIP document and does not respond to federal requirements for PM_{2.5} or ozone planning. However, in anticipation of future PM_{2.5} planning requirements, the CAP control strategy also aims to reduce PM emissions and concentrations. In addition, U.S.



Environmental Protection Agency (EPA) is currently reevaluating national ozone standards, and is likely to tighten those standards in the near future. The control measures in the CAP will also help in the Bay Area’s continuing effort to attain national ozone standards (BAAQMD, September 2010).

**Table 4.1-1
Ambient Air Quality Data**

Pollutant	2008	2009	2010
Ozone, ppm - Worst Hour	0.118	0.088	0.126
Number of days of State exceedances (>0.09 ppm)	1	0	5
Number of days of Federal exceedances (>0.12 ppm)	0	0	1
Carbon Monoxide, ppm - Worst 8 Hours	2.48	2.50	2.19
Number of days of State/Federal exceedances (>9.0 ppm)	0	0	0
Nitrogen Dioxide, ppm - Worst Hour	0.080	0.069	0.064
Number of days of State exceedances (>0.25 ppm)	0	0	0
Particulate Matter <10 microns, $\mu\text{g}/\text{m}^3$ Worst 24 Hours ^b	57.3	43.3	46.8
Number of samples of State exceedances (>50 $\mu\text{g}/\text{m}^3$)	1	0	0
Number of samples of Federal exceedances (>150 $\mu\text{g}/\text{m}^3$)	0	0	0
Particulate Matter <2.5 microns, $\mu\text{g}/\text{m}^3$ Worst 24 Hours	41.9	35.0	41.5
Number of samples of Federal exceedances (>35 $\mu\text{g}/\text{m}^3$)	5	0	3

*b*Data collected for the San Jose – Jackson Street monitoring station

Source: CARB, 2008, 2009, & 2010 Annual Air Quality Data Summaries available at <http://www.arb.ca.gov>

d. Air Quality and Carryout Bags. Carryout bags can affect air quality in two ways, either through emissions associated with manufacturing processes or through emissions associated with truck trips for the delivery of carryout bags to retailers. Each is summarized below.

Manufacturing Process. The manufacturing process to make carryout bags requires fuel and energy consumption, which generates air pollutant emissions. These may include particulate matter, nitrogen oxides, hydrocarbons, sulfur oxides, carbon monoxide, and odorous sulfur (Green Cities California MEA, 2010). The amount of emissions varies depending on the type and quantity of carryout bags produced. These emissions may contribute to air quality impacts related to acid rain (atmospheric acidification) or ground level ozone formation.

Although manufacturing facilities may emit air pollutant emissions in the production of carryout bags, manufacturing facilities are subject to air quality regulations, as described in the *Regulatory Setting*, which are intended to reduce the amount of emissions and the impacts related to air quality. For this EIR, the analysis is focused on the Bay Area Air Basin, of which Sunnyvale is a part.



Truck Trips. Delivery trucks that transport carryout bags from manufacturers or distributors to the local retailers in Sunnyvale also contribute air emissions locally and regionally. As discussed in the Transportation/Circulation section of the Initial Study (see Appendix A), based on a baseline population estimate in Sunnyvale of approximately 141,099 persons and a statewide estimate of approximately 533 plastic bags used per person per year, retail customers in the City of Sunnyvale currently use an estimated 75,231,202 plastic bags per year. Assuming 2,080,000 plastic bags per truck load (City of Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011; refer to Appendix A), this number of plastic bags would require approximately 35 truck trips per year to deliver these carryout bags.

Diesel engines emit a complex mixture of air pollutants, composed of gaseous and solid material (ARB "Health Effects of Diesel Exhaust", 2010). The visible emissions in diesel exhaust are known as particulate matter or PM, which are very small and readily respirable. The particles have hundreds of chemicals adsorbed onto their surfaces, including many known or suspected mutagens and carcinogens. Diesel PM emissions are estimated to be responsible for about 70% of the total ambient air toxics risk. In addition to these general risks, diesel PM can also be responsible for elevated localized or near-source exposures ("hot-spots") (ARB, Health Effects of Diesel Exhaust", 2010).

Like manufacturing facilities, delivery trucks are also subject to existing regulations primarily related to diesel emissions, as described in the *Regulatory Setting*. These regulations are intended to reduce emissions associated with fuel combustion and the impacts related to local and regional air quality.

Ground Level Ozone and Atmospheric Acidification. Various studies have estimated air emissions for the different carryout bags (single-use plastic, paper or reusable bags) to determine a per bag emissions rate. In order to provide metrics to determine environmental impacts associated with the proposed ordinance, reasonable assumptions based upon the best available sources of information have been established and are utilized in this EIR. Specific metrics that compare impacts on a per bag basis are available for single-use plastic, single-use paper and LDPE reusable bags. Air emissions associated with the manufacturing and transportation of one single-use paper bag result in 1.9 times the impact on atmospheric acidification as air emissions associated with one single-use plastic bag. Similarly, on a per bag basis, a reusable carryout bag that is made of LDPE plastic would result in 3 times the atmospheric acidification compared to a single-use plastic bag if the LDPE bag is only used only one time. In addition, on a per bag basis, a single-use paper bag has 1.3 times the impact on ground level ozone formation of a single-use plastic bag. Finally, a reusable carryout bag that is made of LDPE plastic and only used one time would result in 1.4 times the ground level ozone formation of a single-use plastic bag (Stephen L. Joseph, 2009; Ecobilan, 2004; FRIDGE, 2002; and Green Cities California MEA, 2010, City of Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011).

The above statistics use the LDPE carryout bag as a representation of reusable bags in evaluating air quality impacts. There is no known available Life Cycle Assessment that evaluates all types of reusable bags (canvas, cotton, calico, etc.) with respect to potential air emissions. However, given the high rate of reuse of all types of reusable bags (usually at least



one year, or 52 uses), the air emissions from these bags, when compared to the single-use plastic and paper carryout bags, are expected to be comparable to the LPDE bag or lower.

Table 4.1-2 lists the emissions associated contributing to ground level ozone and atmospheric acidification using the per-bag impact rates discussed above and the estimated existing plastic bags used in Sunnyvale. As shown in Table 4.1-2, the manufacturing and transportation of single-use plastic carryout bags currently used in Sunnyvale each year generates an estimated 639 kilograms (kg) of emissions associated with ground level ozone and 33,747 kg of emissions associated with atmospheric acidification.

**Table 4.1-2
 Existing Emissions from Ground Level Ozone and
 Atmospheric Acidification (AA) from Carryout Bags in Sunnyvale**

Bag Type	# of Bags Used per Year	Ozone Emission Rate per Bag*	Ozone Emissions (kg) per 1,000 bags**	Ozone Emissions per year (kg)	AA Emission Rate per Bag*	AA Emissions (kg) per 1,000 bags***	AA Emissions per year (kg)
Single-use Plastic	75,231,202	1.0	0.023	1,730.32	1.0	1.084	81,550.62
Total				1,730	Total		81,551

Source:

* Impact rate per bag as stated in Stephen L. Joseph, 2009; Ecobilan, 2004; FRIDGE, 2002; and Green Cities California MEA, 2010; Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011.

** Emissions per 1,000 bags from Ecobilan, 2004; Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011.

*** Emissions per 1,000 bags from FRIDGE, 2002 and Green Cities California MEA, 2010; Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011.

e. Air Pollution Regulation. Federal and state standards have been established for six criteria pollutants: ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulates less than 10 and 2.5 microns in diameter (PM₁₀ and PM_{2.5} respectively), and lead (Pb). California has also set standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. Table 4.1-3 lists the current federal and state standards for criteria pollutants.

As described above, Sunnyvale is located within the San Francisco Bay Area Air Basin, which is under the jurisdiction of the BAAQMD. The BAAQMD is required to monitor air pollutant levels to ensure that air quality standards are met and, if they are not met, to develop strategies to meet the standards. Depending on whether the standards are met or exceeded, the local air basin is classified as being in “attainment” or “non-attainment.” The Bay Area Air Basin (Basin) is in attainment of the State and Federal standards for NO₂ and CO and the federal standards for PM₁₀. However, the Basin is a non-attainment area for both the federal and state standards for ozone and PM_{2.5} and the state standards for PM₁₀. Thus, the BAAQMD is required to implement strategies that would reduce the pollutant levels to recognized acceptable standards. The non-attainment status is a result of several factors, the primary ones



being the naturally adverse meteorological conditions that limit the dispersion and diffusion of pollutants, the limited capacity of the local air shed to eliminate pollutants from the air, and the number, type, and density of emission sources within the Basin.

**Table 4.1-3
 Current Federal and State Ambient Air Quality Standards**

Pollutant	Federal Standard	California Standard
Ozone	0.075 ppm (8-hr avg)	0.09 ppm (1-hr avg) 0.07 ppm (8-hr avg)
Carbon Monoxide	9.0 ppm (8-hr avg) 35.0 ppm (1-hr avg)	9.0 ppm (8-hr avg) 20.0 ppm (1-hr avg)
Nitrogen Dioxide	53 ppb (annual avg) 100 ppb (1-hr avg)	0.030 ppm (annual avg) 0.18 ppm (1-hr avg)
Sulfur Dioxide	75 ppb (1-hr avg)	0.04 ppm (24-hr avg) 0.25 ppm (1-hr avg)
Lead	1.5 µg/m ³ (annual avg)	1.5 µg/m ³ (calendar qtr)
Particulate Matter (PM ₁₀)	150 µg/m ³ (24-hr avg)	20 µg/m ³ (annual avg) 50 µg/m ³ (24-hr avg)
Particulate Matter (PM _{2.5})	15 µg/m ³ (annual avg) 35 µg/m ³ (24-hr avg)	12 µg/m ³ (annual avg)

ppm= parts per million ppb= parts per billion µg/m³ = micrograms per cubic meter
 Source: California Air Resources Board (2010), accessed online July 2011 at:
www.arb.ca.gov/research/aaqs/aaqs2.pdf

Regulations applicable to Manufacturing Facilities.

EPA Title V Permit. Title V is a federal program designed to standardize air quality permits and the permitting process for major sources of emissions across the country. The name "Title V" comes from Title V of the 1990 federal Clean Air Act Amendments, which requires the EPA to establish a national, operating permit program. Accordingly, EPA adopted regulations [Title 40 of the Code of Federal Regulations, Chapter 1, Part 70 (Part 70)], which require states and local permitting authorities to develop and submit a federally enforceable operating permit programs for EPA approval. Title V only applies to "major sources." EPA defines a major source as a facility that emits, or has the potential to emit (PTE) any criteria pollutant or hazardous air pollutant (HAP) at levels equal to or greater than the Major Source Thresholds (MST). The MST for criteria pollutants may vary depending on the attainment status (e.g. marginal, serious, extreme) of the geographic area and the Criteria Pollutant or HAP in which the facility is located (EPA Title V Requirement, accessed March 2010). Carryout bag manufacturing facilities that emit any criteria pollutant or HAP at levels equal to or greater than the MST of the local air quality management district would need to obtain, and maintain compliance with, a Title V permit.

Local Air Quality Management District's Equipment Permits. Manufacturing facilities may also be required to obtain permits from the local air quality management district. A local air



quality management district permit is a written authorization to build, install, alter, replace, or operate equipment that emits or controls the emission of air contaminants, such as NO_x, CO, PM₁₀, oxides of sulfur (SO_x), or toxics. Permits ensure that emission controls meet the need for the local region to make steady progress toward achieving and maintaining federal and state air quality standards. The BAAQMD, the local air quality management district serving Sunnyvale, requires operators that plan to build, install, alter, replace, or operate any equipment that emits or controls the emission of air contaminants to apply for, obtain and maintain equipment permits. Equipment permits ensure that emission controls meet the need for the Bay Area Air Basin to make steady progress toward achieving and maintaining federal and state air quality standards (as shown in Table 4.1-3). Permits also ensure proper operation of control devices, establish recordkeeping and reporting mechanisms, limit toxic emissions, and control dust or odors. In addition, the BAAQMD routinely inspects operating facilities to verify that equipment operates in compliance with BAAQMD rules and regulations.

Regulations applicable to Delivery Trucks.

On-Road Heavy-Duty Diesel Vehicles (In-Use) Regulation. On December 12, 2008, the ARB approved a new regulation to significantly reduce emissions from existing on-road diesel vehicles operating in California. The regulation requires affected trucks and buses to meet performance requirements between 2011 and 2023. By January 1, 2023 all vehicles must have a 2010 model year engine or equivalent. The regulation is intended to reduce emissions of diesel PM, oxides of nitrogen and other criteria pollutants (ARB “Truck and Bus Regulation, updated March 2010). All trucks making deliveries of carryout bags in California will be required to adhere to this regulation.

Diesel-Fueled Commercial Motor Vehicle Idling Limit. The purpose of this airborne toxic control measure is to reduce public exposure to diesel particulate matter and other air contaminants by limiting the idling of diesel-fueled commercial motor vehicles. The regulation applies to diesel-fueled commercial motor vehicles that operate in the State of California with gross vehicular weight ratings of greater than 10,000 pounds that are or must be licensed for operation on highways. The in-use truck requirements require operators of both in-state and out-of-state registered sleeper berth equipped trucks to manually shut down their engines when idling more than five minutes at any location within California beginning in 2008 (ARB “Heavy-Duty Vehicle Idling Emission Reduction Program”, updated March 2009). All trucks making deliveries in Sunnyvale are required to comply with the no-idling requirements.

4.1.2 Impact Analysis

a. Methodology and Significance Thresholds. The proposed Single-Use Carryout Bag Ordinance does not include any physical development or construction related activities; therefore, the analysis focuses on emissions related to carryout bag manufacturing processes and truck trips associated with delivering carryout bags to retailers in Sunnyvale. Operational emissions associated with the truck trips to deliver carryout bags to Sunnyvale retailers were calculated using the using the URBEMIS 2007 v. 9.2.4 computer program. The estimate of operational emissions by URBEMIS includes truck trips (assumed to be heavy trucks - 33,000 to 60,000 pounds) and utilizes the trip generation rates based on the traffic analysis contained in the *Transportation/Circulation* section of the Initial Study (see Appendix A).



The proposed Ordinance would create an air quality significant impact if it would:

1. *Conflict with or obstruct implementation of the applicable air quality plan*
2. *Violate any air quality standard or contribute substantially to an existing or projected air quality violation*
3. *Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)*
4. *Expose sensitive receptors to substantial pollutant concentrations*
5. *Create objectionable odors affecting a substantial number of people*

The Initial Study (see Appendix A) concluded that only the second and third criteria could potentially result in a significant impact, while the proposed Single-Use Carryout Bag Ordinance would result in no impact with respect to the first, fourth and fifth criteria. Hence, only the second and third criteria are addressed in this section.

The BAAQMD has established the following significance thresholds for project operations within the Bay Area Air Basin:

- *54 pounds per day of ROG*
- *54 pounds per day of NO_x*
- *82 pounds per day of PM₁₀*
- *54 pounds per day of PM_{2.5}*

b. Project Impacts and Mitigation Measures.

Impact AQ-1 **A shift toward reusable bags could potentially alter processing activities related to bag production which has the potential to increase air emissions. However, the proposed Single-Use Carryout Bag Ordinance is expected to substantially reduce the number of single-use plastic carryout bags, thereby reducing the amount of total bags manufactured and overall emissions associated with bag manufacture and use. Therefore, air quality impacts related to alteration of processing activities would be Class IV, beneficial.**

The intent of the proposed Single-Use Carryout Bag Ordinance is to reduce the amount of single-use carryout bags, and to promote the use of reusable bags by Sunnyvale retail customers. The proposed Ordinance would incrementally reduce the number of single-use plastic carryout bags that are manufactured and would incrementally increase the number of single-use paper and reusable bags manufactured compared to existing conditions.

As described in the *Setting*, emissions associated with single-use paper bag production result in 1.9 times the impact on atmospheric acidification as a single-use plastic bag. On a per bag basis,



a reusable carryout bag that is made of LDPE plastic results in three times the atmospheric acidification compared to a single-use plastic bag. Reusable bags may be made of various materials other than LDPE, including cloths such as cotton or canvas. However, because LDPE reusable bags are one of the most common types of reusable bags and are of similar durability and weight (approximately 50 to 200 grams) as other types of reusable bags, this EIR utilizes the best available information regarding specific metrics on a per bag basis to disclose environmental impacts associated with the proposed ordinance. Further, given the high rate of reuse of all types of reusable bags (usually at least one year, or 52 times), the air emissions from these bags when compared to plastic and paper carryout bags are expected to be comparable (to the LPDE bag) or lower (Santa Clara County Single-Use Carryout Bag Initial Study, October 2010). Similarly, based on a per bag basis, a single-use paper bag has 1.3 times the impact on ground level ozone formation compared to a single-use plastic bag and a reusable carryout bag that is made of LDPE plastic would result in 1.4 times the ground level ozone formation compared to a single-use plastic bag (Stephen L. Joseph, 2009; FRIDGE, 2002; and Green Cities California MEA, 2010).

A reusable bag results in greater impacts to ground level ozone formation and atmospheric acidification than a single-use plastic bag on a per bag basis; however, unlike single-use plastic bags, reusable carryout bags are intended to be used multiple times (at least 125 uses as required by the proposed ordinance)¹. Therefore, fewer total carryout bags would need to be manufactured as a shift toward the use of reusable bags occurs. As described in Section 2.0, *Project Description*, stores making available paper carryout bags would be required to sell recycled paper carryout bags made from 100% recycled material with a 40% post-consumer recycled content to customers for \$0.15 per bag. This mandatory charge would create a disincentive to customers to request paper bags when shopping at regulated stores and is intended to promote a shift toward the use of reusable bags by consumers in Sunnyvale. The proposed ordinance may lead to some short-term increase in single-use paper bag use as consumers would be unable to get a free plastic bag while shopping, but may be willing to pay a charge to use paper bags.

Based on a mandatory charge of \$0.15 per bag, this analysis assumes that the total volume of plastic bags currently used in Sunnyvale (75,231,202 plastic bags per year) would be replaced by approximately 45% paper bags and 50% reusable bags as a result of the Single-Use Carryout Bag Ordinance, as shown in Table 4.1-4. As shown therein, it is assumed that 5% of the existing single-use plastic bags used in Sunnyvale would remain in use since the Ordinance does not apply to some retailers who distribute plastic bags (e.g. restaurants) and these retailers would continue to distribute plastic bags after the Ordinance is implemented. Thus, for this analysis it is assumed that 3,761,560 plastic bags would be used in Sunnyvale after implementation of the proposed Ordinance. In addition, it is assumed that approximately 33,854,041 paper bags would replace approximately 45% of the plastic bags currently used in the City. This 1:1 replacement ratio is considered conservative, because the volume of a single-use paper carryout bag (20.48 liters) is generally equal to approximately 150% of the volume of a single-use plastic bag (14 liters), such that fewer paper bags would ultimately be needed to carry the same number of items.

¹ For the purposes of this analysis, it is assumed that reusable bags would be used once per week for a year, or 52 times, before being replaced. However, for the purposes of the ordinance, reusable bags *can* be used as many as 125 times.



**Table 4.1-4
 Existing Plastic Bag Replacement Assumptions**

Type of Bag	Replacement Assumption	Bags used Post-Ordinance	Explanation
Single-use Plastic	5%	3,761,560	Because the ordinance does not apply to all retailers, some single-use plastic bags would remain in circulation.
Single-use Paper	45%	33,854,041	Although the volume of a single-use paper carryout bag is generally 150% of the volume of a single-use plastic bag, such that fewer paper bags would be needed to carry the same number of items, it is conservatively assumed that paper would replace plastic at a 1:1 ratio.
Reusable	50%	723,377	Although a reusable bag can, by definition, be used 125 times, it is conservatively assumed that a reusable bag would be used by a customer once per week for one year, or 52 times.

In order to estimate the number of reusable carryout bags that would replace 37,615,601 plastic bags (50% of the existing number of plastic bags used in Sunnyvale per year), it is assumed that a reusable carryout bag would be used by a customer once per week for one year (52 times). This is a conservative estimate as a reusable bag, as required by the Ordinance, must have the capability of being used 125 times (see Appendix D for complete Ordinance). Nevertheless, for this analysis, in order to replace the volume of groceries contained in the 37,615,601 million single-use plastic bags that would be removed as a result of the Single-Use Carryout Bag Ordinance, an increase of approximately 723,377 reusable bags per year would be purchased by customers at retail stores. It should be noted that approximately 723,377 reusable bags would mean that each person in Sunnyvale (141,099 in 2011) would purchase around 5 reusable bags per year. This analysis assumes that as a result of the proposed ordinance the existing total volume of groceries currently carried in approximately 75.2 million single-use plastic carryout bags would be carried within approximately 38.3 million single-use plastic, reusable and single-use paper bags

Table 4.1-5 estimates emissions that contribute to the development of ground level ozone and atmospheric acidification that would result from implementation of the proposed Single-Use Carryout Bag Ordinance. As shown, the increased use of reusable carryout bags in the City would reduce emissions that contribute to ground level ozone by approximately 604 kg per year (a 35% decrease) and atmospheric acidification by approximately 5,382 kg per year (a 7% decrease).



**Table 4.1-5
 Estimated Emissions that Contribute to Ground Level Ozone and
 Atmospheric Acidification (AA) from Carryout Bags in Sunnyvale**

Bag Type	# of Bags Used per Year*	Ozone Emission Rate per Bag**	Ozone Emissions (kg) per 1,000 bags***	Ozone Emissions per year (kg)	AA Emission Rate per Bag**	AA Emissions (kg) per 1,000 bags****	AA Emissions per year (kg)
Single-use Plastic	3,761,560	1.0	0.023	87	1.0	1.084	4,078
Single-use Paper	33,854,041	1.3	0.03	1,016	1.9	2.06	69,739
Reusable	723,377	1.4	0.032	23	3.0	3.252	2,352
Total				1,125	Total		76,169
Existing				1,730	Existing		81,551
Net Change				(604)	Net Change		(5,382)

Source:

* Refer to Table 4.1-4.

**Impact rate per bag as stated in Stephen L. Joseph, 2009; Ecobilan, 2004; FRIDGE, 2002; and Green Cities California MEA, 2010; Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011.

*** Emissions per 1,000 bags from Ecobilan, 2004; Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011.

**** Emissions per 1,000 bags from FRIDGE, 2002 and Green Cities California MEA, 2010; Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011.

As discussed in the *Setting*, air pollutant emissions from manufacturing facilities are also regulated under the Clean Air Act and would be subject to requirements by the local air quality management district (in Santa Clara County, the BAAQMD). Either a paper bag manufacturing facility or a reusable carryout bag manufacturing facility that emits any criteria pollutant or hazardous air pollutant (HAP) at levels equal to or greater than the Major Source Thresholds (MST) of the local air quality management district would need to obtain and maintain compliance with a Title V permit. Adherence to permit requirements would ensure that a manufacturing facility would not violate any air quality standard. Manufacturing facilities would also be required to obtain equipment permits for emission sources through the local air quality management district which ensures that equipment is operated and maintained in a manner that limits air emissions in the region. Compliance with applicable regulations would ensure that manufacturing facilities would not generate emissions conflicting with or obstructing implementation of the applicable air quality plan, violate any air quality standard or contribute substantially to an existing or projected air quality violation or result in a cumulatively considerable net increase of any criteria pollutant.



As described above, the proposed Single-Use Carryout Bag Ordinance would reduce emissions associated with ozone and atmospheric acidification. Therefore, the proposed ordinance would have a beneficial impact with respect to air quality.

Mitigation Measures. Mitigation is not necessary as impacts would be beneficial.

Significance After Mitigation. The impact would be beneficial without mitigation.

Impact AQ-2 Implementation of the proposed Single-Use Carryout Bag Ordinance would generate air pollutant emissions associated with an incremental increase in truck trips to deliver paper and reusable carryout bags to local retailers. However, emissions would not exceed BAAQMD operational significance thresholds. Therefore, operational air quality impacts would be Class III, less than significant.

Long-term emissions associated with the proposed Single-Use Carryout Bag Ordinance would include those emissions associated with truck trips to deliver carryout bags (paper and reusable) from manufacturing facilities or distributors to the local retailers in Sunnyvale. The URBEMIS 2007 v.9.2.4 model was used to calculate emissions for mobile emissions resulting from the number of trips generated by the proposed ordinance. Trip generation rates were taken from the traffic analysis contained in the *Transportation/Circulation* section of the Initial Study (see Appendix A), which estimates that the change in truck traffic as a result of the proposed Ordinance would be a net increase of 0.35 truck trips per day. Although the reduction in single-use plastic bag deliveries would reduce truck trips compared to existing conditions, the increase in single-use paper and reusable bags would cause the negligible net increase. Mobile emissions associated with such an increase in truck traffic are summarized in Table 4.1-6.

**Table 4.1-6
Operational Emissions Associated with Proposed Ordinance**

Emission Source	Emissions (lbs/day)			
	ROG	NO _x	PM ₁₀	PM _{2.5}
Mobile Emissions (Truck Traffic)	<0.01	0.05	0.01	<0.01
Total Emissions	<0.01	0.05	0.01	<0.01
<i>BAAQMD Thresholds</i>	<i>54</i>	<i>54</i>	<i>82</i>	<i>54</i>
Threshold Exceeded?	No	No	No	No

Source: URBEMIS 2007 calculations for Vehicle. See Appendix B for calculations

As indicated in Table 4.1-6, daily ROG emissions are estimated at <0.01 pounds, daily NO_x emissions are estimated at approximately 0.05 pounds, daily PM₁₀ emissions would be



approximately 0.01 pounds, and daily PM_{2.5} emissions would be <0.01 pounds. The incremental increases in ROG, NO_x, PM₁₀, and PM_{2.5} emissions associated with the proposed project would be substantially less than the BAAQMD thresholds of 54 pounds per day of ROG, NO_x, or PM_{2.5}, and 82 pounds per day of PM₁₀. Because long-term emissions would not exceed BAAQMD thresholds, impacts would not be significant.

Mitigation Measures. Operational emissions associated with the increase in truck traffic as a result of the proposed Single-Use Carryout Bag Ordinance would not exceed BAAQMD thresholds. Therefore, mitigation is not required.

Significance after Mitigation. Impacts would be less than significant without mitigation.

c. Cumulative Impacts. Adopted and pending carryout bag ordinances, as described in Table 3-1 in Section 3.0, *Environmental Setting*, would continue to reduce the amount of single-use carryout bags, and promote a shift toward reusable carryout bags. Similar to the proposed Sunnyvale ordinance, such ordinances would be expected to generally reduce the overall number of bags manufactured and associated air pollutant emissions, while existing and future manufacturing facilities would continue to be subject to federal and state air pollution regulations (see the *Setting* for discussion of applicable regulations). Similar to the proposed Sunnyvale ordinance, other adopted and pending ordinances could incrementally change the number of truck trips associated with carryout bag delivery and associated emissions. Six other agencies in San Francisco Bay Area region (County of Santa Clara, City of San Jose, Marin County, City of San Francisco, Alameda County, and the City of Palo Alto) have either adopted or are considering such ordinances. However, based on the incremental increase in air pollutant emissions associated with the proposed Sunnyvale ordinance (increase of 1/4 pound per day or less of each criteria pollutant), the other ordinances are not expected to generate a cumulative increase in emissions that would exceed BAAQMD thresholds or adversely affect regional air quality. Therefore, cumulative air quality impacts would not be significant.



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4.2 BIOLOGICAL RESOURCES

This section analyzes the proposed Single-Use Carryout Ordinance's impacts to biological resources. Both direct impacts associated with the proposed Single-Use Carryout Bag Ordinance and indirect impacts to off-site biological resources are addressed.

4.2.1 Setting

a. Sunnyvale Terrestrial Habitat. Approximately 24 square miles in size, Sunnyvale is bounded to the north by the cities of San Jose and Fremont and Moffett Federal Airfield, to the west by the cities of Mountain View and Los Altos, to the south by the City of Cupertino, and to the east by the City of Santa Clara. Nearly all of Sunnyvale is developed. Only 0.5% of parcels are vacant (Sunnyvale General Plan, 2011). Natural habitat in Sunnyvale is limited to the slope side portion of the City (toward the Santa Cruz Mountains), which is generally comprised of annual grassland with scattered riparian trees and scrub within drainages. The majority of the City lacks substantial native vegetation that would provide habitat for special status plant or animal species. Terrestrial wildlife within the City is generally limited to urban adapted species, such as American crow (*Corvus brachyrhynchos*), northern mockingbird (*Mimus polyglottos*), Virginia opossum (*Didelphis virginiana*), and raccoon (*Procyon lotor*). Open space and undeveloped areas that could serve as wildlife habitats within the City are limited to San Francisco Bay and riparian corridors (Santa Clara Valley Urban Runoff Pollution Prevention Program, 2011).

b. Special Status Species. Sunnyvale is located within the Santa Clara Basin, which drains directly to San Francisco Bay. The Santa Clara Basin is comprised of 13 watersheds and includes the portion of the Bay south of Dumbarton Bridge and an 840-square mile area of wetlands that drains into it (Santa Clara Basin Watershed Management Initiative, March 2003). Specifically, Sunnyvale is located within the Sunnyvale East Channel and the Sunnyvale West Channel watersheds. The Sunnyvale East Channel watershed drains approximately 7.1 square miles and conveys water through the artificially constructed Sunnyvale East Channel into the Junipero Sierra Channel and the Guadalupe Slough. The Sunnyvale West Channel watershed drains approximately 7.6 square miles and conveys flows through the artificially constructed Sunnyvale West Channel into the Moffett Channel and Guadalupe Slough. Both watersheds eventually drain into the Lower South San Francisco Bay. Open space within these watersheds is limited to the Sunnyvale Baylands along the shoreline of San Francisco Bay and smaller City-owned parks within Sunnyvale.

Several special status plant and animal species are known to occur within the vicinity of Sunnyvale and have the potential to occur if suitable habitat is present. These include western pond turtle (*Actinemys marmorata*), western snowy plover (*Charadrius alexandrinus*), salt marsh harvest mouse (*Reithrodontomys raviventris*), steelhead (*Oncorhynchus mykiss irideus*), alkali milk-vetch (*Astragalus tener*), and California seablite (*Suaeda californica*). Furthermore, Northern Coastal Salt Marsh, a sensitive natural community, has been documented along the shore of the San Francisco Bay within the City.

While the coastal and marine habitat of San Francisco Bay has been altered due to human disturbance, a number of additional sensitive species have the potential to occur in these



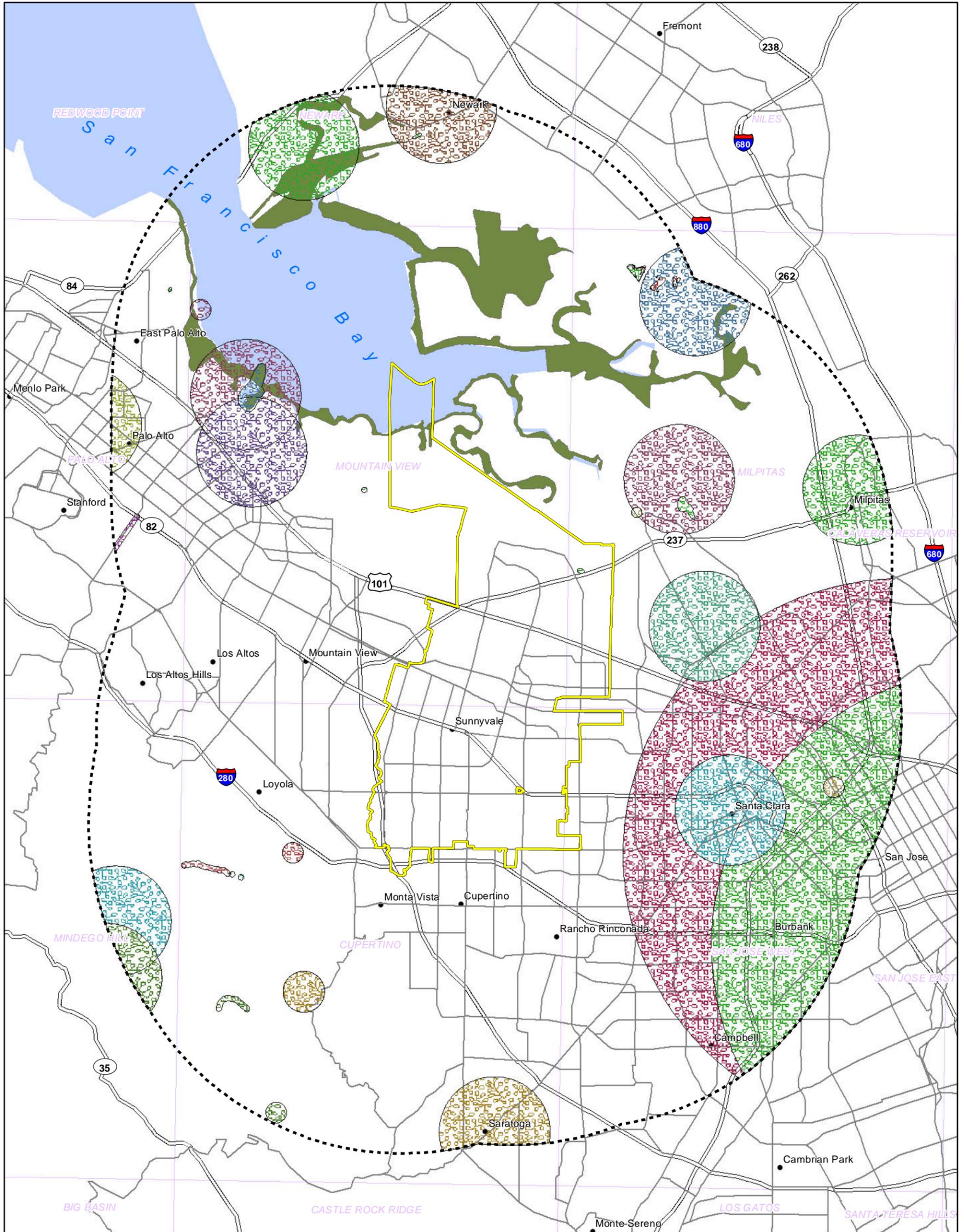
environments. Sensitive species that may inhabit the coastal and marine environment are listed in Table 4.2-1. The locations of special-status species and critical habitat documented in the vicinity of Sunnyvale as listed on the California Natural Diversity Database (CNDDDB) are mapped on Figures 4.2-1a and 4.2-1b.

**Table 4.2-1
 Coastal/Marine Special-Status Species**

Scientific Name	Common Name	Current Federal/State Status
Reptiles		
<i>Chelonia mydas</i>	Green sea turtle	FT
<i>Dermochelys coriacea</i>	Leatherback sea turtle	FE
<i>Lepidochelys olivacea</i>	Olive Ridley sea turtle	FT
Birds		
<i>Polioptila californica</i>	Coastal California gnatcatcher	FT
<i>Charadrius alexandrinus nivosus</i>	Western Snowy plover	FT/SSC
<i>Sterna antillarum browni</i>	California least tern	FE/SE
<i>Pelecanus occidentalis californicus</i>	Brown pelican	FE/delisted
<i>Athene cunicularia</i>	Burrowing owl	-/SSC
Mammals		
<i>Zalophus californianus</i>	California sea lion	MMPA
<i>Phoca vitulina</i>	Harbour seal	MMPA
<i>Enhydra lutris nereis</i>	Southern Sea otter	FT/MMPA
<i>Balaenoptera musculus</i>	Blue whale	FE/MMPA
<i>Balaenoptera physalus</i>	Finback whale	FE/MMPA
<i>Megaptera novaeangliae</i>	Humpback whale	FE/MMPA
<i>Balaenoptera borealis</i>	Sei whale	FE/MMPA
<i>Physeter catodon</i>	Sperm whale	FE/MMPA

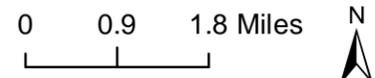
FT = Federally Threatened
 SSC = California Species of Special Concern
 FE = Federally Endangered
 SE = California Endangered
 MMPA = Protected by the Marine Mammal Protection Act
 - = no status but included in Rarefind database as deserving of concern





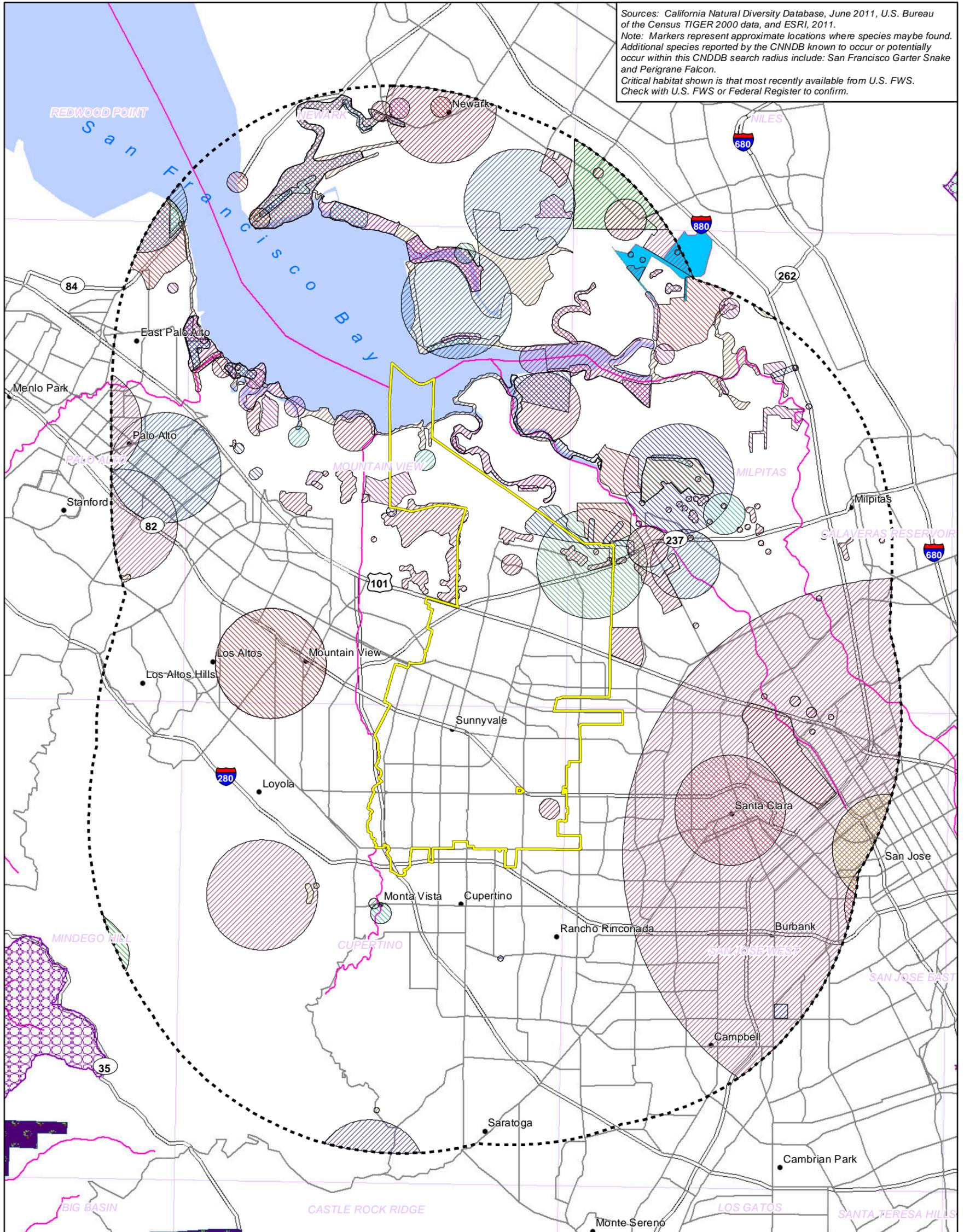
Sources: California Natural Diversity Database, June 2011, U.S. Bureau of the Census TIGER 2000 data, and ESRI, 2011.
 Note: Markers represent approximate locations where species may be found.

- | | | |
|---|---|--|
| <ul style="list-style-type: none"> 5-Mile Radius Buffer City of Sunnyvale | <p>Plants</p> <ul style="list-style-type: none"> California seablite Congdon's tarplant Contra Costa goldfields Franciscan onion Hall's bush-mallow Hoover's button-celery Loma Prieta hoita Point Reyes bird's-beak San Joaquin spearscale Santa Clara red ribbons alkali milk-vetch arcuate bush-mallow brittlescale hairless popcorn-flower lost thistle prostrate vernal pool navarretia robust monardella robust spineflower slender-leaved pondweed western leatherwood woodland woollythreads | <p>Natural Communities</p> <ul style="list-style-type: none"> Northern Coastal Salt Marsh |
|---|---|--|



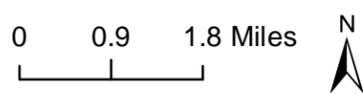
Sensitive Plants and Natural Communities Reported by the California Natural Diversity Database

Figure 4.2-1a
 City of Sunnyvale



Sources: California Natural Diversity Database, June 2011, U.S. Bureau of the Census TIGER 2000 data, and ESRI, 2011.
 Note: Markers represent approximate locations where species may be found. Additional species reported by the CNNDDB known to occur or potentially occur within this CNNDDB search radius include: San Francisco Garter Snake and Perigrane Falcon.
 Critical habitat shown is that most recently available from U.S. FWS. Check with U.S. FWS or Federal Register to confirm.

- | | |
|--|--|
| <ul style="list-style-type: none"> 5-Mile Radius Buffer City of Sunnyvale Critical Habitat CA Red-legged Frog FCH (3/17/2010) Vernal Pools Vernal Pool Tadpole Shrimp FCH (2/10/2006) Calif Central Coast Steelhead Alameda Whipsnake FCH Bay Checkerspot Butterfly Marbeled Murrelet | <p>Animals</p> <ul style="list-style-type: none"> Alameda song sparrow Alameda whipsnake California black rail California clapper rail California least tern California red-legged frog California tiger salamander Cooper's hawk Northern Coastal Salt Marsh Santa Cruz kangaroo rat Yuma myotis burrowing owl great blue heron hoary bat long-eared owl mimic tryonia (=California brackishwater snail) northern harrier pallid bat salt-marsh harvest mouse salt-marsh wandering shrew saltmarsh common yellowthroat snowy egret tricolored blackbird vernal pool tadpole shrimp western pond turtle western snowy plover white-tailed kite |
|--|--|



Sensitive Animals and Critical Habitat Reported by the California Natural Diversity Database and US Fish and Wildlife Service

Figure 4.2-1b
 City of Sunnyvale

c. Carryout Bags and Biological Resources. Carryout bags can affect biological resources either as a result of litter that enters the storm drain system and ultimately into coastal and marine environments.

Single-Use plastic carryout bags enter the biological environment primarily as litter. This can adversely affect terrestrial animal species, and marine species that ingest the plastic bags (or the residue of plastic bags) or become tangled in the bag (Green Cities California MEA, 2010). Based on the data collected for the Ocean Conservancy's Report from September 2009 Ocean Conservancy's International Coastal Cleanup Day, approximately 11% of total debris items collected were plastic bags (Ocean Conservancy, April 2010). Over 260 species of wildlife, including invertebrates, turtles, fish, seabirds and mammals, have been reported to ingest or become entangled in plastic debris. Ingestion or entanglement may result in impaired movement and feeding, reduced productivity, lacerations, ulcers, and death (Laist, 1997; Derraik and Gregory, 2009). Ingested plastic bags affect wildlife by clogging animal throats and causing choking, filling animal stomachs so that they cannot consume real food, and infecting animals with toxins from the plastic (Green Cities California MEA, 2010). In addition to affecting wildlife through physical entanglement and ingestion, plastic debris in the marine environment has been known to absorb and transport polychlorinated biphenyls (PCBs), phthalates, and certain classes of persistent organic pollutants (POPs) (Mato, Y., Isobe, T., Takada, H., et al., 2001; and, Moore, C.J.; Lattin, G.L., A.F. Zellers., 2005).

Single-use paper carryout bags are also released into the environment as litter. However, they generally have less impact on wildlife because they are not as resistant to breakdown as plastic; therefore, they are less likely to cause entanglement. In addition, although not a healthy food source, if single-use paper bags are ingested, they can be chewed effectively and may be digested by many animals.

Reusable bags can also be released into the environment as litter. However, because of the weight and sturdiness of these bags, reusable bags are less likely to be littered or carried from landfills by wind as litter compared to single-use plastic and paper bags (Green Cities California MEA, 2010). In addition, since reusable bags can be used up to 125 times (in accordance with the proposed Ordinance), reusable bags would be disposed of less often than single-use carryout bags. As such, reusable bags are less likely to enter the marine environment as litter. Thus, reusable bags are less likely to enter the environment as litter compared to single-use plastic or paper bags.

d. Regulatory Setting. Regulatory authority over biological resources is shared by federal, state, and local authorities under a variety of statutes and guidelines. Primary authority for general biological resources lies within the land use control and planning authority of local jurisdictions. The California Department of Fish and Game (CDFG) is a trustee agency for biological resources throughout the state under CEQA and also has direct jurisdiction under the California Fish and Game Code (CFGC). Under the State and Federal Endangered Species Acts, the CDFG and the U.S. Fish and Wildlife Service (USFWS) also have direct regulatory authority over species formally listed as Threatened or Endangered. The U.S. Department of Army Corps of Engineers (USACE) has regulatory authority over specific biological resources, namely wetlands and waters of the United States, under Section 404 of the federal Clean Water Act (CWA). The USACE also has jurisdiction over rivers and harbors through Section 10 of the CWA. Waters of the State fall under the jurisdiction of the CDFG



through the CFGC and the Regional Water Quality Control Board (RWQCB) through Section 401 of the CWA. The RWQCB also has jurisdiction over isolated waters and wetlands through the Porter-Cologne Water Quality Control Act.

Plants or animals have “special-status” due to declining populations, vulnerability to habitat change, or restricted distributions. Special-status species are classified in a variety of ways, both formally (e.g. State or Federally Threatened and Endangered Species) and informally (“Special Animals”). The USFWS and the National Marine Fisheries Service (NMFS) share responsibility for implementation of the federal Endangered Species Act, with the USFWS focused on terrestrial and freshwater species and the NMFS focused on marine species. The USFWS is also responsible for regulation of bird species listed under the Migratory Bird Treaty Act (MBTA) (16 United States Code [USC] Section 703-711) and the Bald and Golden Eagle Protection Act (16 USC Section 668).

The CDFG protects a wide variety of special status species through the CFGC. Under the CFGC, species may be formally listed and protected as Threatened or Endangered through the California Endangered Species Act (Fish and Game Code Section 2050 *et. seq.*). The CFGC also protects Fully Protected species, California Species of Special Concern (CSC), all native bird species (Fish and Game Code sections 3503, 3503.5, and 3511), and rare plants under the Native Plant Protection Act (Fish and Game Code Section 1900 *et seq.*).

4.2.2 Impact Analysis

a. Methodology and Significance Thresholds. Chapter 1, Section 21001(c) of CEQA states that it is the policy of the state of California to: “Prevent the elimination of fish and wildlife species due to man’s activities, ensure that fish and wildlife populations do not drop below self-perpetuating levels, and preserve for future generations representations of all plant and animal communities.” Environmental impacts relative to biological resources may be assessed using impact significance criteria encompassing checklist questions from the *CEQA Guidelines* and federal, state, and local plans, regulations, and ordinances. Project impacts to flora and fauna may be determined to be significant even if they do not directly affect rare, threatened, or endangered species.

The proposed Ordinance would create an air quality significant impact if it would:

1. *Have a substantially adverse impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S Wildlife Service*
2. *Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means*
3. *Interfere substantially with the movement of any resident or migratory fish or wildlife species or with established native resident migratory wildlife corridors, or impede the use of native wildlife nursery sites*
4. *Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance*
5. *Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, other approved local, regional, or state habitat conservation plan*



The Initial Study (see Appendix A) concluded that only the first criterion could potentially result in a significant impact, while the proposed Single-Use Carryout Bag Ordinance would result in no impact with respect to the second through fifth criterion. Hence, only the first criteria is addressed in this section.

b. Project Impacts and Mitigation Measures.

Impact BIO-1 The proposed Single-Use Carryout Bag Ordinance would incrementally increase the number of paper and reusable bags within Sunnyvale. However, the reduction in the amount of single-use plastic bags would be expected to incrementally reduce the amount of litter entering coastal and marine habitats, thus reducing litter-related impacts to sensitive species. This is a Class IV, *beneficial*, effect.

All carryout bags, including single-use plastic, paper, and reusable bags, have the potential to affect coastal habitats such as San Francisco Bay when bags are improperly disposed of. These bags can become litter that enters the storm drain system and ultimately enters into coastal and marine environments. As described in the *Setting*, litter that enters coastal habitats can adversely affect sensitive species that inhabit coastal and marine environments, including sea turtles, seals, whales, otters, or bird species as a result of ingestion or entanglement. However, each type of carryout bag's potential to become litter varies and is based on the number of bags disposed of as well as the bag's weight and material.

As described in Section 2.0, *Project Description*, typical single-use plastic bags weigh approximately five to nine grams and are made of thin (less than 2.25 mils thick) high density polyethylene (HDPE) (Hyder Consulting, 2007). Post-use from a retail store, a customer may reuse a single-use plastic bag at home, but eventually the bags are disposed in the landfill or recycling facility or discarded as litter. Although some recycling facilities handle plastic bags, most reject them because they can get caught in the machinery and cause malfunctioning, or are contaminated after use. Only about 5% of the plastic bags in California and nationwide are currently recycled (US EPA, 2005; Green Cities California MEA, 2010; and Boustead, 2007). The majority of single-use plastic bags end up as litter or in the landfill. Even those collected by recycling and solid waste trucks and handled at transfer stations and landfills may blow away as litter due to their light weight (Green Cities California MEA, 2010). Single-use plastic bags that become litter can enter storm drains and watersheds from surface water runoff or may be blown directly into the ocean by the wind.

As described in the *Setting*, when single-use plastic bags enter coastal habitats marine species can ingest them (or the residue of plastic bags) or may become entangled in the bag (Green Cities California MEA, 2010). Ingestion or entanglement in single-use plastic bags can result in choking, reduced productivity, lacerations, ulcers, and death to sensitive species in the marine environment, including sea turtles, seals, whales, otters, or bird species.

Single-use paper grocery bags also have the potential to enter the marine environment as litter. Paper grocery bags are typically produced from kraft paper and weigh anywhere from 50 to 100 grams, depending on whether or not the bag includes handles (AEA Technology, 2009). A paper bag weighs substantially more (by approximately 40 to 90 grams) than single-use plastic



bags. Because of the weight, biodegradability of the materials, and recyclability, single-use paper bags are less likely to become litter compared to single-use plastic bags (Green Cities California MEA, 2010). In addition, because single-use paper bags are not as resistant to breakdown, there would be less risk of entanglement if entering the marine environment compared to single-use plastic bags. In addition, although not a healthy food source, if ingested, a single-use paper bag can be chewed effectively and may be digested by many marine animals (Green Cities California MEA, 2010). Thus, although single-use paper bag litter may enter coastal habitats and affect sensitive species in the marine environment, the impacts would be less than those of single-use plastic bags.

Reusable bags may also become litter and enter the marine environment; however, these bags differ from the single-use bags in their weight and longevity. Reusable bags can be made from plastic or a variety of cloth such as vinyl or cotton. Built to withstand many uses, reusable bags weigh at least ten times what a single-use plastic bag weighs and two times what a single-use paper bag weighs, therefore restricting the movement by wind. Reusable bags are typically reused until worn out through washing or multiple uses, and then typically disposed either in the landfill or recycling facility. Because of the weight and sturdiness of these bags, reusable bags are less likely to be littered or carried from landfills by wind as litter compared to single-use plastic and paper bags (Green Cities California MEA, 2010). In addition, since reusable bags can be used up to 125 times (in accordance with the proposed Ordinance), reusable bags would be disposed of less often than single-use carryout bags. As such, reusable bags are less likely to enter the marine environment as litter. Therefore, reusable bags would generally be expected to result in fewer impacts to sensitive species than single-use plastic and paper carryout bags.

The proposed Ordinance would reduce plastic bag usage by 95% compared to existing conditions (from 75.2 million to 3.8 million bags annually), and would reduce total bag use by 49% (to 38.3 million plastic, single-use paper, and reusable bags).

This reduction in bags would be expected to generally reduce litter-related impacts to sensitive species. Therefore sensitive species such as sea turtles, mammals, and bird species would benefit from the proposed ordinance, which would reduce the amount of litter which could enter the marine environment. Impacts would be beneficial.

Mitigation Measures. As the impact would be beneficial, no mitigation is required.

Significance After Mitigation. Impacts to sensitive species as a result of the proposed ordinance would be beneficial without mitigation.

c. Cumulative Impacts. Adopted and pending carryout bag ordinances, as described in Table 3-1 in Section 3.0, *Environmental Setting*, would continue to reduce the amount of single-use carryout bags, and promote a shift toward reusable carryout bags. This shift would generally have beneficial effects with respect to sensitive biological resources. Six other agencies in San Francisco Bay Area region (County of Santa Clara, City of San Jose, Marin County, City of San Francisco, Alameda County, and the City of Palo Alto) have either adopted or are considering such ordinances. Similar to the proposed Sunnyvale ordinance, these other adopted and pending ordinances could incrementally reduce the number of plastic bags entering the environment, including the San Francisco Bay, as litter. These other ordinances would be expected to have similar beneficial effects. Therefore, there would be no cumulative impacts related to biological resources.



4.3 GREENHOUSE GAS EMISSIONS

This section analyzes the proposed Single-Use Carryout Bag Ordinance’s impacts related to global climate change. The analysis focuses on manufacturing, transportation and disposal of carryout bags as these are the largest contributors to greenhouse gas emissions.

4.3.1 Setting

a. Overview of Global Climate Change and Greenhouse Gases. Gases that trap heat in the atmosphere are often called greenhouse gases (GHGs). Common GHGs include water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxides (N₂O_x), fluorinated gases, and ozone. GHG are emitted by both natural processes and human activities. Of these gases, CO₂ and CH₄ are emitted in the greatest quantities from human activities. The accumulation of GHGs in the atmosphere regulates the earth’s temperature. However, it is believed that emissions from human activities, particularly the consumption of fossil fuels for electricity production and transportation, have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations. The rate of global climate change (GCC) has typically been incremental, with warming or cooling trends occurring over the course of thousands of years. However, scientists have observed an unprecedented acceleration in the rate of warming during the past 150 years likely due to the observed increase in anthropogenic GHG concentrations (United Nations Intergovernmental Panel on Climate Change [IPCC], November 2007). Current annual anthropogenic GHG emitted from the world, United States, and California are listed in Table 4.3-1.

**Table 4.3-1
 Annual Anthropogenic GHG Emissions**

Worldwide	United States	California
40,000 MM CDE	7,054 MM CDE	492 MM CDE

MM = million metric tons
 CDE = carbon dioxide equivalent

Source: IPCC, 2007; USEPA, April 2008; CEC, December 2006

California is the second largest emitter of GHGs among states and, if California were a country, it would be the sixteenth highest emitter among countries (AEP, 2007). Out of the 492 million metric tons of carbon dioxide equivalent (CDE¹) produced in California (7% of U.S. total), 41% is associated with transportation. Electricity generation is the second largest source, contributing 22% of the state’s GHG emissions (CEC, December 2006). Most, 81%, of California’s 2004 GHG

¹ Carbon dioxide equivalent (CDE or CO₂E) is a quantity that describes, for a given mixture and amount of GHGs, the amount of CO₂ (usually in metric tons; million metric tons [megatonne] = MMTCO₂E = terragram [Tg] CO₂ Eq; 1,000 MMT = gigatonne) that would have the same global warming potential (GWP) when measured over a specified timescale (generally, 100 years).



emissions (in terms of CDE) were CO₂ produced from fossil fuel combustion, with 2.8% from other sources of CO₂, 5.7% from methane, and 6.8% from nitrous oxide (CEC, December 2006).

b. Effects of Global Climate Change. GCC has the potential to affect numerous environmental resources through potential impacts related to future air temperatures and precipitation patterns. Scientific modeling predicts that continued GHG emissions at or above current rates would induce more extreme climate changes during the 21st century than were observed during the 20th century. A warming of about 0.2°C (0.36°F) per decade is projected, and there are identifiable signs that global warming could be taking place, including substantial ice loss in the Arctic (IPCC, 2007).

According to the California Energy Commission's (CEC) Draft Climate Action Team Biennial Report, potential impacts in California of global warming may include loss in snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years (CEC, March 2009). Below is a summary of some of the potential effects reported by an array of studies that could be experienced in California as a result of global climate change.

Air Quality. Higher temperatures, conducive to air pollution formation, could worsen air quality in California. Climate change may increase the concentration of ground-level ozone, but the magnitude of the effect, and therefore its indirect effects, are uncertain. If higher temperatures are accompanied by drier conditions, the potential for large wildfires could increase, which, in turn, would further worsen air quality. However, if higher temperatures are accompanied by wetter, rather than drier conditions, the rains would tend to temporarily clear the air of particulate pollution and reduce the incidence of large wildfires, thereby ameliorating the pollution associated with wildfires. Additionally, severe heat accompanied by drier conditions and poor air quality could increase the number of heat-related deaths, illnesses, and asthma attacks throughout the state (CEC, March 2009).

Water Supply. Uncertainty remains with respect to the overall impact of GCC on future water supplies in California. Studies have found that, "considerable uncertainty about precise impacts of climate change on California hydrology and water resources will remain, until we have more precise and consistent information about how precipitation patterns, timing, and intensity will change" (California Department of Water Resources [DWR], 2006). For example, some studies identify little change in total annual precipitation in projections for California (California Climate Change Center [CCCC], 2006). Other studies show substantially more precipitation (DWR, 2006). Even assuming that climate change leads to long-term increases in precipitation, analysis of the impact of climate change is further complicated by the fact that no studies have identified or quantified the runoff impacts that such an increase in precipitation would have in particular watersheds (CCCC, 2006). Also, little is known about how groundwater recharge and water quality will be affected (Id.). Higher rainfall could lead to greater groundwater recharge, although reductions in spring runoff and higher evapotranspiration could reduce the amount of water available for recharge (Ibid.).

The California Department of Water Resources (DWR, 2006) report on climate change and effects on the State Water Project (SWP), the Central Valley Project, and the Sacramento-San Joaquin Delta concludes that "[c]limate change will likely have a significant effect on



California's future water resources... [and] future water demand." DWR also reports that "much uncertainty about future water demand [remains], especially [for] those aspects of future demand that will be directly affected by climate change and warming. While climate change is expected to continue through at least the end of this century, the magnitude and, in some cases, the nature of future changes is uncertain" (DWR, 2006).

This uncertainty serves to complicate the analysis of future water demand, especially where the relationship between climate change and its potential effect on water demand is not well understood (DWR, 2006). DWR adds that "[i]t is unlikely that this level of uncertainty will diminish significantly in the foreseeable future." Still, changes in water supply are expected to occur, and many regional studies have shown that large changes in the reliability of water yields from reservoirs could result from only small changes in inflows (Kiparsky, 2003; DWR, 2006; Cayan, 2006, Cayan, D., et al, 2006).

Hydrology. As discussed above, climate changes could potentially affect: the amount of snowfall, rainfall, and snow pack; the intensity and frequency of storms; flood hydrographs (flash floods, rain or snow events, coincidental high tide and high runoff events); sea level rise and coastal flooding; coastal erosion; and the potential for salt water intrusion. Sea level rise may be a product of climate change through two main processes: expansion of sea water as the oceans warm and melting of ice over land. A rise in sea levels could result in coastal flooding and erosion and could jeopardize California's water supply. Increased storm intensity and frequency could affect the ability of flood-control facilities, including levees, to handle storm events.

Agriculture. California has a \$30 billion agricultural industry that produces half of the country's fruits and vegetables. Higher CO₂ levels can stimulate plant production and increase plant water-use efficiency. However, if temperatures rise and drier conditions prevail, water demand could increase; crop-yield could be threatened by a less reliable water supply; and greater ozone pollution could render plants more susceptible to pest and disease outbreaks. In addition, temperature increases could change the time of year certain crops, such as wine grapes, bloom or ripen, and thereby affect their quality (CCCC, 2006).

Ecosystems and Wildlife. Climate change and the potential resulting changes in weather patterns could have ecological effects on a global and local scale. Increasing concentrations of GHGs are likely to accelerate the rate of climate change. Scientists expect that the average global surface temperature could rise as discussed previously: 1.0-4.5°F (0.6-2.5°C) in the next 50 years, and 2.2-10°F (1.4-5.8°C) in the next century, with substantial regional variation. Soil moisture is likely to decline in many regions, and intense rainstorms are likely to become more frequent. Sea level could rise as much as two feet along most of the U.S. coast. Rising temperatures could have four major impacts on plants and animals: (1) timing of ecological events; (2) geographic range; (3) species' composition within communities; and (4) ecosystem processes, such as carbon cycling and storage (Parmesan, 2004; Parmesan, C. and H. Galbraith, 2004). In addition, increased CO₂ that is absorbed by the oceans could increase the acidity of the oceans and cause direct and indirect effects on organisms and their habitats such as coral reefs (The Royal Society, 2005).



While the above mentioned potential impacts identify the possible effects of climate change at a global and potentially statewide level, in general scientific modeling tools are currently unable to predict what impacts would occur locally.

c. Greenhouse Gas Emissions from Carryout Bags. Carryout bags have the potential to contribute to the generation of GHGs either through emissions associated with manufacturing process, truck trips delivering carryout bags to retailers or through disposal during landfill degradation. Each is summarized below.

Manufacturing Process. The manufacturing process to make carryout bags requires fuel and energy consumption which creates GHG emissions including CO₂, CH₄, N₂O_x, fluorinated gases, and ozone. In addition, fertilizers that are used on crops for resources such as cotton or pulp which are then utilized in the manufacturing of carryout bags also have the potential to emit N₂O_x. The amount of GHG emissions varies depending on the type and quantity of carryout bags produced. Compared to truck trips and disposal, the manufacturing process is the largest emitter of GHGs due to the high volume of fuel and energy consumption that is used during the process.

Truck Trips. Delivery trucks that transport carryout bags from manufacturers or distributors to the local retailers in Sunnyvale also create GHG emissions. GHG emissions from truck trips result primarily from the combustion of fossil fuels and include CO₂, CH₄, and N₂O. As discussed in the *Transportation/Circulation* section of the Initial Study (see Appendix A), based on a baseline population estimate in Sunnyvale of approximately 141,099 persons and a statewide estimate of approximately 533 plastic bags used per person per year, retail customers in the City of Sunnyvale currently use an estimated 75,231,202 plastic bags per year. Assuming 2,080,000 plastic bags per truck load (City of Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011; refer to Appendix A), this number of plastic bags would require approximately 35 truck trips per year to deliver these plastic carryout bags in Sunnyvale.

Disposal/Degradation. Once disposed of by customers, carryout bags that are not recycled are deposited to a landfill where they are left to decompose and degrade. Depending on the type and materials used, a carryout bag will degrade at various rates. When carryout bag materials degrade in anaerobic conditions at a landfill, CH₄ is emitted. This contributes to GCC (Green Cities California MEA, 2010).

GHG Emission Rates per Bag. Various studies have estimated GHG emissions for the different carryout bags (single-use plastic, paper or reusable bags) to determine a per bag GHG emissions rate. The Boustead Report (2007) compared single-use plastic and paper carryout bags and assumed that one paper bag could carry the same quantity of groceries as 1.5 plastic bags. Based on the Boustead Report (2007), 1,500 single-use plastic bags would generate 0.04 metric tons of Carbon Dioxide Equivalent (CDE) as a result of manufacturing, transportation, and disposal. Based on the Scottish Report (AEA Technology, 2005), through the manufacturing, transportation, and disposal of a single-use paper bag, GHG emissions result in 3.3 times the emissions compared to the manufacturing, use and disposal of a single-use plastic bag. Thus using the single-use plastic bag GHG emissions rate of 0.04 CDE per 1,500 from the Boustead Report, single-use paper bags would emit 0.132 CDE per 1,000 bags. If only used once, the manufacturing, use and disposal of a reusable LDPE carryout bag results in 2.6 times



the GHG emissions of a single-use HDPE plastic bag (AEA Technology, 2005). Thus, reusable LDPE carryout bags would emit 0.104 CDE per 1,000 bags (if used only once) (Stephen L. Joseph, 2009; AEA Technology, 2005; Ecobilan, 2004; Green Cities California MEA, 2010; and, City of Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011). However, it should be noted that if used over 20 times, a reusable LDPE carryout bag results in 0.1 times the GHG emissions of a single-use HDPE plastic bag (AEA Technology, 2005). The analysis used above uses the LDPE carryout bag as a representation of reusable bags in evaluating greenhouse gas impacts. There is no known available Life Cycle Assessment that evaluates all types of reusable bags (canvas, cotton, calico, etc.) with respect to potential GHG emissions. However, given the high rate of reuse by all types of reusable bags (up to 125 uses, as defined in the proposed Ordinance), the GHG emissions from these bags, when compared to the single-use plastic and paper carryout bags, are expected to be comparable to the LPDE bag or lower.

Table 4.3-2 lists the current GHG emissions associated with the manufacturing, transportation and disposal of carryout bags in Sunnyvale using the per bag GHG emissions rates discussed above and the estimated existing single-use plastic carryout bags used in Sunnyvale. As discussed in Section 4.1, *Air Quality*, based on a baseline population estimate in Sunnyvale of approximately 141,099 persons and a statewide estimate of approximately 533 plastic bags used per person per year, retail customers in the City of Sunnyvale currently use an estimated 75,231,202 plastic bags per year. As shown in Table 4.3-2, overall GHG emissions associated with plastic carryout bag use in Sunnyvale is 2,006 CDE per year or approximately 0.014 CDE per person in Sunnyvale per year.

**Table 4.3-2
 Existing Greenhouse Gas Emissions
 from Carryout Bags in Sunnyvale**

Bag Type	Existing Number of Bags Used per Year	GHG Impact Rate per Bag	CDE (metric tons)	CDE per year (metric tons)	CDE per Person³
Single-use Plastic	75,231,202*	1.0	0.04 per 1,500 bags**	2,006	0.014
Total				2,006	0.014

CDE = Carbon Dioxide Equivalent units

Source:

* Approximate estimate of reusable bags purchased in one year by Sunnyvale retail customers.

** Based on Boustead Report, 2007; Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011.

***Based on AEA Technology "Scottish Report, 2005; Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011.

³ Emissions per person are divided by the existing population of Sunnyvale – 141,099 (California Department of Finance, January 2011)



d. Regulatory Setting.

International and Federal Regulations. The United States is, and has been, a participant in the United Nations Framework Convention on Climate Change (UNFCCC) since it was signed on March 21, 1994. The Kyoto Protocol is a treaty, made under the UNFCCC, and was the first international agreement to regulate GHG emissions. It has been estimated that if the commitments outlined in the Kyoto Protocol are met, global GHG emissions could be reduced by an estimated 5% from 1990 levels, during the first commitment period of 2008–2012. Although the United States is a signatory to the Kyoto Protocol, Congress has not ratified the Protocol and the United States has not bound itself to the Protocol’s commitments (UNFCCC, 2007)

The United States is currently using a voluntary and incentive-based approach toward emissions reductions in lieu of the Kyoto Protocol’s mandatory framework. The Climate Change Technology Program (CCTP) is a multi-agency research and development coordination effort (led by the Secretaries of Energy and Commerce) that is charged with carrying out the President’s National Climate Change Technology Initiative (USEPA, December 2007; <http://www.epa.gov/climatechange/policy/cctp.html>).

To date, the United States Environmental Protection Agency (EPA) has not regulated GHGs under the Clean Air Act; however, the U.S. Supreme Court in *Massachusetts v. EPA* (April 2, 2007) held that the EPA can, and should, consider regulating motor-vehicle GHG emissions. On June 30, 2009, the EPA granted California’s request for a waiver to directly limit GHG tailpipe emissions for new motor vehicles beginning with the current model year. On December 7, 2009, the EPA determined that emissions of GHGs contribute to air pollution that “endangers public health and welfare” within the meaning of the Clean Air Act. This action finalizes the EPA’s “endangerment determination” initially proposed on April 17, 2009, and now obligates the EPA to regulate GHG emissions from new motor vehicles. This finding sets the stage for the inevitable regulation under the Clean Air Act of GHG emissions from a wide range of stationary and mobile sources unless Congress preempts such regulation by enacting climate change legislation. Although the EPA has not yet promulgated federal regulations limiting GHG emissions, further action is pending.

California Regulations. Assembly Bill (AB) 1493, requiring the development and adoption of regulations to achieve “the maximum feasible reduction of greenhouse gases” emitted by noncommercial passenger vehicles, light-duty trucks, and other vehicles used primarily for personal transportation, was signed into law in September 2002. In 2005, Executive Order S-3-05 established statewide GHG emissions reduction targets. S-3-05 provides that by 2010, emissions shall be reduced to 2000 levels; by 2020, emissions shall be reduced to 1990 levels; and by 2050, emissions shall be reduced to 80% of 1990 levels (CalEPA 2006).

In response to S-3-05, CalEPA created the Climate Action Team (CAT), which in March 2006, published the Climate Action Team Report (the “2006 CAT Report”) (CalEPA, 2006). The 2006 CAT Report identified a recommended list of strategies that the state could pursue to reduce GHG emissions. These are strategies that could be implemented by various state agencies to ensure that the S-3-05 targets are met and can be met with existing authority of the state agencies. Strategies include the reduction of passenger and light duty truck emissions, the



reduction of idling times for diesel trucks, an overhaul of shipping technology/ infrastructure, increased use of alternative fuels, increased recycling, and landfill methane capture.

AB 32, the “California Global Warming Solutions Act of 2006,” was signed into law in the fall of 2006. AB 32 required the ARB to adopt regulations to require reporting and verification of statewide GHG emissions. The ARB was required to produce a plan by January 1, 2009 to indicate how emission reductions will be achieved from major GHG sources via regulations, market mechanisms, and other actions. The bill requires achievement by 2020 of a statewide GHG emissions limit equivalent to 1990 emissions (essentially a 25% reduction below 2005 emission levels; the same requirement as under S-3-05), and the adoption of rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emissions reductions.

In response to the requirements of AB 32, the ARB produced a list of 37 early actions for reducing GHG emissions in June 2007. The ARB expanded this list in October 2007 to 44 measures that have the potential to reduce GHG emissions by at least 42 million metric tons of CO₂ emissions by 2020, representing about 25% of the estimated reductions needed by 2020 (ARB, October 2007). After completing a comprehensive review and update process, the ARB approved a 1990 statewide GHG level and 2020 limit of 427 MMT CDE. The scoping plan required under AB 32 was approved by the ARB Board on December 12, 2008, and it provides the outline for actions to reduce GHG in California. The scoping plan has a range of GHG reduction actions, which include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, market-based mechanisms such as a cap-and-trade system, and an AB 32 cost of implementation fee regulation to fund the program.

Senate Bill (SB) 97, signed in August 2007, acknowledges that GCC is an environmental issue that requires analysis under CEQA. In December 2009, the California Resources Agency (Resources Agency) adopted amendments to the State CEQA Guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions. The adopted guidelines give lead agencies the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHG and GCC impacts.

Executive Order S-01-07 was enacted on January 18, 2007. The order mandates that a statewide goal be established to reduce the carbon intensity of California’s transportation fuels by at least 10% by 2020. In addition, a Low Carbon Fuel Standard (“LCFS”) for transportation fuels is to be established for California.

Senate Bill (SB) 375, signed in August 2008, requires the inclusion of sustainable communities’ strategies (SCS) in regional transportation plans (RTPs) for the purpose of reducing GHG emissions. The bill requires ARB to set regional targets for the purpose of reducing greenhouse gas emissions from passenger vehicles, for 2020 and 2035. On January 23, 2009 ARB appointed a Regional Targets Advisory Committee (RTAC) to provide recommendations on factors to be considered and methodologies to be used in the ARB target setting process, as required under SB 375. The RTAC final report, issued on September 30, 2009, recommended “ambitious but achievable” targets, with a significant emphasis on improving home affordability (rents and mortgages) near job centers as a means to reduce driving.



For more information on the Senate and Assembly bills, Executive Orders, and reports discussed above, and to view reports and research referenced above, please refer to the following websites: www.climatechange.ca.gov and <http://www.arb.ca.gov/cc/cc.htm>.

Local Regulations and CEQA Requirements. Pursuant to the requirements of SB 97, the Resources Agency adopted amendments to the *CEQA Guidelines* for the feasible mitigation of GHG emissions and analysis of the effects of GHG emissions. The adopted *CEQA Guidelines* provide regulatory guidance on the analysis and mitigation of GHG emissions in CEQA documents, while giving lead agencies the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHGs and climate change impacts. To date, the Bay Area Air Quality Management District (BAAQMD), the South Coast Air Quality Management District (SCAQMD), and the San Joaquin Air Pollution Control District (SJVAPCD) have adopted significance thresholds for GHGs. BAAQMD's approach to developing a Threshold of Significance for GHG emissions is to identify the emissions level for which a project would not be expected to substantially conflict with existing California legislation adopted to reduce statewide GHG emissions needed to move us towards climate stabilization. If a project would generate GHG emissions above the threshold level, its contribution to cumulative impacts would be considered significant.

The proposed Single-Use Carryout Bag Ordinance would apply citywide. Therefore, for this analysis, the City's proposed Ordinance is evaluated based on a project-based threshold of 4.6 metric tons CO_{2e} per service population (defined to include both residents and employees) per year. The City does not recommend adoption of that threshold for any other purpose at this time, but it is used for this analysis for the following reasons. First, the 4.6 metric tons CO_{2e} per service population threshold was recently adopted by the Bay Area Air Quality Management District (BAAQMD) as a quantitative GHG emissions thresholds for project-level projects (BAAQMD, "California Environmental Quality Act: Air Quality Guidelines" (June 2010)). Based upon consultation with BAAQMD staff, this threshold was considered most reasonable for use in this analysis (personal communication Allison Kirk, BAAQMD Senior Environmental Planner, August 8, 2011). Second, the BAAQMD derived that "efficiency" metric from statewide compliance with AB 32, and so that metric may be appropriately applied in regions other than the Bay Area. Therefore, this threshold is considered reasonable for use in this EIR. Note that no air district has the power to establish definitive thresholds that will completely relieve a lead agency of the obligation to determine significance on a case-by-case basis for a specific project.

4.3.2 Impact Analysis

a. Methodology and Significance Thresholds. The *CEQA Guidelines* are used in evaluating the cumulative significance of GHG emissions from the proposed project. As described by *CEQA Guidelines* Section 15064.4, a lead agency shall have discretion to determine, in the context of a particular project, whether to:

1. *Use a model or methodology to quantify greenhouse gas emissions resulting from a project, and which model or methodology to use. The lead agency has discretion to select the model or methodology it considers most appropriate provided it supports its*



- decision with substantial evidence. The lead agency should explain the limitations of the particular model or methodology selected for use; and/or*
2. *Rely on a qualitative analysis or performance based standards.*

Further, a lead agency should consider the following factors, among others, when assessing the significance of impacts from greenhouse gas emissions on the environment:

1. *The extent to which the project may increase or reduce greenhouse gas emissions as compared to the existing environmental setting;*
2. *Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project; and*
3. *The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions. Such requirements must be adopted by the relevant public agency through a public review process and must reduce or mitigate the project's incremental contribution of greenhouse gas emissions. If there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with the adopted regulations or requirements, an EIR must be prepared for the project.*

Although this EIR is a programmatic EIR and the proposed Single-Use Carryout Bag Ordinance would not involve any specific development project or change any land use designations, this section provides a quantitative analysis to estimate GHG emissions.

The majority of individual projects do not generate sufficient GHG emissions to create a project-specific impact through a direct influence to global climate change; therefore, the issue of climate change typically involves an analysis of whether a project's contribution towards an impact is cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, other current projects, and probable future projects (CEQA Guidelines, Section 15355).

For future projects, the significance of GHG emissions may be evaluated based on locally adopted quantitative thresholds, or consistency with a regional GHG reduction plan (such as a Climate Action Plan). Although the City of Sunnyvale is in the process of developing a Climate Action Plan (CAP) that would set GHG Reduction Targets, the CAP is not yet finalized and has not been approved by the City Council at this time. Therefore, since the City of Sunnyvale does not have an adopted GHG reduction plan, the proposed Single-Use Carryout Bag Ordinance is evaluated based on the BAAQMD's project-level threshold of 4.6 metric tons CO₂e per service population (defined to include both residents and employees) per year (BAAQMD, "California Environmental Quality Act: Air Quality Guidelines" (June 2010)). It is important to again note that the City has not recommended that threshold for any other purpose at this time, but that numeric threshold is recommended for this analysis.



The proposed Ordinance would have a significant impact related to GHG emissions if the GHG emissions would result in more than 4.6 metric tons of CDE units per service population (residents and employees) per year. In addition, impacts would be significant if the proposed Ordinance would be inconsistent with any of the applicable greenhouse gas emissions reductions strategies.

b. Project Impacts and Mitigation Measures.

Impact GHG-1 **The proposed Single-Use Carryout Bag Ordinance would reduce the amount of single-use carryout bags in Sunnyvale and promote reusable bags, which are intended to be used multiple times. Implementation of the proposed Ordinance would incrementally increase GHG emissions compared to existing conditions. However, emissions would not exceed BAAQMD thresholds and would not conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases. Impacts would be Class III, less than significant.**

The intent of the proposed Single-Use Carryout Bag Ordinance is to reduce the use of single-use carryout bags, and to promote the use of reusable bags by Sunnyvale retail customers. As such, the proposed Ordinance would incrementally reduce the number of single-use plastic carryout bags that are manufactured and incrementally increase the number of single-use paper and reusable bags that are manufactured, transported, and disposed of compared to existing conditions.

As described in the *Setting*, through the manufacturing, transportation, and disposal, each single-use paper bag results in 3.3 times the emissions compared to the manufacturing, transportation and disposal of a single-use plastic bag. If only used once, the manufacturing, use and disposal of a reusable LDPE carryout bag results in 2.6 times the GHG emissions of a single-use HDPE plastic bag (Stephen L. Joseph, 2009; AEA Technology, 2005; Ecobilan, 2004; and Green Cities California MEA, 2010). Thus, on a per bag basis, single-use plastic bags have less impact than single-use paper and reusable carryout bags. However, reusable carryout bags are intended to be used multiple times. With reuse of carryout bags, fewer total carryout bags would need to be manufactured, transported or disposed of compared to the existing processing activities of single-use plastic bags. As described in Section 4.1, *Air Quality*, as a result of the proposed Ordinance, existing plastic bags used in Sunnyvale (75.2 million annually) would be replaced by an estimated 33.9 million single-use paper bags and 0.7 million reusable bags; an estimated 3,761,560 single-use plastic bags would remain in circulation (refer to Table 4.1-4). This represents a 95% reduction in single-use plastic bags and a 49% reduction in all types of carryout bags (including plastic, single-use paper, and reusable).

Table 4.3-3 provides an estimate of GHG emissions that would result from the reduction of carryout bags in Sunnyvale associated with the implementation of the proposed Single-Use Carryout Bag Ordinance. Although the total number of carryout bags would be reduced by approximately 37 million bags per year, as a result of the increase of single-use paper bags, GHG emissions associated with the manufacturing, transport, and disposal of carryout bags



would increase by approximately 0.016 CDE per person per year compared to existing conditions.

**Table 4.3-3
 Estimated Greenhouse Gas Emissions
 from Carryout Bags in Sunnyvale**

Bag Type	Estimated Number of Bags Used per Year*	GHG Impact Rate per Bag	CDE (metric tons)	CDE per year (metric tons)	CDE per Person³
Single-use Plastic	3,761,560	1.0	0.04 per 1,500 bags**	150	0.001
Single-use Paper	33,854,041	2.97 ¹	0.1188 per 1,000 bags ¹	4,022	0.029
Reusable	723,377	2.6	0.104 per 1,000 bags***	75	0.0005
Total				4,247	0.030
Existing				2,006	0.014
Net Change				2,241	0.016

CDE = Carbon Dioxide Equivalent units

** refer to Table 4.1-4 in Section 4.1, Air Quality.*

¹ 10% reduction (from a rate of 3.3) based on Santa Clara County Negative Declaration, October 2010 based on Environmental Defense Fund's Paper Calculator.

*** Based on Boustead Report, 2007; Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011.*

****Based on AEA Technology "Scottish Report, 2005; Santa Monica Single-use Carryout Bag Ordinance Final EIR, January 2011.*

³ Emissions per person are divided by the existing Sunnyvale population of 141,099 (Department of Finance, January 2011)

As shown in Table 4.3-3, the increase in GHG emissions associated with the manufacturing, transportation and disposal of carryout bags used in Sunnyvale as a result of the proposed Ordinance would be approximately 0.016 CDE per person per year (or a total of approximately 2,241 CDE per year). This represents approximately 0.00045% of California's statewide GHG inventory of 492 million CDE per year. The proposed Ordinance's increase of about 0.016 metric tons CDE per person per year compared to existing conditions (0.014 CDE per person per year) would not exceed the BAAQMD's 4.6 metric tons CDE per person per year threshold.

The proposed Ordinance would also be generally consistent with applicable regulations or plans addressing greenhouse gas reductions. As indicated above, the CAT published the Climate Action Team Report (the "2006 CAT Report") in March 2006. The CAT Report identifies a recommended list of strategies that the State could pursue to reduce climate change greenhouse gas emissions. The CAT strategies are recommended to reduce GHG emissions at a statewide level to meet the goals of the Executive Order S-3-05. These are strategies that could be implemented by various State agencies to ensure that the Governor's targets are met and can be met with existing authority of the State agencies. In addition, in 2008 the California Attorney General published The California Environmental Quality Act Addressing Global Warming Impacts at the Local Agency Level (Office of the California Attorney General, Global Warming Measures Updated May 21, 2008). This document provides information that may be helpful to



local agencies in carrying out their duties under CEQA as they relate to global warming. Included in this document are various measures that may reduce the global warming related impacts of a project. Tables 4.3-4 and 4.3-5 illustrate that the proposed Ordinance would be consistent with the GHG reduction strategies set forth by the 2006 CAT Report as well as the 2008 Attorney General’s Greenhouse Gas Reduction Measures.

**Table 4.3-4
Proposed Ordinance Consistency with Applicable Climate Action
Team Greenhouse Gas Emission Reduction Strategies**

<i>Strategy</i>	<i>Project Consistency</i>
California Air Resources Board	
<p><i>Vehicle Climate Change Standards</i></p> <p>AB 1493 (Pavley) required the state to develop and adopt regulations that achieve the maximum feasible and cost-effective reduction of climate change emissions emitted by passenger vehicles and light duty trucks. Regulations were adopted by the ARB in September 2004.</p>	<p>Consistent</p> <p>The trucks that deliver carryout bags to and from Sunnyvale on public roadways would be in compliance with ARB vehicle standards that are in effect at the time of vehicle purchase.</p>
<p><i>Diesel Anti-Idling</i></p> <p>The ARB adopted a measure to limit diesel-fueled commercial motor vehicle idling in July 2004.</p>	<p>Consistent</p> <p>Current State law restricts diesel truck idling to five minutes or less. Diesel trucks operating from and making deliveries to Sunnyvale are subject to this state-wide law.</p>
<p><i>Alternative Fuels: Biodiesel Blends</i></p> <p>ARB would develop regulations to require the use of 1 to 4% biodiesel displacement of California diesel fuel.</p>	<p>Consistent</p> <p>The diesel vehicles that deliver carryout bags to and from Sunnyvale on public roadways could utilize this fuel once it is commercially available.</p>
<p><i>Alternative Fuels: Ethanol</i></p> <p>Increased use of E-85 fuel.</p>	<p>Consistent</p> <p>Truck drivers delivering carryout bags could choose to purchase flex-fuel vehicles and utilize this fuel once it is commercially available regionally and locally.</p>
<p><i>Heavy-Duty Vehicle Emission Reduction Measures</i></p> <p>Increased efficiency in the design of heavy duty vehicles and an education program for the heavy duty vehicle sector.</p>	<p>Consistent</p> <p>The heavy-duty trucks that deliver carryout bags to and from Sunnyvale on public roadways would be subject to all applicable ARB efficiency standards that are in effect at the time of vehicle manufacture.</p>
<p><i>Achieve 50% Statewide Diversion Goal</i></p> <p>Achieving the State’s 50% waste diversion mandate as established by the Integrated Waste Management Act of 1989, (AB 939, Sher, Chapter 1095, Statutes of 1989), will reduce climate change emissions associated with energy intensive material extraction and production as well as methane emission from landfills. A diversion rate of 48% has been achieved on a statewide basis. Therefore, a 2% additional reduction is needed.</p>	<p>Consistent</p> <p>As of 2010, the City was diverting 67% of its solid waste, thereby complying with the standards established by AB 939. Any disposal of carryout bags would be required to adhere to the existing standards. The proposed Ordinance would also assist by promoting reusable carryout bags, thus reducing the amount of solid waste generated in the form of single-use carryout bags.</p>
<p><i>Zero Waste – High Recycling</i></p> <p>Efforts to exceed the 50% mandate would allow for additional reductions in climate change emissions.</p>	<p>Consistent</p> <p>As described above, the City exceeds the 50% goal of recycling by diverting 67% of its solid waste. The proposed Ordinance would assist by promoting reusable carryout bags, thus reducing the amount of solid waste generated in the form of</p>



**Table 4.3-4
Proposed Ordinance Consistency with Applicable Climate Action
Team Greenhouse Gas Emission Reduction Strategies**

<i>Strategy</i>	<i>Project Consistency</i>
	single-use carryout bags. The ordinance would also shift single-use bag consumption from plastic to paper. This would increase recycling of single-use bags because paper bags are recycled by services provided to each residence and workplace in the City. Consumer access to plastic bag recycling opportunities is limited.
Energy Commission (CEC)	
<i>Fuel-Efficient Replacement Tires & Inflation Programs</i> State legislation established a statewide program to encourage the production and use of more efficient tires.	Consistent Carryout bag delivery drivers could purchase tires for their vehicles that comply with state programs for increased fuel efficiency.
<i>Alternative Fuels: Non-Petroleum Fuels</i> Increasing the use of non-petroleum fuels in California's transportation sector, as recommended as recommended in the CEC's 2003 and 2005 Integrated Energy Policy Reports.	Consistent Carryout bag delivery drivers could purchase alternative fuel vehicles and utilize these fuels once they are commercially available regionally and locally.

**Table 4.3-5
Proposed Ordinance Consistency with Applicable
Attorney General Greenhouse Gas Reduction Measures**

<i>Strategy</i>	<i>Project Consistency</i>
Transportation-Related Emissions	
<i>Diesel Anti-Idling</i> Set specific limits on idling time for commercial vehicles, including delivery vehicles.	Consistent Currently, the CARB's Airborne Toxic Control Measure (ATCM) to Limit Diesel-Fueled Commercial Motor Vehicle Idling restricts diesel truck idling to five minutes or less. Diesel trucks delivering carryout bags to Sunnyvale are subject to this state-wide law.
Solid Waste and Energy Emissions	
<i>Solid Waste Reduction Strategy</i> Project construction shall require reuse and recycling of construction and demolition (C&D) waste.	Consistent As described above, the City exceeds the 50% mandate and diverts 67% of its solid waste. Single-use carryout bags make up a portion of C&D waste. The proposed Ordinance would also assist by promoting reusable carryout bags, thus reducing the amount of C&D waste attributed to single-use carryout bags. Any disposal of carryout bags would be required to adhere to the existing standards.

The proposed Single-Use Carryout Bag Ordinance would result in a net increase of approximately 0.016 metric tons CDE per person per year. However, both the increase of GHG emissions compared to existing conditions and the total emissions after implementation of the Ordinance would be less than 4.6 metric tons CDE per person per year and the Single-Use Carryout Bag Ordinance would be consistent with the CAT strategies and measures suggested in



the Attorney General's Greenhouse Gas Reduction Report as discussed in tables 4.3-4 and 4.3-5. Therefore, the Single-Use Carryout Bag Ordinance would be consistent with the objectives of AB 32, SB 97, and SB 375. Impacts would be less than significant.

Mitigation Measures. Mitigation is not required since the impact would not be significant.

Significance after Mitigation. Impacts would be less than significant without mitigation.

c. Cumulative Impacts. Adopted and pending carryout bag ordinances, as described in Table 3-1 in Section 3.0, *Environmental Setting*, would continue to reduce the amount of single-use carryout bags, and promote a shift toward reusable carryout bags. Similar to the proposed Sunnyvale ordinance, such ordinances would be expected to generally reduce the overall number of bags manufactured and associated greenhouse gas emissions. Similar to the proposed Sunnyvale ordinance, other adopted and pending ordinances could incrementally change the greenhouse gas emissions associated with bag manufacturing. Seven other agencies in the San Francisco Bay Area region (County of Santa Clara, City of San Jose, Marin County, City of Fairfax, City of San Francisco, Alameda County, and the City of Palo Alto) have either adopted or are considering such ordinances. However, based on the incremental increase in per capita emissions, the other ordinances are not expected to generate a cumulative increase in GHG emissions. For these reasons, cumulative significant impacts associated with implementation of carryout bag ordinances throughout the state are not anticipated.



4.4 HYDROLOGY and WATER QUALITY

This section analyzes the proposed Single-Use Carryout Bag Ordinance's potential to adversely affect hydrology and water quality.

4.4.1 Setting

Carryout bags are manufactured at various facilities, which may or may not be located in Sunnyvale or in Santa Clara County. Therefore, impacts to hydrology and water quality are not limited to the local watershed. However, for this analysis the local watershed and hydrologic conditions are discussed and used as an example of the types of effects that may occur as a result of the manufacturing and disposal of carryout bags.

a. Surface Water Drainage and Carryout Bags. Sunnyvale is located within the Santa Clara Basin, which drains directly to San Francisco Bay. The Santa Clara Basin includes the portion of the Bay south of Dumbarton Bridge and the 840-square mile area of wetlands that drains into it (Santa Clara Basin Watershed Management Initiative, March 2003). It is bounded by the Dumbarton Bridge to the north, the crest of the Diablo Mountains to the east, and the crest of the Santa Cruz Mountains to the west and south. The Basin is comprised of 13 watersheds. Sunnyvale is located within the Sunnyvale East Channel and the Sunnyvale West Channel Watersheds, which are two artificial channels constructed by the Santa Clara Valley Water District to provide drainage for a large area in Sunnyvale between Calabazas Creek and Stevens Creek (Santa Clara Basin Watershed Management Initiative, March 2003). The Sunnyvale West Channel watershed is located to the east of Stevens Creek. The Sunnyvale East Channel watershed is located to the west of Calabazas Creek. The Sunnyvale East Channel empties into Guadalupe Slough and the Sunnyvale West Channel drains into Moffett Channel and then into Guadalupe Slough (Santa Clara Basin Watershed Management Initiative, March 2003).

Urban runoff within Sunnyvale consists of stormwater runoff from rainfall as well as non-stormwater runoff from human activities (e.g. over-irrigation of landscapes, vehicle washing, discharges from pools, spas, or water features, etc.). Urban runoff is collected and transported through the City's storm drain system and ultimately discharged to local waterways like Calabazas Creek and Guadalupe Slough.

Carryout bags that enter the storm drain system may affect storm water flow by clogging drains and redirecting flow. As described in Section 4.2, *Biological Resources*, typical single-use plastic bags weigh approximately five to nine grams and are made of thin (less than 2.25 mils thick) high density polyethylene (HDPE) (Hyder Consulting, 2007). Post-use from a retail store, a customer may reuse a single-use plastic bag at home, but eventually the bags are disposed in the landfill or recycling facility or discarded as litter. Although some recycling facilities handle plastic bags, most reject them because they get caught in the machinery and cause malfunctioning, or are contaminated after use. Only about 5% of the plastic bags in California and nationwide are currently recycled (Green Cities California MEA, 2010; and Boustead, 2007). The majority of single-use plastic bags end up as litter or in the landfill. Even those collected by recycling and solid waste trucks and handled at transfer stations and landfills may blow away



as litter due to their light weight (Green Cities California MEA, 2010). Single-Use plastic bags that become litter can enter storm drains and may clog catch basins or be transported to the local watershed, the San Francisco Bay, or the Pacific Ocean.

Single-Use paper grocery bags also have the potential to enter the storm drains as litter. However, as described in Section 4.2, *Biological Resources*, because of the weight, biodegradability of the materials, and recyclability, single-use paper bags are less likely to become litter compared to single-use plastic bags (Green Cities California MEA, 2010). In addition, because single-use paper bags are not as resistant to breakdown, there is less potential to clog catch basins compared to single-use plastic bags. Thus, although single-use paper bag litter may enter storm drains and affect hydrologic flow of surface water runoff, the potential to enter storm drains and cause hydrologic affects is less than with single-use plastic bags.

Reusable bags may also become litter and enter storm drains; however, these bags differ from the single-use bags in their weight and longevity. Reusable bags can be made from plastic or a variety of cloth such as vinyl or cotton. Built to withstand many uses, reusable bags weigh at least ten times what a single-use plastic bag weighs and two times what a single-use paper bag weighs, therefore restricting the movement by wind. Reusable bags are typically reused until worn out through washing or multiple uses, and then typically disposed either in the landfill or recycling facility. Because of the weight and sturdiness of these bags, reusable bags are less likely to become litter or be carried from landfills by wind as litter compared to single-use plastic and paper bags (Green Cities California MEA, 2010). Therefore, reusable bags are less likely to enter the storm drain system as litter.

b. Water Quality and Carryout Bags. The City of Sunnyvale conducts an extensive water quality monitoring program as required by and to document compliance with all applicable State and Federal requirements. 2,392 samples are collected from the distribution system, imported sources, wells in operation, storage tanks, and/or household taps, depending on the constituent of interest. Samples are analyzed by either the City's State-certified laboratory or an outside State-certified laboratory. The City has been in consistent compliance with the requirements of its water quality monitoring program since it was instituted in 1988.

Water quality may be affected by carryout bags in two different ways, litter from carryout bags and the use of materials for processing activities. As described above in *Surface Water Drainage and Water Quality*, litter that enters the storm drain system may clog storm drains and could result in contamination or may be transported into the local watershed or coastal habitat, violating waste discharge requirements (as described below in the *Regulatory Setting*). In addition, manufacturing facilities may utilize materials that, if released in an uncontrolled manner, could degrade the water quality in local waterways.

While single-use plastic bags are more likely to affect water quality as a result of litter, the manufacturing process utilizes "pre-production plastic," which may degrade water quality if released either directly to a surface water body or indirectly through storm water runoff. Single-Use paper carryout bags have less litter-related effect on water quality than single-use plastic bags; however, the manufacturing process for paper bags may utilize various chemicals and materials and may also require the use of fertilizers, pesticides and other chemicals for production of resources (such as pulp). This may increase the potential for higher natural



concentrations of trace metals, biodegradable wastes (which affect dissolved oxygen levels), and excessive major nutrients such as nitrogen and phosphorus if discharged into water bodies, either directly or indirectly through storm water runoff. If released into the environment, these potential pollutants can degrade water quality in local water bodies.

Reusable carryout bags are less likely to affect water quality. Because of the weight and sturdiness of these bags, reusable bags are less likely to be littered or carried from landfills by wind as litter compared to single-use plastic and paper bags (Green Cities California MEA, 2010). However, similar to single-use paper carryout bags, the manufacturing process for reusable bags can utilize materials such as chemicals or fertilizer for production of resources (such as cotton) that if released, either directly to a stream or indirectly via storm water runoff, could degrade water quality in local water bodies.

c. Regulatory Setting. The federal Clean Water Act (CWA) and the California Ocean Plan are the primary mechanisms through which pollutant discharges are regulated in California. The CWA established minimum national water quality goals and created the National Pollutant Discharge Elimination System (NPDES) permit system to regulate the quality of discharged water. All dischargers must obtain NPDES permits. Beginning in 1991, all municipal and industrial storm water runoff is also regulated under the NPDES system. Although the CWA has established 126 “priority contaminants” (metals and organic chemicals), the California Ocean Plan has established effluent limitations for 21 of these pollutants.

The U.S. Environmental Protection Agency (EPA) is the primary Federal agency responsible for implementing the CWA. The Regional Water Quality Control Board (RWQCB) is the primary state agency responsible for implementing the CWA and the state’s Porter-Cologne Water Quality Act within state waters. The RWQCB is also responsible for water quality regulation through its work in preparing and adopting the California Ocean Plan. Local agencies also have responsibility for managing wastewater discharges. All are required to meet criteria set forth in their NPDES permits, to monitor their discharges, and to submit monthly reports to the RWQCB and the EPA.

Assembly Bill (AB) 258 was enacted in 2008 to address problems associated with releasing "preproduction plastic" (including plastic resin pellets and powdered coloring for plastics) into the environment. The bill enacted Water Code Section 13367, requiring the State Water Resource Control Board and RWQCBs to implement a program to control discharges of preproduction plastic from point and nonpoint sources (Green Cities California MEA, 2010). Program control measures must, at a minimum, include waste discharge, monitoring, and reporting requirements that target plastic manufacturing, handling, and transportation facilities. The program must, at a minimum, require plastic manufacturing, handling, and transportation facilities to implement best management practices to control discharges of preproduction plastics. This includes containment systems, careful storage of pre-production plastics, and the use of capture devices to collect any spills.

The State Water Resources Control Board (SWRCB, 2010) reports that it is taking the following actions to comply with Section 13367:

“State and Regional Water Board staff has conducted and are continuing to conduct



compliance inspections of various types and scales of preproduction plastic manufacturing, handling, and transport facilities enrolled under California's Industrial General Permit (IGP) for storm water discharges...Collectively these inspections will help State and Regional Water Board staff to develop cost-effective regulatory approaches (including compliance-evaluation procedures and appropriate best management practices) for addressing this pollution problem.

"The State Water Board has issued an investigative order to all plastic-related facilities enrolled under the IGP to provide the State Water Board with critical information needed to satisfy the legislative mandates in AB 258 (Krekorian). Facilities subject to this order must complete an online evaluation and assess their points of potential preproduction plastics discharge and means of controlling these discharges. Data gathered as a result of this effort will be used to help the State Board understand the California plastics industry and ultimately develop appropriate regulation of these facilities to ensure compliance with the Clean Water Act."

The City of Sunnyvale is one of 76 co-permittees listed under a regional municipal stormwater permit for the San Francisco Bay. On October 14, 2009, order No. R2-2009-0074 was adopted by the Regional Water Quality Control Board (RWQCB) for Region 2. This permit regulates discharges from municipal separate storm drain systems into waterways under each co-permittee's jurisdiction.

The City of Sunnyvale has developed an Urban Runoff Management Plan (URMP) to reduce, control, or otherwise address pollutant sources in discharges to the storm drain system. Departments within the City of Sunnyvale have adopted Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) to reduce the presence of pollutants in stormwater discharges to the maximum extent practicable.

The Sunnyvale URMP focuses on prevention of illicit connection/illegal dumping, quality of industrial and commercial discharges, and minimizing impacts from new development and construction activities. The City implements BMPs for maintaining street and roads, storm drains, and water utilities, and preventing stormwater pollution. The City also provides public education and outreach activities related to the prevention of discharges of pollutants such as pesticides, copper, mercury, and other wastes that may have an impact on water quality.

4.4.2 Impact Analysis

a. Methodology and Significance Thresholds. The proposed Ordinance would create a significant hydrology or water quality impact if it would:

1. Place housing within a 100-year floodplain, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map
2. Place within a 100-year flood hazard area structures which would impede or redirect flood flows
3. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam
4. Violate any water quality standards or waste discharge requirements



5. *Substantially degrade groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)*
6. *Otherwise substantially degrade water quality*
7. *Create or contribute runoff which would exceed the capacity of existing or planned storm water drainage systems in a manner which could create flooding or provide substantial additional sources of polluted runoff*
8. *Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river*

The Initial Study (see Appendix A) concluded that only the fourth and sixth criteria could potentially result in a significant impact, while the proposed Single-Use Carryout Bag Ordinance would result in no impact with respect to the first, second, third, seventh, and eighth criteria. Hence, only the fourth and sixth criteria are addressed in this section. The fifth criterion is addressed in Section 4.5, *Utilities and Service Systems*.

b. Project Impacts and Mitigation Measures.

Impact HWQ-1 **Although the proposed Single-Use Carryout Bag Ordinance would incrementally increase the number of single-use paper and reusable bags used in Sunnyvale, the overall reduction in the total amount of carryout bags would incrementally reduce the amount of litter and waste entering storm drains, improving water quality. This would be a Class IV, beneficial, effect.**

As a result of the proposed Ordinance, existing plastic bags used in Sunnyvale (75.2 million annually) would be replaced by an estimated 33.9 million single-use paper bags and 0.7 million reusable bags; an estimated 3,761,560 single-use plastic bags would remain in circulation (refer to Table 4.1-4 in Section 4.1, *Air Quality*). This represents a 95% reduction in single-use plastic bags and a 49% reduction in all types of carryout bags (including plastic, single-use paper, and reusable).

Each type of carryout bag's potential to become litter is based on the bag's weight, material and quantity of bags used within Sunnyvale. As described in Impact BIO-1 in Section 4.2, *Biological Resources*, the majority of single-use plastic bags end up as litter or in the landfill. Even those collected by recycling and solid waste trucks and handled at transfer stations and landfills may blow away as litter due to their light weight (Green Cities California MEA, 2010). Single-use plastic bags that become litter may enter storm drains from surface water runoff or may be blown directly into local waterways by the wind. Single-use plastic bag litter that enters the storm drain system can block or clog drains resulting in contamination (Green Cities California MEA, 2010). Based on the statewide data that currently almost 20 billion plastic grocery bags (or approximately 533 bags per person) are consumed annually in California (Green Cities California MEA, 2010), retail customers in the City of Sunnyvale currently use approximately 75,231,202 plastic bags per year.



Similarly, single-use paper grocery bags also have the potential to enter storm drains and local waterways as litter. However, as described in Impact BIO-1 in Section 4.2, *Biological Resources*, due to the weight, biodegradability of the materials, and recyclability, single-use paper bags are less likely to become litter compared to single-use plastic bags (Green Cities California MEA, 2010). In addition, because single-use paper bags are not as resistant to breakdown, it would be less likely for single-use paper bags to block or clog drains compared to single-use plastic bags and would therefore be less likely to result in storm drain blockage or contamination compared to single-use plastic bags.

Due to the weight and sturdiness of reusable bags made for multiple uses, reusable bags are less likely to be littered or carried from landfills by wind as litter compared to both single-use plastic and paper bags (Green Cities California MEA, 2010). Reusable bags are less likely to become litter compared to single-use plastic and paper carryout bags. Therefore, shifting toward greater use of reusable bags would not degrade water quality compared to existing conditions as a result of litter, nor would it increase the potential for storm drain blockage.

As described in Section 4.1, *Air Quality*, and Section 4.3, *Greenhouse Gas Emissions*, the proposed Ordinance is anticipated to reduce the overall amount of carryout bags used in Sunnyvale per year by approximately 36.8 million bags. Therefore, the proposed Single-Use Carryout Bag Ordinance would reduce the amount of litter associated with single-use plastic carryout bags. Consequently, water quality would benefit from the proposed Single-Use Carryout Bag Ordinance, which would be expected to reduce the amount litter that could enter storm drains and local waterways, thus improving water quality and reducing the potential for storm drain blockage.

Mitigation Measures. Water quality and storm drains and associated hydrological conditions would benefit from the proposed Single-Use Carryout Bag Ordinance because the proposed ordinance would be expected to incrementally reduce the amount of litter that enters the storm drain system and local waterways, thereby improving water quality. Therefore, mitigation is not required.

Significance After Mitigation. Impacts to water quality and storm drain operation from litter entering storm drains and local waterways would be beneficial without mitigation.

Impact HWQ-2 **A shift toward reusable bags could potentially alter processing activities related to bag production, which could potentially degrade water quality in some instances and locations. However, bag manufacturers would be required to adhere to existing regulations including NPDES Permit requirements, AB 258 and the California Health and Safety Code. Therefore, impacts to water quality from altering bag processing activities would be Class III, less than significant.**

The manufacturing process for single-use plastic, single-use paper, and reusable carryout bags utilize various chemicals and materials. Single-use plastic bag manufacturers utilize “pre-production plastic.” As discussed in the *Setting*, single-use paper carryout bags and reusable carryout bag manufacturers may utilize various chemicals and materials and may also require



the use of fertilizers, pesticides and other chemicals for production of resources (such as pulp or cotton) which may increase the potential for higher natural concentrations of trace metals, biodegradable wastes (which affect dissolved oxygen levels), and excessive major nutrients such as nitrogen and phosphorus. Similar to single-use paper carryout bags, the manufacturing process for reusable bags can utilize materials such as chemicals or fertilizer for production of resources (such as cotton) that if released, either directly to a stream or indirectly via storm water runoff, could degrade water quality in local water bodies. If released into the environment, these pollutant materials from the processing activities for carryout bags could degrade water quality.

The intent of the proposed Single-Use Carryout Bag Ordinance is to reduce the amount of single-use carryout bags and promote the use of reusable bags by Sunnyvale retail customers. The ordinance is anticipated to reduce single-use plastic bags in Sunnyvale by 95% and reduce the use of all types of bags (including plastic, single-use paper, and reusable) by 49%. These shifts in the types and amounts of carryout bags used could potentially alter processing activities related to bag production. The manufacturing impacts of each bag type and the anticipated changes in use are described below.

Single-Use Plastic Bags. Conventional single-use plastic bags are a product of the petrochemical industry and are typically produced by independent manufacturers who purchase virgin resin from petrochemical companies or obtain non-virgin resin from recyclers or other sources. Single-use plastic bags begin the manufacturing process with the conversion of crude oil or natural gas into hydrocarbon monomers, which are then further processed into polymers. These polymers are heated to form plastic resins, which are then blown through tubes to create the air pocket of the bag. Once cooled, the plastic film is stretched to the desired size of the bag and cut into individual bags (Green Cities California MEA, 2010). As described in the *Setting*, the plastic resin pellets are a concern when accidentally released (from spilling into storm drains during use or transport) into aquatic environments. AB 258 was enacted to address these concerns by implementing program control measures that require plastic manufacturing, handling, and transportation facilities to implement best management practices to control discharges (accidental release from spilling) of preproduction plastics. This includes containment systems, careful storage of pre-production plastics, and the use of capture devices to collect any spills.

Products used in the process to manufacture single-use plastic bags, such as petroleum and natural gas, also have the potential to be released as result of an accident during transport or use. However, regulatory agencies such as the EPA set forth Preliminary Remediation Goals (PRGs) for various pollutants in soil, air, and tap water (EPA Region IX, Preliminary Remediation Goals Tables, 2004). PRG concentrations can be used to screen pollutants in environmental media, trigger further investigation, and provide initial cleanup goals resulting from an accident or spill of petroleum or natural gas at a single-use plastic bag manufacturing facility.

Single-Use Paper Bags. The majority of single-use paper bags are made from Kraft paper bags, which are manufactured from a pulp that is produced by digesting a material into its fibrous constituents via chemical and/or mechanical means. Kraft pulp is produced by chemical separation of cellulose from lignin. Chemicals used in this process include caustic



sodas, sodium hydroxide, sodium sulfide, and chlorine compounds (Green Cities California MEA, 2010). Processed and then dried and shaped into large rolls, the paper is then printed, formed into bags, baled, and then distributed to grocery stores. Although it does not directly discharge pollutants, the paper bag manufacturing process may utilize fertilizers, pesticides and other chemicals in the production of resources such as pulp. These pollutants may increase the potential for higher concentrations of trace metals, biodegradable wastes (which affect dissolved oxygen levels), and excessive major nutrients such as nitrogen and phosphorus, causing eutrophication as a result of surface water runoff. A single-use paper bag has 14 times the impact of one single-use plastic bag on eutrophication, which is caused when nitrate and phosphate are emitted into water, stimulating excessive growth of algae and other aquatic life (Green Cities California MEA, 2010). Eutrophication reduces the water quality and causes a variety of problems such as a lack of oxygen in the water (Green Cities California MEA, 2010). However, direct discharges of pollutants into waters of the United States are not allowed, except in accordance with the National Pollutant Discharge Elimination System (NPDES) program established in Section 402 of the Clean Water Act (CWA).

Single-use paper bag manufacturers are required to comply with the local plans and policies of the SWRCB and the RWQCB, which regulate discharges to surface and groundwater, regulate waste disposal sites, and require clean up of discharges of hazardous materials and other pollutants. For example, in the City of Sunnyvale, single-use paper bag manufacturers would be required to adhere to the Sunnyvale Urban Runoff Management Plan (URMP) which specifies Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) to reduce the presence of pollutants in stormwater discharges to the maximum extent practicable. Single-use paper bag manufacturing facilities would be required to implement BMPs, reducing the likelihood that pollutants would enter storm drains and other aquatic environments. It should be noted, however, there are no known single-use bag manufacturers in the City of Sunnyvale or Santa Clara County.

Reusable Bags. Reusable bags can be manufactured with various materials, including polyethylene (PE) plastic, polypropylene (PP) plastics, multiple types of cloth (cotton canvas, nylon, etc.), and recycled plastic beverage containers (polyethylene terephthalate, or PET), among others (Green Cities California MEA, 2010). Depending on the type of material used in the manufacturing process, reusable bags have various impacts to water quality. A single reusable LDPE bag has 2.8 times the impact of a single-use plastic bag on eutrophication as result of the use of pollutants that are used for materials in the manufacturing process (Green Cities California MEA, 2010). In addition, other types of reusable bags, such as cotton canvas, may require the use of fertilizers, pesticides and other chemicals in the production process. These pollutants may increase the potential for higher natural concentrations of trace metals, biodegradable wastes (which affect dissolved oxygen levels), and excessive major nutrients such as nitrogen and phosphorus causing eutrophication as a result of surface water runoff. However, with reuse of a LDPE or cotton canvas bag as intended, impacts to eutrophication would be lower in comparison to a single-use plastic bag and a single-use paper bag since reusable bags are intended to be used “hundreds of times” (Green Cities California MEA, 2010). Therefore, each reusable bag would be expected to replace hundreds of single-use plastic or paper bags, more than offsetting the increased impacts associated with each individual bag.

As with other types of carryout bags, reusable bag manufacturers would not be allowed to directly discharge pollutants into waters of the United States, except in accordance with the NPDES program established in Section 402 of the CWA. Reusable bag manufacturers may be required to obtain an “Individual” NPDES Permit and/or would need to adhere to an existing “General” NPDES Permit of the local area. An Individual NPDES permit regulates and limits the particular discharge at the manufacturing facility. The permit limits are based on the type of activity, nature of discharge and receiving water quality. Manufacturing facilities would need to apply for and obtain a permit prior to the start of manufacturing operations. In addition, as part of the Individual Permit, a manufacturing facility would be required to monitor and report its discharges to the local Regional Water Quality Control Board to demonstrate that the facility’s discharges are not in violation of any water quality standards.

Manufacturing facilities would also be required to adhere to existing General Permits that specify local discharge requirements for municipal storm water and urban runoff discharges. For example, in the City of Sunnyvale, single-use paper bag manufacturers would be required to adhere to the Sunnyvale Urban Runoff Management Plan (URMP) which specifies Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) to reduce the presence of pollutants in stormwater discharges to the maximum extent practicable.

Although reusable bags may utilize various materials, reusable carryout bag manufactures who utilize plastics in their production (for example, production of LPDE reusable bags) would also be required to adhere to pending requirements specified in AB 258, which addresses the release of “preproduction plastics” as described in the *Setting*. In addition, the California Health and Safety Code (Section 25531-25543.3) establishes a program for the prevention of accidental releases of regulated substances. With adherence to Health and Safety Code Section 25531-25543.3, reusable carryout bag manufacturing facilities would be required to prepare and update a Risk Management Plan (RMP). This would further reduce the potential for a release of substances that may be washed into and through the storm drainage systems, local waterways, and ultimately to the San Francisco Bay.

Anticipated Changes in Bag Use. Based on a cost requirement of at least \$0.15 per bag, as outlined in Section 4.1, *Air Quality*, it is assumed in this analysis that the total volume of plastic bags currently used in Sunnyvale (approximately 75,231,202 plastic bags per year) would be replaced by approximately 45% paper bags and 50% reusable bags as a result of the Single-Use Carryout Bag Ordinance. It is assumed that 5% of the existing total of single-use plastic bags used in Sunnyvale would remain in use since the Ordinance does not apply to some retailers who distribute plastic bags (e.g. restaurants) and these retailers would continue to distribute plastic bags after the Ordinance is implemented. Even though the volume of a single paper carryout bag (20.48 liters) is generally equal to approximately 150% of the volume of a plastic bag (14 liters¹), for this analysis it is conservatively assumed that 33,854,041 plastic bags (45% of those currently used) would be replaced by the same number of paper bags. It is estimated that the remaining 37,615,601 plastic bags eliminated by the Ordinance would be replaced by 723,377 reusable bags annually (refer to Section 4.1, *Air Quality*).

¹ *The Ordinances to Ban Plastic Carryout Bags in Los Angeles County Final Environmental Impact Report (SCH #2009111104). Adopted by the County of Los Angeles Board of Supervisors on November 16, 2010.*



Although the proposed Ordinance would be expected to incrementally increase the manufacturing of single-use paper bags and reusable bags for use in Sunnyvale, it would also eliminate approximately 71.5 million single-use plastic bags per year. With implementation of the proposed Ordinance, approximately 38.3 million carryout bags (including single-use paper, single-use plastic, and reusable bags) would be manufactured for use in Sunnyvale – a decrease of 49% compared to existing conditions. Because the proposed Ordinance would reduce the overall number of carryout bags manufactured, it would reduce the overall impacts to water quality associated with bag manufacturing. Furthermore, any existing or potential manufacturing facilities would be required to adhere to existing federal, state and local regulations which are intended to protect water quality, as described above. Therefore, impacts to water quality related to the potential change of processing activities as a result of the proposed Sunnyvale Single-Use Carryout Bag Ordinance would not be significant.

Mitigation Measures. Because the impact would not be significant, no mitigation is required.

Significance After Mitigation. Impacts to water quality related to the potential change of process activities would be less than significant without mitigation.

c. Cumulative Impacts. Adopted and pending carryout bag ordinances, as described in Table 3-1 in Section 3.0, *Environmental Setting*, would continue to reduce the amount of single-use carryout bags, and promote a shift toward reusable carryout bags. As discussed above, the hydrology and water quality impacts associated with the proposed Sunnyvale Single-Use Carryout Bag Ordinance are not considered significant and are generally considered beneficial. Seven other agencies in San Francisco Bay Area region (County of Santa Clara, City of San Jose, Marin County, City of Fairfax, City of San Francisco, Alameda County, and the City of Palo Alto) have either adopted or are considering such ordinances. These ordinances would be expected to result in similar reductions in the amount of litter entering storm drains, local creeks or watersheds, thereby improving water quality. In addition, the overall reduction in bag manufacturing expected to occur as a result of implementation of these ordinances would be expected to generally reduce water quality impacts associated with bag manufacturing. In addition, all single-use paper and reusable bag manufacturing facilities would be required to comply with applicable regulatory requirements pertaining to preservation of water quality, including AB 258 and the California Health and Safety Code, as discussed in Impact HWQ-2. For these reasons, cumulative significant impacts associated with implementation of carryout bag ordinances throughout the state are not anticipated.



4.5 UTILITIES and SERVICE SYSTEMS

This section discusses potential impacts of the proposed Single-Use Carryout Bag Ordinance on utilities, including water supply and distribution, wastewater collection and treatment, and solid waste.

4.5.1 Setting

a. Water Supply.

City Water Supplies. Sunnyvale has four different sources of water supply readily available: local groundwater from eight operating wells, imported Central Valley Project and Delta water from the Santa Clara Valley Water District (SCVWD), Hetch Hetchy, and Sunol Valley water supply from the San Francisco Public Utilities Commission (SFPUC), and recycled water produced at the Sunnyvale Water Pollution Control Plant for non-potable use. The first three sources meet all State and Federal drinking water quality standards. Recycled water is used to irrigate landscaping, pursuant to compliance with applicable requirements under the City's permit with the Regional Water Quality Control Board. There are also about a dozen service area pockets in Sunnyvale receiving water from the California Water Service Company (CAL Water) (City of Sunnyvale Homepage, "Water Supply and Distribution", accessed June 2011).

The annually-updated 20-year water forecast for the City, which estimates the City's consumption requirements in future years, falls within the City's contract parameters, except for periods of drought and/or periods when the supply is reduced due to increases in government mandated Bay-Delta allocations for environmental protection concerns. Based on the most recent 20-year water forecast, the current citywide water demand is approximately 21,475 acre-feet per year (AFY). In 2031, the estimated citywide demand would be approximately 25,968 AFY (or approximately 4,493 AFY more than current conditions) (City of Sunnyvale, 2010 Urban Water Management Plan Projected Demands Provided to Wholesale Agencies). Barring catastrophic events, the City has adequate supply commitments and facilities to reliably meet the projected water needs of its residents and businesses for the foreseeable future (City of Sunnyvale, Water Resources Sub-element of the General Plan, Updated 2008).

Water Use for Carryout Bags. Various studies have estimated water use related to manufacturing of the different carryout bags (single-use plastic, paper or reusable bags) to determine a per bag water use rate. In order to provide metrics to determine environmental impacts associated with the proposed Ordinance, reasonable assumptions based upon the best available sources of information have been established and are utilized in this EIR. Specific metrics that compare impacts on a per bag basis are available for single-use plastic, single-use paper and LDPE reusable bags. However, water use for paper bags varies depending on which Life Cycle Assessment (LCA) data is utilized. The Ecobilan LCA study determined that per 9,000 liters of groceries, manufacturing of plastic bags use 52.5 liters of water, paper bags use 173 liters of water, and reusable bags (used 52 times) use 1.096 liters of water (Ecobilan, 2004; County of Los Angeles Final EIR, 2010). Similarly, though using slightly different assumptions and data, the Boustead LCA study determined that water use from manufacturing carryout bags would require approximately 58 gallons of water for 1,500 plastic bags and approximately



1,004 gallons of water for 1,000 paper bags. The Boustead data does not include estimates for reusable bags. Utilizing the data from these two different studies, Tables 4.5-1 and 4.5-2 summarize the existing water use from manufacturing of plastic bags used in Sunnyvale.

**Table 4.5-1
 Water Consumption Due to Existing Plastic Carryout Bags Based on Ecobilan Data**

Number of Plastic Bags	Water Consumption		
	Liters of Water per 9,000 liters of Groceries	Gallons of Water Per Day*	Millions of Gallons per Year
75,231,202	52.5	4,455	1.63

*Calculations are contained in the Utility Worksheets contained in Appendix C
 Source: Ecobilan. February 2004. Environmental Impact Assessment of Carrefour Bags: An Analysis of the Life Cycle of Shopping Bags of Plastic, Paper, and Biodegradable Material. Prepared for: Carrefour Group. Neuilly-sur-Seine, France.

As shown in Table 4.5-1, the Ecobilan LCA data determined that the water demand from manufacturing facilities that currently supply the approximately 75.2 million plastic carryout bags used in the City is approximately 1.63 million gallons per year or 4,455 gallons per day (0.004 million gallons per day (MGD)). In addition, as shown in Table 4.5-2, the Boustead LCA data determined that water demand for the plastic bags used in Sunnyvale is approximately 2.91 million gallons per year or 7,970 gallons per day (0.008 MGD). Please note that although water use is calculated below, because no plastic bag manufacturing facilities are located within Sunnyvale or Santa Clara County, these facilities would not affect the Sunnyvale existing water supply.

**Table 4.5-2
 Water Consumption Due to Existing Plastic Carryout Bags Based on Boustead Data**

Number of Plastic Bags	Water Consumption		
	Gallons of Water per 1,500 plastic bags	Gallons of Water Per Day*	Millions of Gallons per Year
75,231,202	58	7,970	2.91

*Calculations are contained in the Utility Worksheets contained in Appendix C
 Source: Boustead Consulting and Associates Ltd. 2007. Life Cycle Assessment for Three Types of Grocery Bags – Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper. Prepared for Progressive Bag Affiliates.

b. Wastewater Collection and Treatment.

City Wastewater System. Wastewater draining from indoor sources in Sunnyvale flows through sewer pipes that direct the wastewater to the Donald M. Somers Water Pollution Control Plant for treatment before being discharged to the San Francisco Bay. Originally constructed in 1956, the plant utilizes primary, secondary and tertiary treatment processes to treat the wastewater. The objective of the Plant is to remove pollutants and produce a high quality effluent suitable either for safe discharge to the South San Francisco Bay or for non-potable uses (City of Sunnyvale Homepage, Water Pollution Control Plant, accessed June 2011). The final upgrade to increase the Plant to its present capacity of 29.5 MGD was completed in



1984 (City of Sunnyvale Homepage, Plant History, accessed June 2011). In addition to wastewater treatment, services include regulatory permitting and inspections of pretreatment facilities and storm water management for business and industry in Sunnyvale, information on water pollution prevention and environmental education services to schools and youth. As described in the Sunnyvale Wastewater Sub-Element of the General Plan existing flow at the Water Pollution Control Plant is approximately 16.2 MGD per day (City of Sunnyvale Wastewater Sub-Element of the General Plan, 2001). Thus, the Water Pollution Control Plant has up to approximately 13.3 MGD of unused capacity.

Wastewater for Carryout Bags. Various studies have estimated wastewater related to manufacturing of the different carryout bags (single-use plastic, paper or reusable bags) to determine a per bag wastewater use rate. The Ecobilan study determined that per 9,000 liters of groceries, the manufacturing of a plastic bag would generate 50 liters of wastewater, while a paper bag would generate 130.7 liters of wastewater and a reusable bag (used 52 times) would generate 2.63 liters of wastewater. Based on the Ecobilan data, Table 4.5-3 displays the existing wastewater from manufacturing the approximately 75.23 million plastic bags used in Sunnyvale. As shown, currently manufacturing of plastic bags results in approximately 1.55 million gallons of wastewater per year or approximately 4,235 gallons per day (or 0.004 MGD). Similar to water use, please note that since no manufacturing facilities are located in Sunnyvale or Santa Clara County, the estimated wastewater does not impact the Water Pollution Control Plant.

**Table 4.5-3
Wastewater Due to Existing Plastic Carryout Bags Based on Ecobilan Data**

Number of Plastic Bags	Wastewater		
	Liters of Wastewater per 9000 liters of Groceries	Gallons of Water Per Day*	Millions of Gallons per Year
75,231,202	50	4,235	1.55

**Calculations are contained in the Utility Worksheets contained in Appendix C
Source: Ecobilan. February 2004. Environmental Impact Assessment of Carrefour Bags: An Analysis of the Life Cycle of Shopping Bags of Plastic, Paper, and Biodegradable Material. Prepared for: Carrefour Group. Neuilly-sur-Seine, France.*

c. Solid Waste.

City Solid Waste Service. The City of Sunnyvale provides refuse collection service throughout the City. The Solid Waste Division of the Utilities Department operates the solid waste management system. Key services include collection of: garbage from residents, businesses and institutions; recyclables from single-family and multi-family residences, City facilities and schools; and yard trimmings from single-family residences. The Division also operates the Sunnyvale Materials Recovery and Transfer Station (SMaRT Station®) under an MOU among the cities of Mountain View, Palo Alto and Sunnyvale. The SMaRT Station MOU is coordinated with each city’s landfill disposal agreement with Waste Management, Inc. Key services provided include receipt of garbage from the three cities, diversion of recyclable materials by the materials recovery facility (MRF), and transfer of the unrecycled portion to Kirby Canyon Landfill in San Jose. In addition to the Kirby Canyon Landfill, some solid waste from Sunnyvale is disposed at the Potrero Hills Landfill, the Zanker Road Landfill, and other



disposal sites around the state. Table 4.5-4 summarizes the permitted throughput, estimated capacity, and estimated closure date for these facilities.

**Table 4.5-4
Solid Waste Disposal Facilities**

Facility	Permitted Daily Throughput (tons/day)	Estimated Remaining Capacity (CY)*	Estimated Closure Date
SMaRT Station	1,500	N/A	N/A
Kirby Canyon Landfill	2,600	57,271,507	2022
Potrero Hills Landfill	4,330	13,872,000	N/A
Zanker Road Landfill	1,300	700,000	N/A

Source: California Integrated Waste Management Board Website, <http://www.calrecycle.ca.gov/SWFacilities/Directory/Search.aspx> accessed on June 29, 2011.

N/A = Not Available

* Remaining capacity estimates are based on reported estimated closure date minus the annual average throughput since date of reported remaining capacity.

cy=cubic yards

The City has completed a comprehensive waste reduction and recycling plan in compliance with State Law AB 939, which required every city in California to reduce the waste it sends to landfills by 50% by the year 2000. As of 2010, the City was recycling or otherwise diverting 67% of its solid waste, thereby complying with the standards established by AB 939 (Sunnyvale Waste Stream Profile, CIWMB, 2010).

Solid Waste Rates for Carryout Bags. Various studies have estimated solid waste rates related to the different carryout bags (single-use plastic, paper or reusable bags) to determine a per bag solid waste rate. Using EPA recycling rates and the Ecobilan data, it was determined that a plastic bag would generate .0065 kilograms (kg) of solid waste per bag, while a paper bag would generate 0.0087 kg of waste per bag, and a reusable bag (used 52 times) would generate 0.001 kg of waste per bag. Similarly, using the Boustead data along with EPA recycling rates, it was determined that plastic bags would produce 0.004 kg waste per bag, while a paper bag would result in 0.021 kg of waste per bag. The Boustead data does not estimate the solid waste from reusable bags. Tables 4.5-5 and 4.5-6 estimate the amount of solid waste associated with plastic bags currently used in Sunnyvale based on the Ecobilan and Boustead studies.

As shown in Table 4.5-5, with current EPA recycling rates, the Ecobilan data determined that approximately 1.48 tons per day or 541 tons per year result from use of plastic bags in Sunnyvale. The Boustead data (Table 4.5-6) determined that 0.93 tons of solid waste per day and approximately 343 tons per year of solid waste result from plastic bag use in Sunnyvale.



**Table 4.5-5
Solid Waste Due to Existing Plastic Carryout Bags Based on Ecobilan Data**

Number of Plastic Bags	Solid Waste		
	Solid Waste per Bag per bag (kg)	Solid Waste Per Day (tons)*	Solid Waste per Year
75,231,202	0.0065	1.48	541

**Calculations are contained in the Utility Worksheets contained in Appendix C
Source: Ecobilan. February 2004. Environmental Impact Assessment of Carrefour Bags: An Analysis of the Life Cycle of Shopping Bags of Plastic, Paper, and Biodegradable Material. Prepared for: Carrefour Group. Neuilly-sur-Seine, France.*

**Table 4.5-6
Solid Waste Due to Existing Plastic Carryout Bags Based on Boustead Data**

Number of Plastic Bags	Solid Waste		
	Solid Waste per Bag per bag (kg)	Solid Waste Per Day (tons)*	Solid Waste per Year
75,231,202	0.004	0.93	343

**Calculations are contained in the Utility Worksheets contained in Appendix C
Source: Boustead Consulting and Associates Ltd. 2007. Life Cycle Assessment for Three Types of Grocery Bags – Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper. Prepared for: Progressive Bag Affiliates.*

4.5.2 Impact Analysis

a. Methodology and Significance Thresholds. To analyze impacts to utilities, the anticipated increase of water, wastewater and solid waste as a result of implementation of the proposed Ordinance was compared to the available capacity of facilities that serve Sunnyvale.

Based on the City of Sunnyvale’s environmental checklist, a significant impact related to utilities and service systems would occur if the proposed Ordinance:

1. Exceeds wastewater treatment requirements of the applicable Regional Water Quality Control Board;
2. Requires or results in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
3. Requires or results in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
4. Has insufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed;
5. Results in a determination by the wastewater treatment provider that serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments;



6. *Is not served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs; or*
7. *Does not comply with federal, state, and local statutes and regulations related to solid waste.*

The Initial Study (Appendix A) determined that all of the above criteria should be discussed in this EIR except impacts related to stormwater drainage facilities (item 3), which were determined to be less than significant. Impacts related to water, wastewater, and solid waste are discussed below.

b. Project Impacts and Mitigation Measures

Impact U-1 **The increase of reusable bags within Sunnyvale as a result of the Ordinance would increase water demand related to washing reusable bags. However, sufficient water supplies are available to meet the demand created by reusable bags. Therefore, water supply impacts would be Class III, less than significant.**

The proposed Ordinance would increase the use of reusable bags as a result of banning plastic bags and requiring a mandatory charge for paper bags. Manufacturing facilities of carryout bags are not known to be located within Sunnyvale or Santa Clara County. Therefore, manufacturing facilities would not utilize City of Sunnyvale water supplies.

In addition to water use from manufacturing carryout bags, reusable bags, as required by the Ordinance, would be machine washable or made from a material that can be cleaned or disinfected. Washing reusable bags used in the City would utilize City of Sunnyvale water supplies. It is anticipated that most bag users would simply include reusable bags in wash loads that would occur with or without the bags. Nevertheless, for a conservative estimate, this analysis assumes that in order to maintain hygiene of reusable bags washing of bags (either by washing machine or rinsing) would increase the demand for water in Sunnyvale. This analysis assumes that approximately half of the reusable bags would be cleaned by rinsing and sanitizing and the other half would be machine washable. Assuming that all new reusable carryout bags require monthly cleaning in either a washing machine or by rinsing, the total increase in water demand (as shown in Table 4.5-7) in the City would be approximately 29 AFY.



**Table 4.5-7
 Water Use From Reusable Bag Cleaning**

# of Additional Reusable Bags from Proposed Ordinance that Require Washing¹	Number of times washed per year (monthly)²	# bags per Wash Load³	# of Loads per Year	Gallons of Water per Wash Load*	Total Gallons per Year	Acre Feet Year (AFY)
361,688.5	12	19	228,435	40	9,137,394	28.04
361,688.5	12	N/A	N/A	1	361,689	1.1
Total						29.14

¹ Assumes that 50% of reusable bags would be machine washable and 50% would be hand washed/sanitized.

² Assumes that each bag is washed once a month.

³ Assumes an average washer capacity of 8 pounds per load and 6.8 ounces per bag (as measured on 8/10/2010 by Rincon Consultants, Inc.)

Source: California Energy Commission: Consumer Energy Center, 2010; City of Santa Monica Carryout Bag Final EIR, January 2011.

As stated in the *Setting*, City’s most recent estimate for water demand is 21,475 acre-feet per year (AFY). In 2031, the estimated demand citywide would be 25,968 AFY (or approximately 4,493 AFY more than current conditions) (City of Sunnyvale – 2010 Urban Water Management Plan Projected Demands Provided to Wholesale Agencies). As such the additional water demand from reusable bag washing associated with the proposed Ordinance would represent 0.14% of the current demand and would represent 0.64% of the anticipated increase in demand in 2031. Because projected water supplies would be sufficient to meet the forecast level of demand in the City, the potential increase in water demand due to implementation of the proposed Ordinance is within the capacity of the City’s water supplies and would result in a less than significant impact. It should again be noted that the estimated water demand associated with implementation of the Ordinance is very conservative insofar as it assumes that 50% of reusable bags would be washed in separate washing machine loads rather than included in existing wash loads.

Mitigation Measures. Impacts would be less than significant; therefore mitigation is not necessary.

Significance After Mitigation. Impacts would be less than significant without mitigation.

Impact U-2 Water use associated with washing reusable bags would increase wastewater generation in the City. However, projected wastewater flows would remain within the capacity of the City’s wastewater collection and treatment system, and would not exceed applicable wastewater treatment requirements of the RWQCB. Impacts would be Class III, *less than significant*.



Although the proposed Ordinance would not result in additional sewer connections or an increase in the service population, the proposed Ordinance may increase water use associated with cleaning reusable bags and, therefore, may contribute to the wastewater system. As stated in the *Setting*, the City's Water Pollution Control Plant has a maximum capacity of 29.5 MGD and currently processes approximately 16.2 MGD. Thus, the plant has available capacity of 13.3 MGD.

Although manufacturing of carryout bags would produce wastewater (as described above in the *Setting*), because no manufacturing facilities are located within Sunnyvale or Santa Clara County, there would be no impacts to the wastewater treatment requirements at the Water Pollution Control Plant. However, the use of reusable bags in the City would require periodic washing of bags for hygienic purposes by retail customers. Using a conservative approach, assuming that 100% of the water used to wash reusable bags would become wastewater, approximately 29.14 AFY per year (9,499,083 gallons) or approximately 26,025 gallons per day would enter the sewer system and require treatment at the Water Pollution Control Plant. 26,025 gallons per day only represents 0.16% of the remaining capacity (approximately 16.2 MGD) at the Water Pollution Control Plant. Thus, there is adequate capacity to treat the additional wastewater that would result from the proposed Ordinance and no new facilities would be necessary. Impacts would be less than significant.

Mitigation Measures. Impacts would be less than significant; therefore, mitigation is not necessary.

Significance After Mitigation. Impacts would be less than significant without mitigation.

Impact U-3 The proposed Ordinance would alter the solid waste generation associated with bag use in Sunnyvale. However, projected future solid waste generation would remain within the capacity of local landfills. Impacts would therefore be Class III, less than significant.

Solid waste generated within Sunnyvale would be taken to the SMaRT Station, which is owned and operated by the City of Sunnyvale. After separation of recyclable materials in the materials recovery facility (MRF), non-recyclable/solid waste would be transferred to the Kirby Canyon Landfill in San Jose. In addition to the Kirby Canyon Landfill (which receives all material disposed by the SMaRT Station), some solid waste originating in Sunnyvale is disposed at the Potrero Hills Landfill, the Zanker Road Landfill, and other disposal sites around the state. The proposed Ordinance does not involve any physical development. However, use of carryout bags would require disposal at the end of use and would alter existing solid waste generation. Tables 4.5-8 and 4.5-9 estimate the anticipated change in solid waste generation that would result from the proposed Ordinance using the Ecobilan (Table 4.5-8) and the Boustead (Table 4.5-9) data.



**Table 4.5-8
Solid Waste Due to Carryout Bags Based on Ecobilan Data**

Type of Bags	Number of Bags	Solid Waste		
		Solid Waste per Bag per day (kg)	Solid Waste Per Day (tons)*	Solid Waste per Year (tons)
Plastic	3,761,560	0.0065	0.074	27
Paper	33,854,041	0.0087	0.89	326
Reusable (used 52 times)	723,377	0.001	0.0009	0.34
Total			0.964	353
Existing			1.48	541
Net Change			0.516	188

**Calculations are contained in the Utility Worksheets contained in Appendix C
Source: Ecobilan. February 2004. Environmental Impact Assessment of Carrefour Bags: An Analysis of the Life Cycle of Shopping Bags of Plastic, Paper, and Biodegradable Material. Prepared for: Carrefour Group. Neuilly-sur-Seine, France.*

**Table 4.5-9
Solid Waste Due to Carryout Bags Based on Boustead Data**

Type of Bags	Number of Bags	Solid Waste		
		Solid Waste per Bag per day (kg)	Solid Waste Per Day (tons)*	Solid Waste per Year (tons)
Plastic	3,761,560	0.004	0.047	17.14
Paper	33,854,041	0.021	2.19	799.52
Total			2.24	817
Existing			0.93	343
Net Change			1.31	474

**Calculations are contained in the Utility Worksheets contained in Appendix C
Source: Boustead Consulting and Associates Ltd. 2007. Life Cycle Assessment for Three Types of Grocery Bags – Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper. Prepared for: Progressive Bag Affiliates.*

***Please note that the Boustead data does not estimate solid waste from reusable bags.*

As shown in Table 4.5-8, using the Ecobilan data, it is anticipated that the proposed Ordinance would result in a reduction of approximately 188 tons per year of solid waste. However, the more conservative Boustead data as shown in Table 4.5-9 estimates that there would be an increase of approximately 474 tons per year of solid waste, primarily due to the projected increase in paper bag use. For the proposed Ordinance, using the worst case scenario (the Boustead data in Table 4.5-9), the increase of solid waste (474 tons per year or 1.31 tons per day) represents .09% of the permitted daily throughput, and would not exceed the 1500 tons per day capacity of the SMaRT Station. When disposed, this amount of solid waste would not exceed the daily capacity for any of the landfills, including Kirby Canyon Landfill (daily capacity of 2,600 tons/day), Potrero Hills Landfill (daily capacity of 4,330 tons/day, and the Zanker Road Landfill (daily capacity of 1,300 tons/day). The impact to solid waste facilities as a result of the proposed Ordinance would be less than significant.



Mitigation Measures. As specified above, impacts would be less than significant; therefore, mitigation is not necessary.

Significance After Mitigation. Impacts would be less than significant without mitigation.

c. Cumulative Impacts. Adopted and pending carryout bag ordinances, as described in Table 3-1 in Section 3.0, *Environmental Setting*, would continue to reduce the amount of single-use carryout bags, and promote a shift toward reusable carryout bags. Cumulative impacts from this development are discussed below by impact area.

Water. Similar to the proposed Sunnyvale ordinance, such ordinances would be expected to generally reduce the overall number of bags manufactured and associated water use from these facilities. Similar to the proposed Sunnyvale ordinance, other adopted and pending ordinances could incrementally increase water use associated with cleaning reusable bags for hygienic purposes. Seven other agencies in San Francisco Bay Area region (County of Santa Clara, City of San Jose, City of Fairfax, Marin County, City of San Francisco, County of Alameda, and the City of Palo Alto) have either adopted or are considering such ordinances. However, based on the incremental water use associated with the proposed Sunnyvale ordinance (increase of approximately 29 AFY per year), the other ordinances are not expected to generate an increase in water that would exceed water supplies in their respective regions. Therefore, cumulative water impacts would not be significant.

Wastewater. Similar to the proposed Sunnyvale ordinance, other carryout bag ordinances would be expected to generally reduce the overall number of bags manufactured and associated wastewater from these facilities. Similar to the proposed Sunnyvale ordinance, other adopted and pending ordinances could incrementally increase wastewater associated with cleaning reusable bags. Seven other agencies in San Francisco Bay Area region (County of Santa Clara, City of San Jose, City of Fairfax, Marin County, City of San Francisco, County of Alameda, and the City of Palo Alto) have either adopted or are considering such ordinances. However, based on the incremental increase in wastewater associated with the proposed Sunnyvale ordinance (approximately 26,025 gallons per day), the other ordinances are not expected to generate an increase in wastewater that would exceed the capacity of a wastewater treatment plant or require new or expanded facilities within their respective regions. Therefore, cumulative wastewater impacts would not be significant.

Solid Waste. Similar to the proposed Sunnyvale ordinance, other carryout bag ordinances would be expected to generally reduce the overall number of bags manufactured and associated wastewater from these facilities. Similar to the proposed Sunnyvale ordinance, other adopted and pending ordinances could incrementally increase solid waste associated with carryout bags. Seven other agencies in San Francisco Bay Area region (County of Santa Clara, City of San Jose, City of Fairfax, Marin County, City of San Francisco, County of Alameda, and the City of Palo Alto) have either adopted or are considering such ordinances. However, as described in Impact U-3, these ordinances may actually result in a reduction of solid waste according to the Ecobilan study. However, using the more conservative Boustead data, based on the incremental increase in solid waste associated with the proposed Sunnyvale ordinance



(approximately 1.31 tons per day), the other ordinances are not expected to generate an increase in solid waste that would exceed the capacity of a local landfill or require new or expanded facilities within their respective regions. Therefore, cumulative solid waste impacts would not be significant.



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5.0 OTHER CEQA DISCUSSIONS

This section discusses additional issues required for analysis under CEQA, including growth inducement and significant irreversible environmental effects.

5.1 GROWTH INDUCING IMPACTS

The *CEQA Guidelines* require a discussion of a proposed project's potential to foster economic or population growth, including ways in which a project could remove an obstacle to growth. Growth does not necessarily create significant physical changes to the environment. However, depending upon the type, magnitude, and location of growth, it can result in significant adverse environmental effects. The proposed Single-Use Carryout Bag Ordinance's growth-inducing potential is therefore considered significant if it could result in significant physical effects in one or more environmental issue areas. The most commonly cited example of how an economic effect might create a physical change is where economic growth in one area could create blight conditions elsewhere by causing existing competitors to go out of business and the buildings to be left vacant.

5.1.1 Economic and Population Growth

The proposed Single-Use Carryout Bag Ordinance would prohibit specified retail establishments in Sunnyvale from providing single-use plastic carryout bags to customers at the point of sale, and would create a mandatory 15 cent (\$0.15) charge for each paper bag distributed by these stores. The intent of the Single-Use Carryout Bag Ordinance is to reduce the amount of single-use carryout bags, and to promote the use of reusable bags by Sunnyvale retail customers. The Single-Use Carryout Bag Ordinance would apply to three specified categories of retail establishments located within the City of Sunnyvale's corporate limits. The proposed Single-Use Carryout Bag Ordinance would not include development of any physical structures or involve any construction activity. Therefore, the proposed Single-Use Carryout Bag Ordinance would not be growth-inducing as it would not affect long-term employment opportunities or increase the City's population.

Revenues generated by sales of paper bags would remain with the affected stores. The Single-Use Carryout Bag Ordinance would not affect economic growth and therefore would not be significant.

5.1.2 Removal of Obstacles to Growth

The proposed Single-Use Carryout Bag Ordinance would prohibit specified retail establishments in Sunnyvale from providing single-use plastic carryout bags to customers at the point of sale, and would create a mandatory 15 cent (\$0.15) charge for each paper bag distributed by these stores. No improvements to water, sewer, and drainage connection infrastructure would be necessary. No new roads would be required. Because the proposed Ordinance would not include any physical development or construction related activities and would not involve the extension of infrastructure into areas that otherwise could not accommodate growth, it would not remove an obstacle to growth.



5.2 IRREVERSIBLE ENVIRONMENTAL EFFECTS

The *CEQA Guidelines* require that EIRs reveal the significant environmental changes that would occur with project development. CEQA also requires decisionmakers to balance the benefits of a proposed project against its unavoidable environmental risks in determining whether to approve a project. This section addresses non-renewable resources, the commitment of future generations to the proposed Ordinance, and irreversible impacts associated with the proposed Ordinance.

The proposed Single-Use Carryout Bag Ordinance would prohibit specified retail establishments in Sunnyvale from providing single-use plastic carryout bags to customers at the point of sale, and would create a mandatory 15 cent (\$0.15) charge for each paper bag distributed by these stores. As a City Ordinance, the proposed Single-use Carryout Bag Ordinance would not include development of any physical structures or involve any construction activity. Therefore, the proposed Ordinance would not alter existing land uses or cause irreversible physical alterations related to land development or resource use. To the contrary, the express purpose of the Ordinance is to reduce the wasteful use of resources and associated environmental impacts.

The manufacturing of carryout bags and the additional truck trips associated with delivering carryout bags (single-use paper and reusable bags) to Sunnyvale would incrementally reduce regional air pollutant emissions. As discussed in Section 4.1, *Air Quality*, air pollutant emissions would not be increased beyond existing thresholds and with anticipated reductions in the overall number of carryout bags in Sunnyvale, emissions would be reduced compared to existing conditions. Similarly, as discussed in Section 4.3, *Greenhouse Gas Emissions*, although the proposed Ordinance would result in net increase of GHG emissions (approximately 0.016 CDE/person/year) compared to existing conditions, the Single-Use Carryout Bag Ordinance would be consistent with applicable plans, policies and regulations related to reducing GHG emissions. Thus, the proposed Single-Use Carryout Bag Ordinance would not result in any significant impacts related to air quality and GHG emissions.



6.0 ALTERNATIVES

As required by Section 15126.6 of the *CEQA Guidelines*, this section examines a range of reasonable alternatives to the proposed project. The following four alternatives are evaluated:

- *Alternative 1: No Project*
- *Alternative 2: Ban on Single-Use Plastic Bags at all Retail Establishments*
- *Alternative 3: Mandatory Charge of \$0.25 for Paper Bags*
- *Alternative 4: Mandatory Charge of \$0.10 for Paper Bags*

This section also includes a discussion of the “environmentally superior alternative” among those studied.

6.1 ALTERNATIVE 1: NO PROJECT ALTERNATIVE

6.1.1 Description

The No Project alternative assumes that the proposed Single-Use Carryout Bag Ordinance would not be adopted. Thus, the use of carryout bags at retail stores in Sunnyvale would not change compared to current conditions. Single-use plastic and paper carryout bags would be available free-of-charge to customers at most retail stores in Sunnyvale. In addition, reusable carryout bags would be available for purchase by retailers.

6.1.2 Impact Analysis

No change in environmental conditions would occur under this alternative because neither a ban nor a mandatory charge for carryout bags would be imposed. Thus, Sunnyvale retail customers would have no incentive to alter their existing carryout bag preferences. Because conditions would not change under this alternative, none of the impacts in the studied issue areas associated with the proposed Ordinance would occur. This alternative would not result in the change in truck trips associated with delivering reusable and single-use paper bags that would occur with implementation of the proposed ordinance and would therefore eliminate impacts associated with such trips. In addition, because the No Project alternative would not facilitate a shift to reusable bags, the proposed Ordinance’s less than significant impacts related to water and wastewater demand from washing reusable bags would be eliminated. On the other hand, this alternative would not achieve the proposed Ordinance’s beneficial effects relative to air quality, biological resources (sensitive species), and hydrology and water quality, nor would it result in the general benefits with respect to litter accumulation that are expected to result from implementation of the proposed Ordinance. Solid waste generation would not change from existing conditions and there would therefore be no impact related to solid waste.



6.2 ALTERNATIVE 2: BAN ON SINGLE-USE PLASTIC BAGS AT ALL RETAIL ESTABLISHMENTS

6.2.1 Description

Similar to the proposed Single-Use Carryout Bag Ordinance, this alternative would ban retailers from providing single-use plastic carryout bags to customers at the point of sale and would create a mandatory \$0.15 charge for paper bags. However, under this alternative, the Ordinance would apply to all categories of retail establishments in the City, including restaurants. As a result, under this alternative, no plastic bags would be distributed at the point of sale in Sunnyvale.

Under this alternative, the Ordinance would result in a 100% reduction of the number of plastic bags distributed to customers (thus, a reduction of 75,231,202 plastic bags). In contrast, the proposed Ordinance would only reduce 95% of the plastic bags. It is assumed that the additional 5% of plastic bags that would be removed as part of this alternative would be replaced by paper bags, such that, in total, 50% of single-use plastic bags currently used in the City would be replaced by single-use paper bags, and 50% would be replaced by reusable bags.

The total estimate of bag use under this alternative, compared to the proposed Ordinance, is summarized in Table 6-1.

**Table 6-1
 Estimated Bag Use: Proposed Ordinance versus Alternative 2**

Bag Type	Bags Used Annually	
	Proposed Ordinance*	Alternative 2**
Single-Use Plastic	3,761,560	0
Single-Use Paper	33,854,041	37,615,601
Reusable	723,377	723,377

*Refer to Table 4.1-4 in Section 4.1, Air Quality.

** Based on assumptions of 50% conversion of the volume of existing plastic bag use in Sunnyvale to paper bags and 50% conversion to reusable bags (based on 52 uses per year).

6.2.2 Impact Analysis

a. Air Quality. As described in Section 4.1, *Air Quality*, it is anticipated that the proposed Ordinance would replace the total volume of single-use plastic bags currently used in Sunnyvale with approximately 45% paper bags and 50% reusable bags, leaving 5% of the plastic bags in circulation (or approximately 3.8 million bags, as shown in Table 6-1 above). This alternative would apply to all retail establishments in Sunnyvale and would therefore eliminate an additional 3.8 million single-use plastic bags as compared to the proposed Ordinance. Consequently, this alternative would reduce emissions associated with plastic bag manufacturing, transportation, and disposal to a greater extent than the proposed Ordinance.



However, because the additional 5% of single-use plastic bags captured by this alternative would be replaced by single-use paper bags rather than reusable bags (refer to Table 6-1), the total number of single-use bags would increase compared to the proposed Ordinance. As described in Section 4.1, *Air Quality*, single-use paper bags have a greater per bag impact than single-use plastic bags. Because Alternative 2 would essentially trade 3.8 million single-use plastic bags for the same number of single-use paper bags, air pollutant emissions would incrementally increase as compared to the proposed Ordinance.

Table 6-2 estimates emissions that contribute to the development of ground level ozone and atmospheric acidification that would result from implementation of Alternative 2, as compared with the proposed Ordinance. As shown, because this alternative would increase the use of single-use paper bags in the City, contribution to ground level ozone would increase by approximately 26 kg per year (a 2% increase) and contribution to atmospheric acidification would increase by approximately 3,641 kg per year (a 5% increase) when compared to the proposed Ordinance.

**Table 6-2
 Estimated Emissions that Contribute to Ground Level Ozone and
 Atmospheric Acidification (AA) from Alternative 2**

Bag Type	# of Bags Used per Year	Ozone Emission Rate per Bag	Ozone Emissions (kg) per 1,000 bags	Ozone Emissions per year (kg)	AA Emission Rate per Bag	AA Emissions (kg) per 1,000 bags	AA Emissions per year (kg)
Single-use Plastic	0	1.0	0.023	0	1.0	1.084	0
Single-use Paper	37,615,601	1.3	0.03	1,128	1.9	2.06	77,488
Reusable	723,377	1.4	0.032	23	3.0	3.252	2,352
Total				1,151	Total		79,840
Ordinance				1,125	Ordinance		76,169
Difference				26	Net Change		(3,671)

Source: Refer to Table 4.1-5 in Section 4.1, *Air Quality*.

To estimate mobile emissions resulting from Alternative 2, the number of truck trips per day was calculated using the assumptions outlined in the Initial Study (Appendix A). As shown in Table 6-3, Alternative 2 would result in an estimated 179.45 truck trips per year, or 0.49 truck trips per day, which is slightly higher than the proposed Ordinance.



**Table 6-3
 Estimated Truck Trips per Day
 Following Implementation of Alternative 2**

Bag Type	Number of Bags per Year	Number of Bags per Truck Load*	Truck Trips Per Year	Truck Trips per Day
Single-use Plastic	0	2,080,000	0	0
Single-use Paper	37,615,601	217,665	172.81	0.47
Reusable	723,377	108,862	6.64	0.09
Alternative 2 Total			179.45	0.49
Truck Trips from Proposed Ordinance			164.17	0.45
Difference			15.28	0.04

*City of Santa Monica Single-Use Carryout Bag Ordinance EIR (SCH #2010041004), January 2011.
 Refer to Appendix A.

Based on the estimated truck trips for Alternative 2, mobile emissions were calculated using the URBEMIS model. As shown in Table 6-4, although Alternative 2 would slightly increase truck trips compared to the proposed Ordinance, this increase is negligible such that daily ROG, NO_x, PM₁₀, and PM_{2.5} emissions would be the same for Alternative 2 as for the proposed Ordinance. None of these emissions would exceed BAAQMD thresholds.

**Table 6-4
 Operational Emissions Associated with Alternative 2**

	Emissions (lbs/day)			
	ROG	NO_x	PM₁₀	PM_{2.5}
Mobile Emissions: Proposed Ordinance	<0.01	0.05	0.01	<0.01
Mobile Emissions: Alternative 2	<0.01	0.05	0.01	<0.01
<i>BAAQMD Thresholds</i>	<i>54</i>	<i>54</i>	<i>82</i>	<i>54</i>
Threshold Exceeded?	No	No	No	No

Source: URBEMIS 2007 calculations for Vehicle. See Appendix B for calculations

Based on the above, impacts resulting from bag manufacturing and use (including ground level ozone and atmospheric acidification) would be slightly greater under this alternative, but would continue to be Class IV, *beneficial*, while impacts relating to an increase in truck trips would be similar, and would continue to be Class III, *less than significant*.



b. Biological Resources. Similar to the proposed Ordinance, this alternative would ban single-use plastic carryout bags, thereby reducing the amount of single-use plastic bag litter that could enter the marine environment and affect sensitive species. Although this alternative may incrementally increase the use of single-use paper bags in Sunnyvale as compared to the proposed Ordinance, the impacts of single-use paper bags on biological resources are less than those of single-use plastic bags. Because of the weight, biodegradability of the materials, and recyclability, single-use paper bags are less likely to become litter compared to single-use plastic bags (Green Cities California MEA, 2010). In addition, because single-use paper bags are not as resistant to breakdown, there would be less risk of entanglement if entering the marine environment compared to single-use plastic bags. Therefore, the impact to sensitive species as a result of litter entering the marine environment from Alternative 2 would be reduced compared to the proposed Ordinance. Similar to the proposed Ordinance, impacts would be Class IV, *beneficial*. Overall benefits would be somewhat greater than those of the proposed Ordinance.

c. Greenhouse Gas Emissions. Compared to the proposed Ordinance, this alternative would be expected to reduce the number of single-use plastic bags by approximately 3.8 million bags and increase the number of single-use paper bags by the same amount. The number of reusable bags would not change under this alternative. As noted in Section 4.3, *Greenhouse Gases*, through the manufacturing, transportation, and disposal, each single-use paper bag results in 3.3 times the emissions of a single-use plastic bag. Because this alternative would increase the number of single-use paper bags and reduce the number of single-use plastic bags, it would result in a net increase of GHG emissions compared to the proposed Ordinance.

Table 6-5 provides an estimate of GHG emissions associated with implementation of Alternative 2.

**Table 6-5
 Estimated Greenhouse Gas Emissions
 from Alternative 2**

Bag Type	Estimated Number of Bags Used per Year	GHG Impact Rate per Bag	CDE (metric tons)	CDE per year (metric tons)	CDE per Person
Single-use Plastic	0	1.0	0.04 per 1,500 bags	0	0
Single-use Paper	37,615,601	2.97	0.1188 per 1,000 bags	4,469	0.032
Reusable	723,377	2.6	0.104 per 1,000 bags	75	0.001
Alternative 2 Total				4,544	0.033
Proposed Ordinance				4,247	0.030
Difference				297	0.0025

CDE = Carbon Dioxide Equivalent units
 Source: Refer to Table 4.3-4 in Section 4.3, *Greenhouse Gas Emissions*.



Compared to the proposed Ordinance, GHG emissions under Alternative 2 would increase by approximately 0.0025 CDE per person per year. This represents 0.51 e^{-10%} of California's statewide GHG inventory of 492 million CDE per year. Although Alternative 2 would result in slightly greater GHG impacts than the proposed Ordinance, emissions as a result of this alternative would not exceed the BAAQMD's 4.6 metric tons CDE per person per year threshold. Therefore, impacts would remain Class III, *less than significant*.

d. Hydrology and Water Quality. Similar to the proposed Ordinance, this alternative would reduce the number of single-use plastic bags used in Sunnyvale, thereby incrementally reducing the amount of plastic litter and waste entering storm drains. Although this alternative would be expected to replace 3.8 million single-use plastic bags with the same number of single-use paper bags, single-use paper bags are not as resistant to breakdown, and would therefore be less likely to block or clog drains compared to single-use plastic bags (refer to Section 4.4, *Hydrology and Water Quality*). Because single-use paper bags would be less likely to result in storm drain blockage or contamination, this alternative would reduce litter compared to the proposed Ordinance. As with the proposed Ordinance, an incremental reduction in the amount of litter that could enter storm drains and local waterways would improve water quality and reduce the potential for storm drain blockage. Therefore, like the proposed Ordinance, this alternative would result in generally Class IV, *beneficial*, effects to water quality, and overall benefits would be somewhat greater under this alternative.

This alternative would be expected to result in the use of more single-use paper carryout bags in Sunnyvale than with implementation of the proposed Single-Use Carryout Bag Ordinance. However, as with the proposed Ordinance, single-use paper bag manufacturing facilities would be required to adhere to NPDES Permit requirements, AB 258 and the California Health and Safety Code reducing impacts to water quality. Impacts to water quality from altering bag processing activities would be the same as the proposed Ordinance and would remain Class III, *less than significant*.

e. Utilities and Service Systems. Compared to the proposed Ordinance, this alternative would be expected to reduce the number of single-use plastic bags by approximately 3.8 million bags and increase the number of single-use paper bags by same amount. The number of reusable bags would not change under this alternative. Because the same number of reusable bags would be used under this alternative as under the proposed Ordinance, water demand and wastewater generation related to washing reusable bags would be the same. This includes 29 AFY of water and 26,025 gallons per day of wastewater. As discussed in Section 4.5, *Utilities*, there are sufficient water supplies available to meet this demand, as well as capacity within the City's wastewater distribution and treatment system. Therefore, impacts would be similar to the proposed Ordinance and would continue to be Class III, *less than significant*.

Using the more conservative solid waste generation rates from Boustead (as shown in Table 4.5-9 in Section 4.5, *Utilities and Service systems*), implementation of this alternative would generate a net increase of 1.49 tons/day of solid waste (calculations are contained in Appendix C). In comparison, implementation of the proposed Ordinance would generate an increase of 1.31 tons/day. Therefore, Alternative 2 would generate 0.18 tons/day more than the proposed Ordinance (a 12% increase). However, like the proposed Ordinance, this increase would not



exceed the existing capacity at area landfills. Therefore, solid waste impacts would be greater when compared to the proposed Ordinance, but would remain Class III, *less than significant*.

6.3 ALTERNATIVE 3: MANDATORY CHARGE OF \$0.25 FOR PAPER BAGS

6.3.1 Description

Similar to the proposed Ordinance, this alternative would prohibit three specified categories of retail establishments in Sunnyvale from providing single-use plastic carryout bags to customers at the point of sale. However, under this alternative, the mandatory charge for each paper bag distributed by stores in the City would be increased from \$0.15 per bag (as currently proposed) to \$0.25 per bag. As a result of the \$0.10 mandatory charge increase for paper bags, it is anticipated that this alternative would further promote the use of reusable bags since customers would be deterred from purchasing paper bags due to the additional cost.

Based on a cost requirement of \$0.25 per bag, it is assumed that the total volume of plastic bags currently used in Sunnyvale (approximately 75,231,202 plastic bags per year) would be replaced by approximately 35% paper bags and 60% reusable bags under Alternative 3 (compared to 45% paper and 50% reusable assumed for the proposed Ordinance). It is assumed that 5% of existing single-use plastic bags would remain in use, similar to the proposed Ordinance, since the alternative would not apply to some retailers who distribute plastic bags (e.g. restaurants). Table 6-6 summarizes the changes in bag distribution as a result of a \$0.25 mandatory charge under this alternative compared to the \$0.15 charge under the proposed Ordinance.

**Table 6-6
 Estimated Bag Use: Proposed Ordinance versus Alternative 3**

Bag Type	Bags Used Annually	
	Proposed Ordinance	Alternative 3
Single-Use Plastic	3,761,560	3,761,560
Single-Use Paper	33,854,041	26,330,921
Reusable	723,377	868,052

* Refer to Table 4.1-4 in Section 4.1, Air Quality.

** Based on an assumption of 5% existing plastic bag use in Sunnyvale (approximately 75,231,202 plastic bags per year) to remain, 35% conversion of the volume of existing plastic bag use in Sunnyvale to paper bags and 60% conversion to reusable bags (based on 52 uses per year).

6.3.2 Impact Analysis

a. Air Quality. As described in Section 4.1, *Air Quality*, it is estimated that the proposed Ordinance would replace the total volume of single-use plastic bags currently used in Sunnyvale with approximately 45% paper bags and 50% reusable bags, leaving 5% of the plastic bags in circulation (or approximately 3.8 million bags, as shown in Table 6-1 above). This alternative would increase the mandatory charge on paper bags by ten cents, and would



therefore promote a greater shift toward reusable bags. Consequently, this alternative would reduce the number of single-use paper bags and increase the number of reusable bags compared to the proposed Ordinance. Because this alternative would apply to the same retailers as the proposed Ordinance, the number of single-use plastic bags remaining in circulation would be the same. In total, Alternative 3 would result in 7,378,445 fewer bags (including single-use plastic, single-use paper, and reusable) than the proposed Ordinance. Air pollutant emissions associated with bag manufacturing, transportation, and disposal would therefore be reduced when compared to the proposed Ordinance.

Table 6-7 estimates emissions that contribute to the development of ground level ozone and atmospheric acidification that would result from implementation of Alternative 3, as compared with the proposed Ordinance. Because this alternative would reduce the amount of single-use paper bags in the City, contribution to ground level ozone would decrease by approximately 221 kg per year (a 20% decrease) and contribution to atmospheric acidification would decrease by approximately 15,026 kg per year (a 20% decrease) when compared to the proposed Ordinance.

**Table 6-7
 Estimated Emissions that Contribute to Ground Level Ozone and
 Atmospheric Acidification (AA) from Alternative 3**

Bag Type	# of Bags Used per Year*	Ozone Emission Rate per Bag	Ozone Emissions (kg) per 1,000 bags	Ozone Emissions per year (kg)	AA Emission Rate per Bag	AA Emissions (kg) per 1,000 bags	AA Emissions per year (kg)
Single-use Plastic	3,761,560	1.0	0.023	86	1.0	1.084	4,078
Single-use Paper	26,330,921	1.3	0.03	790	1.9	2.06	54,242
Reusable	868,052	1.4	0.032	28	3.0	3.252	2,823
Alternative 3 Total				904	Alternative 3 Total		61,143
Ordinance				1,125	Ordinance		76,169
Difference				(221)	Net Change		(15,026)

Source: Refer to Table 4.1-5 in Section 4.1, Air Quality.

To estimate mobile emissions resulting from Alternative 3, the number of truck trips per day was calculated using the assumptions outlined in the Initial Study (Appendix A). As shown in Table 6-8, Alternative 3 would result in an estimated 130.74 truck trips per year, or 0.36 truck trips per day, which is lower than the proposed Ordinance.



**Table 6-8
 Estimated Truck Trips per Day
 Following Implementation of Alternative 3**

Bag Type	Number of Bags per Year	Number of Bags per Truck Load*	Truck Trips Per Year	Truck Trips per Day
Single-use Plastic	3,761,560	2,080,000	1.8	0.01
Single-use Paper	26,330,921	217,665	120.97	0.33
Reusable	868,052	108,862	7.97	0.02
Alternative 3 Total			130.74	0.36
Truck Trips from Proposed Ordinance			164.17	0.45
Difference			(33.43)	(0.09)

*City of Santa Monica Single-Use Carryout Bag Ordinance EIR (SCH #2010041004), January 2011. Refer to Appendix A.

Based on the estimated truck trips for Alternative 3, mobile emissions were calculated using the URBEMIS model. As indicated in Table 6-9, daily ROG and PM_{2.5} emissions would be the same for Alternative 3 as for the proposed Ordinance, while daily emissions of NO_x and PM₁₀ would be slightly lower. None of these emissions would exceed BAAQMD thresholds.

**Table 6-9
 Operational Emissions Associated with Alternative 3**

	Emissions (lbs/day)			
	ROG	NO _x	PM ₁₀	PM _{2.5}
Mobile Emissions: Proposed Ordinance	<0.01	0.05	0.01	<0.01
Mobile Emissions: Alternative 3	<0.01	0.04	<0.01	<0.01
<i>BAAQMD Thresholds</i>	<i>54</i>	<i>54</i>	<i>82</i>	<i>54</i>
Threshold Exceeded?	No	No	No	No

Source: URBEMIS 2007 calculations for Vehicle. See Appendix B for calculations

Based on the above, Alternative 3 would slightly reduce air quality impacts compared to the proposed Ordinance. Impacts resulting from bag manufacturing and use (ground level ozone and atmospheric acidification) would continue to be Class IV, *beneficial*, while impacts relating to an increase in truck trips would continue to be Class III, *less than significant*.



b. Biological Resources. Similar to the proposed Ordinance, this alternative would ban single-use plastic carryout bags from certain retailers, thereby incrementally reducing the amount of single-use plastic bag litter that could enter the marine environment and affect sensitive species. Compared to the proposed Ordinance, this alternative would also further reduce the amount of single-use paper bag litter that could enter the marine environment. Although single-use paper bags are less likely to become litter compared to single-use plastic bags (refer to Section 4.2, *Biological Resources*), the net reduction of all bag types associated with this alternative would result in overall less litter entering the marine environment. As a result, the Class IV, *beneficial*, effects to marine species from Alternative 3 would be increased as compared to the proposed Ordinance.

c. Greenhouse Gas Emissions. Compared to the proposed Ordinance, this alternative would be expected to reduce the number of single-use paper bags by approximately 7.5 million bags and increase the number of reusable bags by approximately 145,000. The number of single-use plastic bags would not change under this alternative. As noted in Section 4.3, *Greenhouse Gases*, the manufacturing, transportation, and disposal of each single-use paper bag results in 3.3 times the emissions of a single-use plastic bag, while the manufacturing, transportation, and disposal of each reusable bag results in approximately 2.6 times the emissions of a single-use plastic bag. Although this alternative would increase the number of reusable bags by approximately 145,000, which would slightly increase GHG emissions, it would reduce number of single-use paper bags to a greater extent (approximately 7.5 million bags).

Table 6-10 provides an estimate of GHG emissions that would result from the reduction of carryout bags as a result of implementation of Alternative 3.

**Table 6-10
 Estimated Greenhouse Gas Emissions
 from Alternative 3**

Bag Type	Estimated Number of Bags Used per Year	GHG Impact Rate per Bag	CDE (metric tons)	CDE per year (metric tons)	CDE per Person
Single-use Plastic	3,761,560	1.0	0.04 per 1,500 bags	100	0.0007
Single-use Paper	26,330,921	2.97	0.1188 per 1,000 bags	3,128	0.022
Reusable	868,052	2.6	0.104 per 1,000 bags	90	0.0006
Alternative 3 Total				3,318	0.023
Proposed Ordinance				4,247	0.030
Difference				(929)	(0.007)

*CDE = Carbon Dioxide Equivalent units
 Source: Refer to Table 4.3-4 in Section 4.3, Greenhouse Gas Emissions.*



Compared to the proposed Ordinance, GHG emissions under Alternative 3 would decrease by approximately 0.007 CDE per person per year. The total GHG emissions from Alternative 3 (0.023 CDE per person per year) represent approximately 4.7 e-9% of California's statewide GHG inventory of 492 million CDE per year. GHG impacts from Alternative 3 would be slightly reduced when compared to the proposed Ordinance, and would continue to be Class III, *less than significant*.

d. Hydrology and Water Quality. Similar to the proposed Ordinance, this alternative would reduce the number of single-use plastic bags used in Sunnyvale, thereby incrementally reducing the amount of plastic litter and waste entering storm drains. In addition, this alternative would further reduce the number of single-use paper bags compared to the proposed Ordinance (by approximately 7.5 million bags), replacing them instead with approximately 145,000 reusable bags. As a result, overall, this alternative would reduce litter compared to the proposed Ordinance. As with the proposed Ordinance, an incremental reduction in the amount of litter that could enter storm drains and local waterways would improve water quality and reduce the potential for storm drain blockage. Therefore, like the proposed Ordinance, this alternative would result in Class IV, *beneficial*, effects to water quality. Overall benefits would be somewhat greater under this alternative.

This alternative would be expected to result in the use of fewer single-use paper carryout bags in Sunnyvale than with implementation of the proposed Single-Use Carryout Bag Ordinance. However, it would not completely eliminate single-use paper bags. As with the proposed Ordinance, single-use paper bag manufacturing facilities would be required to adhere to NPDES Permit requirements, AB 258 and the California Health and Safety Code reducing impacts to water quality. Impacts to water quality from altering bag processing activities would be the same as the proposed Ordinance and would continue to be Class III, *less than significant*.

e. Utilities and Service Systems. Compared to the proposed Ordinance, this alternative would be expected to reduce the number of single-use paper bags by approximately 7.5 million and increase the number of reusable bags by approximately 145,000. The number of single-use plastic bags would not change under this alternative. Because 20% more reusable bags would be used under this alternative as compared to the proposed Ordinance, water demand and wastewater generation related to washing reusable bags would also increase by 20%. This equates to an estimated 34.8 AFY of water and 31,230 gallons per day of wastewater. However, as noted in Section 4.5, *Utilities and Service Systems*, there are sufficient water supplies available to meet this demand, as well as capacity within the City's wastewater distribution and treatment system. Therefore, impacts would be slightly greater than those of the proposed Ordinance, but would remain Class III, *less than significant*.

Using the more conservative solid waste generation rates from Boustead (as shown in Table 4.5-9 in Section 4.5, *Utilities and Service systems*), this alternative would generate 0.81 tons/day of solid waste (calculations are contained in Appendix C). In comparison, the proposed Ordinance would generate 1.31 tons/day. Therefore, Alternative 3 would generate 0.5 tons/day less than the proposed Ordinance (a 38% decrease), and would not exceed the existing capacity at area landfills. Therefore, solid waste impacts would be reduced when compared to the proposed Ordinance, and would remain Class III, *less than significant*.



6.4 ALTERNATIVE 4: MANDATORY CHARGE OF \$0.10 FOR PAPER BAGS

6.4.1 Description

Similar to the proposed Ordinance, this alternative would prohibit three specified categories of retail establishments in Sunnyvale from providing single-use plastic carryout bags to customers at the point of sale. However, under this alternative, the mandatory charge for each paper bag distributed by stores in the City would be reduced from \$0.15 per bag (as currently proposed) to \$0.10 per bag. As a result of the \$0.05 mandatory charge decrease for paper bags, it is anticipated that this alternative would increase the use of paper bags and decrease the use of reusable bags, since customers would be more likely to purchase paper bags due to the reduced cost.

Based on a cost requirement of \$0.10 per bag, it is assumed that the total volume of plastic bags currently used in Sunnyvale (approximately 75,231,202 plastic bags per year) would be replaced by approximately 50% paper bags and 45% reusable bags under Alternative 4 (compared to 45% paper and 50% reusable assumed for the proposed Ordinance). It is assumed that 5% of existing single-use plastic bags would remain in use, similar to the proposed Ordinance, since the alternative would not apply to some retailers who distribute plastic bags (e.g. restaurants). Table 6-11 summarizes the changes in bag distribution as a result of a \$0.10 mandatory charge under this alternative compared to the \$0.15 charge under the proposed Ordinance.

**Table 6-11
 Estimated Bag Use: Proposed Ordinance versus Alternative 4**

Bag Type	Bags Used Annually	
	Proposed Ordinance	Alternative 4
Single-Use Plastic	3,761,560	3,761,560
Single-Use Paper	33,854,041	37,615,601
Reusable	723,377	651,039

* Refer to Table 4.1-4 in Section 4.1, Air Quality.

** Based on an assumption of 5% existing plastic bag use in Sunnyvale (approximately 75,231,202 plastic bags per year) to remain, 50% conversion of the volume of existing plastic bag use in Sunnyvale to paper bags and 45% conversion to reusable bags (based on 52 uses per year).

6.4.2 Impact Analysis

a. Air Quality. As described in Section 4.1, *Air Quality*, it is estimated that the proposed Ordinance would replace the total volume of single-use plastic bags currently used in Sunnyvale with approximately 45% paper bags and 50% reusable bags, leaving 5% of the plastic bags in circulation (or approximately 3.8 million bags, as shown in Table 6-1 above). This alternative would reduce the mandatory charge on paper bags by five cents, and would therefore promote a smaller shift toward reusable bags. Consequently, this alternative would increase the number of single-use paper bags and decrease the number of reusable bags



compared to the proposed Ordinance. Because this alternative would apply to the same retailers as the proposed Ordinance, the number of single-use plastic bags remaining in circulation would be the same. In total, Alternative 4 would result in 3,689,222 more bags (including single-use plastic, single-use paper, and reusable) than the proposed Ordinance. Air pollutant emissions associated with bag manufacturing, transportation, and disposal would therefore be increased when compared to the proposed Ordinance.

Table 6-12 estimates emissions that contribute to the development of ground level ozone and atmospheric acidification that would result from implementation of Alternative 4, as compared with the proposed Ordinance. Because this alternative would increase the amount of single-use paper bags in the City, contribution to ground level ozone would increase by approximately 110 kg per year (a 10% increase) and contribution to atmospheric acidification would increase by approximately 7,514 kg per year (a 10% increase) when compared to the proposed Ordinance.

**Table 6-12
 Estimated Emissions that Contribute to Ground Level Ozone and
 Atmospheric Acidification (AA) from Alternative 4**

Bag Type	# of Bags Used per Year*	Ozone Emission Rate per Bag	Ozone Emissions (kg) per 1,000 bags	Ozone Emissions per year (kg)	AA Emission Rate per Bag	AA Emissions (kg) per 1,000 bags	AA Emissions per year (kg)
Single-use Plastic	3,761,560	1.0	0.023	86	1.0	1.084	4,078
Single-use Paper	37,615,601	1.3	0.03	1,128	1.9	2.06	77,488
Reusable	651,039	1.4	0.032	21	3.0	3.252	2,117
Alternative 4 Total				1,235	Alternative 4 Total		83,683
Ordinance				1,125	Ordinance		76,169
Difference				110	Net Change		7,514

Source: Refer to Table 4.1-5 in Section 4.1, Air Quality.

To estimate mobile emissions resulting from Alternative 4, the number of truck trips per day was calculated using the assumptions outlined in the Initial Study (Appendix A). As shown in Table 6-13, Alternative 4 would result in an estimated 180.59 truck trips per year, or 0.50 truck trips per day, which is higher than the proposed Ordinance.



**Table 6-13
 Estimated Truck Trips per Day Following Implementation of Alternative 4**

Bag Type	Number of Bags per Year	Number of Bags per Truck Load*	Truck Trips Per Year	Truck Trips per Day
Single-use Plastic	3,761,560	2,080,000	1.8	0.01
Single-use Paper	37,615,601	217,665	172.81	0.47
Reusable	651,039	108,862	5.98	0.02
Alternative 4 Total			180.59	0.50
Truck Trips from Proposed Ordinance			164.17	0.45
Difference			16.42	0.05

*City of Santa Monica Single-Use Carryout Bag Ordinance EIR (SCH #2010041004), January 2011. Refer to Appendix A.

Based on the estimated truck trips for Alternative 4, mobile emissions were calculated using the URBEMIS model. As indicated in Table 6-14, daily ROG, PM₁₀, and PM_{2.5} emissions would be the same for Alternative 4 as for the proposed Ordinance, while daily emissions of NO_x and PM₁₀ would be slightly higher. None of these emissions would exceed BAAQMD thresholds.

**Table 6-14
 Operational Emissions Associated with Alternative 4**

	Emissions (lbs/day)			
	ROG	NO _x	PM ₁₀	PM _{2.5}
Mobile Emissions: Proposed Ordinance	<0.01	0.05	0.01	<0.01
Mobile Emissions: Alternative 4	<0.01	0.06	0.01	<0.01
<i>BAAQMD Thresholds</i>	<i>54</i>	<i>54</i>	<i>82</i>	<i>54</i>
Threshold Exceeded?	No	No	No	No

Source: URBEMIS 2007 calculations for Vehicle. See Appendix B for calculations

Based on the above, Alternative 4 would slightly increase air quality impacts compared to the proposed Ordinance. However, impacts resulting from bag manufacturing and use (ground level ozone and atmospheric acidification) would continue to be Class IV, *beneficial*, while impacts relating to an increase in truck trips would continue to be Class III, *less than significant*.

b. Biological Resources. Similar to the proposed Ordinance, this alternative would ban single-use plastic carryout bags from certain retailers, thereby incrementally reducing the amount of single-use plastic bag litter that could enter the marine environment and affect



sensitive species. Compared to the proposed Ordinance, however, this alternative would slightly increase the amount of single-use paper bag litter that could enter the marine environment. Although single-use paper bags are less likely to become litter compared to single-use plastic bags (refer to Section 4.2, *Biological Resources*), the net increase of all bag types associated with this alternative would result in more overall litter entering the marine environment. As a result, impact to marine species from Alternative 4 would slightly increase as compared to the proposed Ordinance. However, impacts would remain Class IV, *beneficial*.

c. Greenhouse Gas Emissions. Compared to the proposed Ordinance, this alternative would be expected to increase the number of single-use paper bags by approximately 3.8 million bags and decrease the number of reusable bags by approximately 72,000. The number of single-use plastic bags would not change under this alternative. As noted in Section 4.3, *Greenhouse Gases*, the manufacturing, transportation, and disposal of each single-use paper bag results in 3.3 times the emissions of a single-use plastic bag, while the manufacturing, transportation, and disposal of each reusable bag results in approximately 2.6 times the emissions of a single-use plastic bag. Although this alternative would reduce the number of reusable bags by approximately 72,000, which would slightly decrease GHG emissions, it would increase number of single-use paper bags to a greater extent (approximately 7.5 million bags).

Table 6-15 provides an estimate of GHG emissions that would result from the reduction of carryout bags as a result of implementation of Alternative 4. Compared to the proposed Ordinance, GHG emissions under Alternative 4 would increase by approximately 0.003 CDE per person per year. The total GHG emissions from Alternative 4 (0.033 CDE per person per year) represent approximately 6.7 e⁻⁹% of California’s statewide GHG inventory of 492 million CDE per year.

**Table 6-15
 Estimated Greenhouse Gas Emissions from Alternative 4**

Bag Type	Estimated Number of Bags Used per Year	GHG Impact Rate per Bag	CDE (metric tons)	CDE per year (metric tons)	CDE per Person
Single-use Plastic	3,761,560	1.0	0.04 per 1,500 bags	100	0.0007
Single-use Paper	37,615,601	2.97	0.1188 per 1,000 bags	4,469	0.032
Reusable	651,039	2.6	0.104 per 1,000 bags	68	0.0005
Alternative 4 Total				4,637	0.033
Proposed Ordinance				4,247	0.030
Difference				390	0.003

CDE = Carbon Dioxide Equivalent units
 Source: Refer to Table 4.3-4 in Section 4.3, *Greenhouse Gas Emissions*.



GHG impacts from Alternative 4 would be slightly increased when compared to the proposed Ordinance, but would continue to be Class III, *less than significant*.

d. Hydrology and Water Quality. Similar to the proposed Ordinance, this alternative would reduce the number of single-use plastic bags used in Sunnyvale, thereby incrementally reducing the amount of plastic litter and waste entering storm drains. Compared to the proposed Ordinance, however, this alternative would slightly increase the amount of single-use paper bags (by approximately 3.8 million bags), and would reduce the number of reusable bags by approximately 72,000. As a result, overall, this alternative would slightly increase litter compared to the proposed Ordinance. As with the proposed Ordinance, an incremental reduction in the amount of litter that could enter storm drains and local waterways (compared to existing conditions) would nevertheless improve water quality and reduce the potential for storm drain blockage. Therefore, like the proposed Ordinance, this alternative would result in Class IV, *beneficial*, effects to water quality. Overall benefits would be somewhat reduced under this alternative.

This alternative would be expected to result in the use of more single-use paper carryout bags in Sunnyvale than with implementation of the proposed Single-Use Carryout Bag Ordinance. As with the proposed Ordinance, single-use paper bag manufacturing facilities would be required to adhere to NPDES Permit requirements, AB 258 and the California Health and Safety Code reducing impacts to water quality. Impacts to water quality from altering bag processing activities would be the same as the proposed Ordinance and would continue to be Class III, *less than significant*.

e. Utilities and Service Systems. Compared to the proposed Ordinance, this alternative would be expected to increase the number of single-use paper bags by approximately 3.8 million and reduce the number of reusable bags by approximately 72,000. The number of single-use plastic bags would not change under this alternative. Because 10% fewer reusable bags would be used under this alternative as compared to the proposed Ordinance, water demand and wastewater generation related to washing reusable bags would also decrease by 10%. This equates to an estimated 26.2 AFY of water and 23,423 gallons per day of wastewater. As noted in Section 4.5, *Utilities and Service Systems*, there are sufficient water supplies available to meet this demand, as well as capacity within the City's wastewater distribution and treatment system. Therefore, impacts would be slightly less than those of the proposed Ordinance, and would remain Class III, *less than significant*.

Using the more conservative solid waste generation rates from Boustead (as shown in Table 4.5-9 in Section 4.5, *Utilities and Service systems*), this alternative would generate 1.54 tons/day of solid waste (calculations are contained in Appendix C). In comparison, the proposed Ordinance would generate 1.31 tons/day. Therefore, Alternative 4 would generate 0.23 tons/day more than the proposed Ordinance (a 15% increase). However, like the proposed Ordinance, this increase would not exceed the existing capacity at area landfills. Therefore, solid waste impacts would be greater when compared to the proposed Ordinance, but would remain Class III, *less than significant*.



6.5 ALTERNATIVES CONSIDERED BUT REJECTED

As required by Section 15126.6 (c) of the *CEQA Guidelines*, this subsection identifies those alternatives that were considered but rejected by the lead agency because they either did not meet the objectives of the project or could not avoid or substantially lessen one or more of the significant effects.

Two alternatives that were considered were rejected. The first alternative involved a suggestion during the Public Scoping Meetings (conducted on June 29, 2011) that would allow plastic bags to be included as part of the City's curbside recycling program. *CEQA Guidelines* § 15126.6 requires that an EIR consider a range of reasonable alternatives to a proposed project, which would feasibly obtain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project. This alternative was therefore rejected because it does not achieve the Ordinance's objectives including reducing the number of single-use plastic bags distributed by retailers and used by customers in Sunnyvale, as well as avoiding litter and the associated adverse impacts to stormwater systems, aesthetics and the marine environment (San Francisco Bay). Objectives of the proposed Ordinance are outlined in Section 2.0, *Project Description*.

The second alternative that was considered but ultimately rejected was to apply a fee to single-use plastic bags rather than banning them all together. However, California Assembly Bill (AB) 2449, passed in 2006, forbids cities from requiring stores that comply with AB 2449 to charge for single-use plastic bags. Such a fee would be legally infeasible, and was therefore rejected as a viable alternative to the proposed Ordinance.

6.6 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

This subsection identifies the environmentally superior alternative. The Mandatory Charge of \$0.25 for Paper Bags alternative would be considered environmentally superior among the alternatives, as it would have more environmental benefits compared to the proposed Ordinance. In addition, this alternative would result in beneficial effects to the environment compared to existing conditions in the areas of air quality, biological resources, greenhouse gas emissions, and hydrology/water quality. This alternative would also meet the project objectives, including:

- *Reducing the number of single-use plastic distributed by retailers and used by customers in Sunnyvale*
- *Deterring the use of paper bags by customers in Sunnyvale*
- *Promoting a shift toward the use of reusable carryout bags by retail customers in Sunnyvale*
- *Reducing the environmental impacts related to single-use plastic carryout bags, such as impacts to biological resources (including marine environments), water quality and utilities (solid waste)*
- *Avoiding litter and the associated adverse impacts to stormwater systems, aesthetics and the marine environment (San Francisco Bay)*



It should be noted that the proposed Ordinance would not have any significant impacts; therefore, adopting Alternative 3 (Mandatory Charge of \$0.25 for Paper Bags) rather than the proposed project would not avoid any significant environmental effects.

Table 6-16 compares the impacts for each of the alternatives.

**Table 6-16
 Impact Comparison of Alternatives**

Issue	Proposed Ordinance	Alt 1: No Project	Alt 2: Ban on Plastic Bags at all Retail Establishments	Alt 3: Mandatory Charge of \$0.25 for Paper Bags	Alt 4: Mandatory Charge of \$0.10 for Paper Bags
Air Quality	=	-/+	-/=	+	-
Biological Resources	=	-	+	+	-
Greenhouse Gas Emissions	=	-	-	+	-
Hydrology/Water Quality	=	-	+/=	+/=	-/=
Utilities and Service Systems	=	+	+/=	-/+	=/+

Superior to the proposed project (reduced level of impact)
- Inferior to the proposed project (increased level of impact)
= / + slightly superior to the proposed project in one or more aspects, but not significantly superior
= Similar level of impact to the proposed project



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7.1 REFERENCES

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