Appendix C

Greenhouse Gas Emissions Reductions Strategies Memorandum

This memorandum (memo) presents the City of San José's greenhouse gas (GHG) emissions context with a brief summary of the 2017 communitywide GHG inventory, an introduction to the emissions forecasts based on that inventory, and a comparison of forecasted emissions levels to the City's draft 2030 GHG target to establish the total amount of GHG reductions needed. It then presents draft GHG reduction actions proposed for inclusion in the 2030 Greenhouse Gas Reduction Strategy (GHGRS) to show how the City can achieve its 2030 GHG target. Action selection was based on a review of the City's recent Climate Smart San José (CSSJ) plan, the current version of the GHGRS, the City's previous Green Vision, and the Envision San José 2040 General Plan.

2017 GHG Inventory

The City's 2017 GHG inventory totals 5,711,667 MT CO_2e. This represents approximately 5.50 MT CO_2e per capita and 3.96 MT CO_2e per service population (i.e., population plus local employment). Figure 1 shows the 2017 inventory organized by emissions sector. Transportation emissions represent 63% of the total inventory, energy emissions contribute 32%, and waste emissions provide the remaining 5%.

Figure 1 – 2017 GHG Inventory by Sector

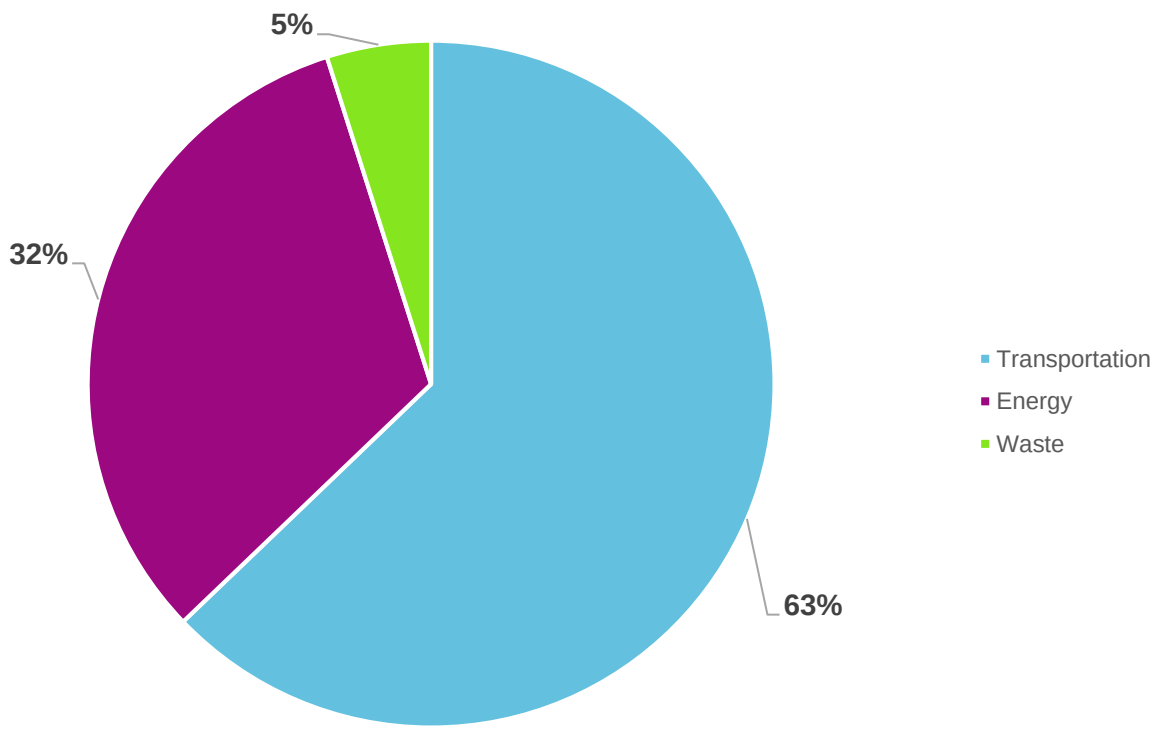
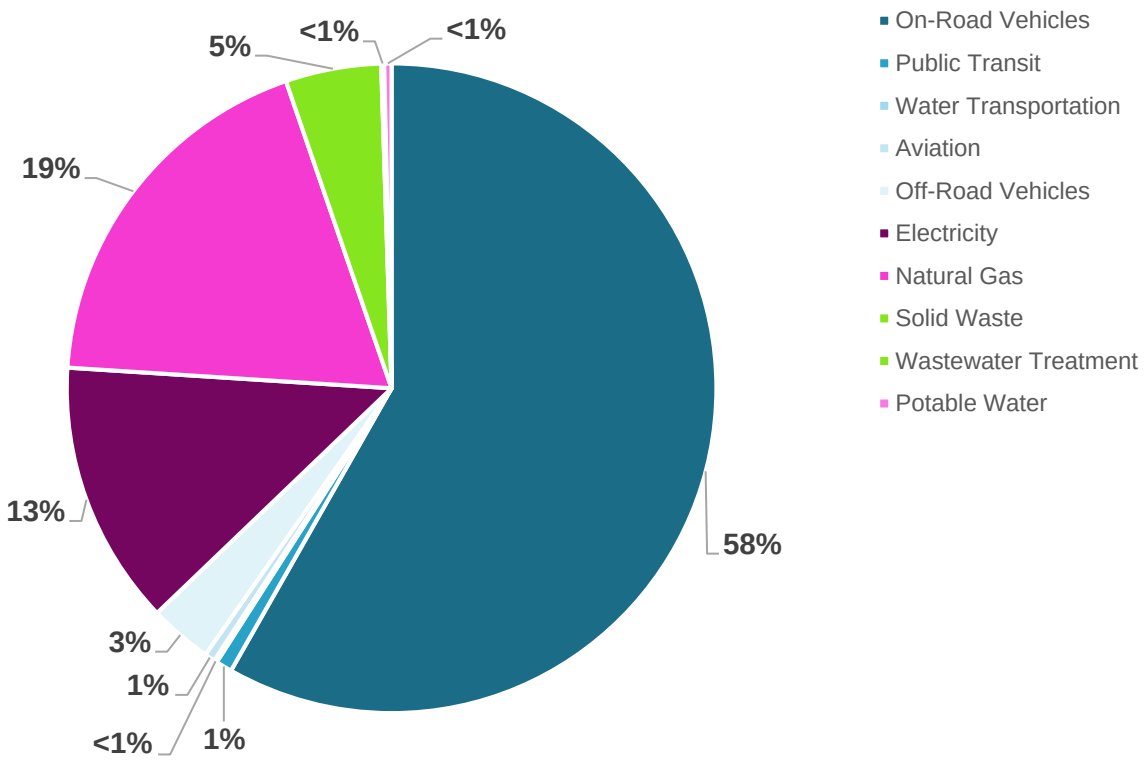


Figure 2 on the following page shows the 2017 inventory by emissions subsector to provide deeper understanding of the community's emissions sources. On-road vehicle emissions are the most significant source, contributing 58% of the total emissions. Natural gas and electricity are the second and third largest sources, providing 19% and 13% of total emissions, respectively. Solid waste management emissions contribute 5% and off-road vehicle and equipment use is responsible for another 3%. The remaining 2% of emissions come from public transit, water transportation, in-boundary aviation, and wastewater treatment.

Figure 2 – 2017 GHG Inventory by Subsector



Emissions Forecasts from 2017 Inventory

The 2017 GHG inventory results were used to develop emissions forecasts through a 2040 horizon year that aligns with the Envision San José 2040 General Plan; forecasts were developed for the years 2030 and 2040, even though the focus of this 2030 GHGRS is on a 2030 target year. The forecasts estimate how emissions in the community could grow if no additional GHG reduction actions are taken at the statewide or local levels.[1] The one exception to this approach is with on-road vehicle emissions, which are estimated based on the Envision San José 2040 General Plan vehicle miles traveled (VMT) forecasts and using ARB's mobile emissions model to develop future year vehicle emissions factors.[2] The EMFAC2017 emissions factors assume implementation of various statewide actions designed to improve vehicle fleet efficiency and reduce on-road tailpipe emissions. Therefore, the impact of these statewide actions is reflected in the emissions forecasts. The remaining emissions subsectors are primarily forecasted using demographic growth indicators from the 2040 General Plan, including population and local employment growth estimates, as well as subsector-specific planning forecasts, like Caltrain ridership forecasts and future wastewater treatment plant influent estimates. Table 1 on the following page summarizes the emissions forecast growth indicators that were applied to the 2017 inventory results for each subsector.

It should be noted that the State's Renewables Portfolio Standard (RPS), which requires California's electric utility companies to procure increasing amounts of renewable electricity for their energy portfolios, was purposefully excluded from the emissions forecast analysis. As shown later in the draft actions

[1] *This was historically referred to as a business-as-usual forecast, though use of the term has become less common in recent years.*

[2] *EMFAC2017 was used to maintain consistency with the City's 2017 GHG inventory on-road emissions calculation*

discussion, a primary source of future GHG reductions will come from implementation of the San José Clean Energy (SJCE) program. This program overlaps significantly with the RPS, and for purposes of this analysis, clean electricity reduction estimates have been attributed to SJCE.

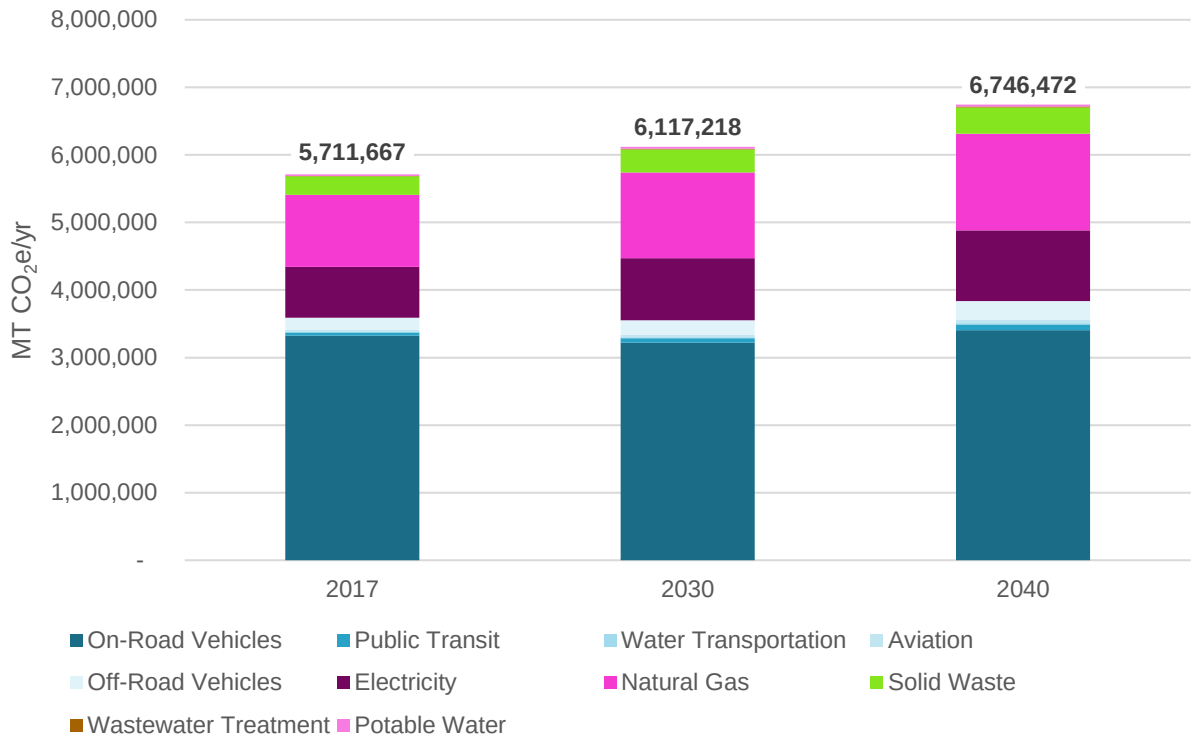
These forecasts represent an estimate of how future emissions might change based on numerous assumptions and currently available information. Consistent emissions monitoring, through inventory updates or activity data tracking, is important to ensure that emissions reductions are occurring as planned considering how emissions actually change in the future.

Table 1 – GHG Forecast Growth Indicators

Emissions Subsector	Emissions Growth Indicator
On-Road Vehicles	General Plan VMT forecast; EMFAC2017 vehicle emissions factors
Public Transit	Ridership forecasts from Caltrain, Altamont Corridor Express (ACE), Amtrak and community service population growth
Water Transportation	OFFROAD emissions model
Aviation	Enplaned passenger forecasts for SJC
Off-Road Vehicles	OFFROAD emissions model and community service population growth
Electricity	Population and service population
Natural Gas	Population and service population
Solid Waste	Service population
Wastewater Treatment	Influent projection from 2013 Santa Clara WWTP Master Plan
Potable Water	Service population

Based on these growth assumptions, Figure 3 illustrates the community's emissions forecasts for 2030 and 2040 (see following page). Emissions are estimated to increase by 7% from 2017-2030 and by 18% from 2017-2040. Per-capita emissions intensity is forecast to decrease by 7% below 2017 levels by 2030 and hold constant through 2040, decreasing from 5.5 MT CO_2e/capita in 2017 to 5.1 MT CO_2e/capita in 2030 and 2040. Per-service population emissions intensity is forecast to decrease by 14% below 2017 levels by 2030 and by 17% by 2040, decreasing from 4.0 MT CO_2e/service population in 2017 to 3.4 and 3.3 MT CO_2e/service population in 2030 and 2040, respectively.

Figure 3 – Emissions Forecast 2017-2040



Draft GHG Target

As described in the Draft GHG Emissions Reduction Target Options Memo (Target Options Memo) developed for this project, GHG targets can be defined as mass emissions targets that reflect an absolute emissions level or as emissions intensity targets that set emissions budgets on a per capita or per service population basis. The California Office of Planning and Research (OPR) through its General Plan Guidelines and the California Air Resources Board (ARB) through the *2017 Climate Change Scoping Plan* recommend that local governments analyze a community's mass emissions and emissions intensity to support a fuller understanding of the issue.

The 2030 GHGRS draft action analysis was performed based on the Target Option D 2030 per service population target, which was preliminarily recommended in the Target Options Memo. Target Option D was selected because it aligns with the most current guidance from ARB, OPR, and indirectly with the California Supreme Court's Newhall Ranch decision[3]; is tailored to match the emissions sectors included locally in the City's inventory; and provides an easy calculation metric for tracking future target progress.

[3] *The Newhall Ranch case was not about a communitywide climate action plan, but rather a new development project and that project's GHG threshold. This is an important distinction because communitywide CAPs consider emissions from existing and future development, whereas a project's CEQA analysis only considers emissions from new development associated with the project. However, the guidance provided in the Newhall Ranch case decision is still interpreted as a good analog for CAP target setting because it affirms the connection between State's GHG legislative framework, local agency determination, and CEQA determination.*

Target Option D reflects the following emissions intensity targets for 2030 and 2040[4]:

Target Metrics	2030	2040
MT CO_2e/service population	2.94	1.84
MT CO_2e/yr	5,280,218	3,803,055

Figure 4 shows how these targets compare to the GHG forecasts and is expressed as MT CO_2e/service population; Figure 5 shows the same information expressed as MT CO_2e/yr. As illustrated, the targets would result in improved emissions intensity levels and mass emissions reductions below 2017 levels.

Figure 4 – GHG Forecasts and Target – Emissions Intensity per-Service Population

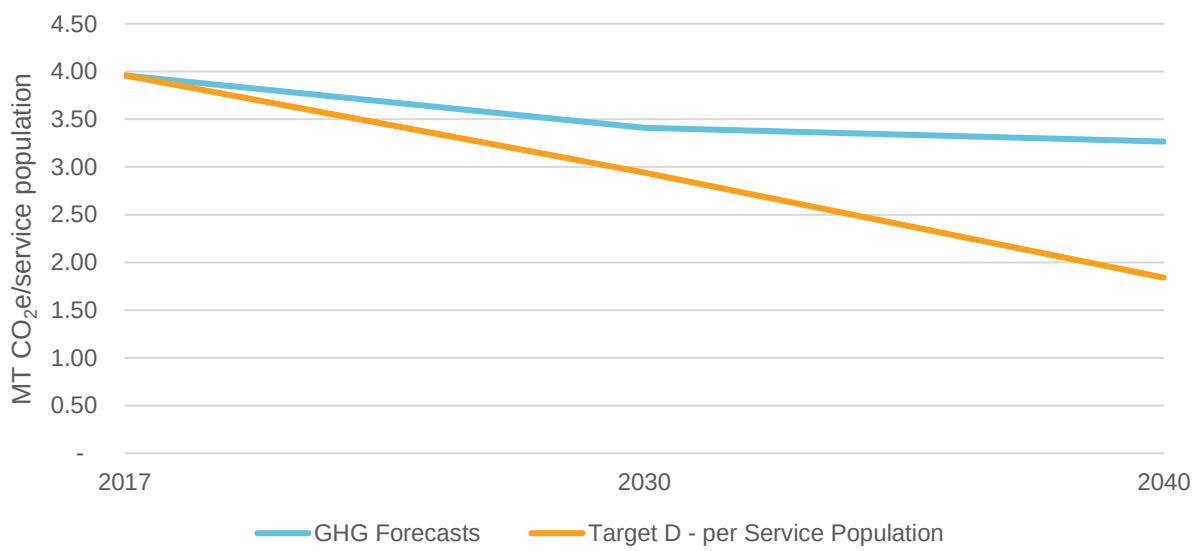
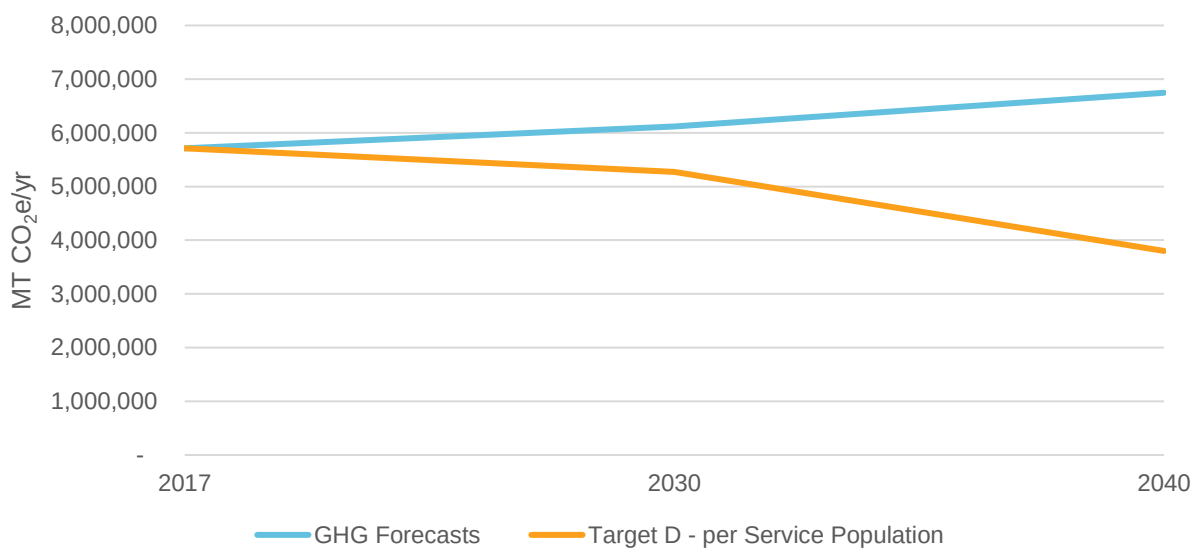


Figure 5 – GHG Forecasts and Target – Mass Emissions



[4] *See the Draft GHG Emissions Reduction Target Options Memo for a detailed description of how these targets were developed.*

GHG Reductions for Target Achievement

In Figures 4 and 5, the gap between the top emissions forecast line and the bottom GHG target line represents the amount of emissions reductions needed from implementation of statewide and local actions. Table 2 summarizes the emissions reduction values associated with the mass emissions shown in Figure 5. To achieve the proposed target in 2030, implementation of the 2030 GHGRS will need to support reductions totaling approximately 845,000 MT CO_2e/yr. Achievement of the 2040 target would require reductions of 2.9 million MT CO_2e/yr, although a 2040 target achievement pathway is beyond the scope of the 2030 GHGRS.[5]

Table 2 – GHG Forecasts and Reduction Targets

	2017 (MT CO_2e/yr)	2030 (MT CO_2e/yr)	2040 (MT CO_2e/yr)
GHG Forecasts	5,711,667	6,117,218	6,746,472
Target D - per Service Population	5,711,667	5,272,268	3,800,448
Reductions Needed	-	844,950	2,946,024

Draft GHGRS Actions

The draft GHGRS actions were selected based on a review of the City's recent Climate Smart San José plan, the current version of the GHGRS, the City's previous Green Vision, and the Envision San José 2040 General Plan. Actions were selected to represent a feasible pathway to 2030 target achievement by leveraging the City's existing planning efforts and supporting policy and program frameworks. However, this is not an exhaustive list of all possible GHG reduction strategies. It is assumed that the City will continue to protect and enhance the local environment through implementation of its various plans, policies, and programs, some of which will also result in local GHG reductions. Actions that provide GHG reductions, but are not represented in this draft list, can still contribute to GHG target achievement and their emissions impact would be reflected in future GHG inventory updates.

GHGRS Relationship to Climate Smart San José

CSSJ is the City's long-term, Paris-treaty consistent plan. It outlines an ambitious pathway to achieve future deep carbon reductions, including several transformative actions that will need to be widely implemented. As in similar deep carbon reduction plans, CSSJ outlines a potential pathway for achieving the City's long-term GHG target, but the pathway is contingent upon aggressive implementation assumptions.

The 2030 GHGRS should be consistent with CSSJ in terms of the types of actions the City will take, since the two planning approaches are complementary. However, the 2030 GHGRS has a shorter time horizon (i.e., 2030) and different purpose (i.e., serve as a Plan for the Reduction of Greenhouse Gases as defined in California's CEQA Guidelines Section 15183.5). Therefore, the 2030 GHGRS should be grounded in assumptions that have a higher degree of certainty, as well as include an implementation monitoring and adjustment plan to ensure the anticipated reductions occur by 2030.

[5] *In the future, it is assumed the State will codify additional GHG targets beyond its current 2030 target (i.e. Senate Bill 32 Global Warming Solutions Act). As with the adopted 2020 and 2030 targets, ARB will likely update the Scoping Plan to outline the State's new target achievement pathway. This in turn will help local governments to understand more clearly their role and opportunities in providing additional local GHG reductions to achieve longer-term targets. The City may then decide to update the GHGRS following adoption of new State GHG targets and the supporting Scoping Plan analysis.*

Proposed Actions for Inclusion in 2030 GHGRS

Table 3 presents the draft list of actions proposed for inclusion in the 2030 GHGRS to demonstrate how the City will achieve its 2030 GHG target. The table shows the estimated GHG reductions for each action in 2030 and compares the total estimated reductions to the 2030 target on a mass emissions and per-service population emissions intensity basis. The table also identifies sources of origin for the actions to demonstrate how the proposed list overlaps with state regulations or policies, and the City's policy framework of sustainability-related actions. As shown, the proposed list of actions would achieve the 2030 GHG target of 2.94 MT CO_2e/service population. Figure 6 on the following page shows the GHGRS reductions in the context of the emissions forecasts and GHG target trajectory through 2040. Reductions were calculated through the 2030 target year and are shown as a dashed dark blue line that overlaps with the GHG target line.

Table 3 – Proposed GHGRS Actions and Reduction Estimates

Proposed Action	2030 Reductions MT CO_2e/yr	Action Origins
San José Clean Energy	655,104	Green Vision Goal 3 Climate Smart San José (CSSJ) Strategy 1.1
Zero Net Energy Residential Construction	43,678	California Energy Efficiency Strategic Plan CSSJ Strategy 2.2 General Plan Goal MS-14
Renewable Energy Development	63,697	Green Vision Goal 3 CSSJ Strategy 1.1 General Plan Goal MS-2
Existing Building Retrofits – Natural Gas	208,986	Senate Bill 350 CSSJ Strategy 2.2 General Plan Goal MS-2
Zero Waste Goal	207,956	Green Vision Goal 5 General Plan Goal MS-5 Council Resolution 74077
Caltrain Modernization Project	12,547	CSSJ Strategy 2.4
Water Conservation	3,106	CSSJ Strategy 1.2 General Plan Goal MS-3
Total	**1,195,074**	-
GHG Target Impact	**MT CO_2e/yr**	**MT CO_2e/service population**
2030 Target	5,272,268	2.94
2030 Mitigated Emissions	4,922,144	2.74
Target Achieved	**YES**	**YES**

Figure 6 – 2030 GHGRS Scenario GHG Reductions

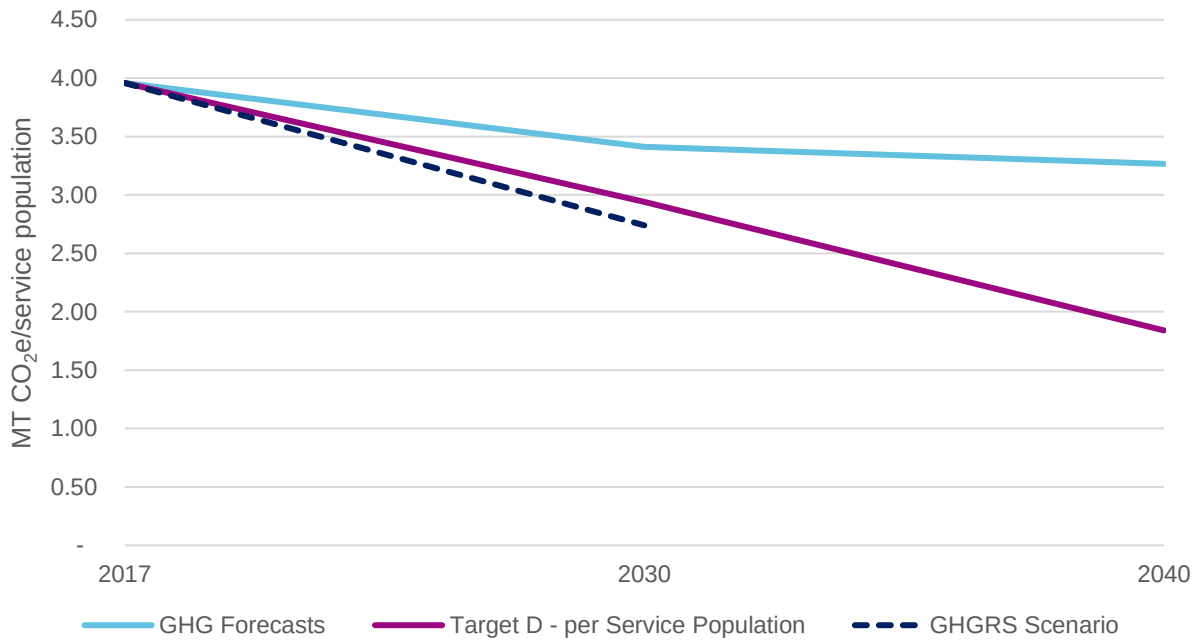


Table 4 presents the primary assumptions for each action that support the GHG reduction estimates. Where relevant, action implementation assumptions from CSSJ or Green Vision are referenced to provide additional context.

Table 4 – Primary Action Assumptions

Proposed Action	Primary Assumptions
San José Clean Energy (SJCE)	**98% participation in SJCE (excluding direct-access customers) in 2030;** **100% renewable or GHG-free energy sources in 2030** <u>Participation Rates</u> Residential and non-residential electricity demand is met through 98% SJCE and 2% PG&E, and direct access customers remain with their current suppliers, per *SJCE Community Choice Aggregation Implementation Plan and Statement of Intent, August 17, 2017.* <u>Electricity Emissions Factors</u> PG&E's 2030 energy portfolio was modeled to show compliance with RPS requirements for 60% renewable energy sources (per SB 100); the remaining sources include large hydro, nuclear, natural gas, and unspecified sources; the relative contributions of these remaining sources to the total energy portfolio in 2030 were scaled down from the 2017 PG&E Power Content Label such that as RPS sources increase, non-RPS sources decrease evenly; the result is a PG&E 2030 portfolio that is 88.2% renewable or GHG-free. Per *SJCE Community Choice Aggregation Implementation Plan and Statement of Intent, August 17, 2017,* SJCE will exceed PG&E's <u>renewable and GHG-free</u> generation by 10%, which would mean providing 98.2% renewable and GHG-free generation based on the PG&E assumptions above. The CSSJ Detailed Modelling Assumptions assumed that SJCE would exceed PG&E's RPS requirements by 10% and that all non-renewable electricity would come from zero-emissions sources, resulting in 100% emissions-free electricity. Further, it is the City's

	goal to provide 100% emissions-free electricity as the standard offering through SJCE by 2021 – 9 years in advance of the GHGRS 2030 target year. This analysis assumed the City will achieve its goal of providing 100% emissions-free electricity sources by 2030 at the latest. If that goal is not achieved before the 2030 target year, the City will revisit other GHG reduction options, as needed, to close any remaining emissions reduction gap. <u>Electricity Demand Affected</u> Electricity reductions from the Zero Net Energy Residential Construction and Renewable Energy Development (i.e., avoided grid electricity) actions were subtracted from the 2030 electricity demand forecast to calculate remaining electricity demand to which this action applies.
Zero Net Energy – Residential Construction	**50% of new residential construction from 2020-2030 achieves zero-net energy use** <u>Participation Rates</u> California's Energy Efficiency Strategic Plan sets goals for the development of zero net energy (ZNE) buildings for new construction and retrofits, including a goal for 100% of new residential construction to be ZNE by 2020, 100% of new commercial construction to be ZNE by 2030, and 50% of commercial buildings retrofitted to ZNE by 2030. Recent changes to the State's Green Building Standards Code will support the residential ZNE goals by requiring solar panels to be installed on all new residential construction of three stories or less (with some exceptions based on site conditions) starting in 2020. CSSJ Strategy 2.2 assumes 100% of new residential development in San José will achieve ZNE goals in 2020. CSSJ Strategy 3.2 assumes 100% of new commercial development in San José will achieve ZNE goals in 2025 (5 years earlier than anticipated State requirements). This analysis conservatively assumes that 50% of new residential construction from 2020-2030 would achieve the ZNE goals. The calculations assume that 100% of electricity and natural gas demand from 50% of new residential construction during this period can be offset through a combination of increased building energy efficiency, integration of electric appliances/building systems, and renewable energy development. This analysis assumes that commercial ZNE construction will not begin until required to do so in 2030.
Renewable Energy Development	**472.1 net new MW of solar PV installed 2017-2030** <u>Participation Rates</u> San José had an installed solar capacity of 195.9 MW (DC) in 2017, per Shining Cities 2018 report data. Per CSSJ Strategy 1.1, the installed local renewable energy target is 668 MW by 2030. This represents average annual growth in PV capacity of 10.5% per year through 2030; capacity increased 13% per year on average from 2015-2018, per Shining Cities report data. <u>Calculation</u> The electricity generation capacity of a 4 kW DC solar systems in San José was calculated using the National Renewable Energy Laboratory (NREL) PVWatts Calculator and converted to a kWh/MW installed metric. This energy generation metric was multiplied by the total net new MW capacity goal (472.1) to calculate total kWh of solar PV generation in 2030. The amount of electricity assumed to be avoided through the Zero Net Energy Residential Construction action was subtracted from this total new solar energy generation value to calculate the net new solar energy resulting from this action.
Building Retrofits – Natural Gas	**4% reduction in natural gas use below 2017 levels**

	Green Vision Goal 2 was defined to reduce per-capita energy use by 50% below 2008 levels by 2022. The General Plan also includes this goal in IP-17.1, which directs the City to implement the Green Vision. Natural gas use in the 2008 inventory totaled 20.87 mmbtu/capita; a 50% reduction would set a target to achieve natural gas use of 10.43 mmbtu/capita. The 2030 natural gas forecasts, after accounting for ZNE building energy reductions, assume remaining natural gas consumption of 18.95 mmbtu/capita. To achieve the Green Vision Goal's 50% per capita reductions, 2030 natural gas forecast use will need to be 36% below 2017 inventory levels. At the state level, SB 350 requires the California Energy Commission to define energy efficiency targets that would result in a doubling of energy efficiency savings from electricity and natural gas end uses by 2030. Per the *2018 California Gas Report*, prepared by the State's gas and electric utilities, the state's natural gas demand is expected to decrease 0.5% per year from 2018-2035. This natural gas use reduction applied locally would result in 2030 consumption that is 6.3% below 2017 levels. <u>Participation</u> This action conservatively assumes natural gas reductions of 4.4% below 2017 inventory levels, which corresponds to a 25% per capita reduction below 2008 levels.
Zero Waste Goal	**90% of waste diverted from landfills in 2030** General Plan Goal MS-5 Waste Diversion is to "Divert 100% of waste from landfills by 2022 and maintain 100% diversion through 2040." Per the Status Report on Zero Waste Strategic Plan 2022 memorandum to the City's Transportation and Environment Committee, "zero waste" is defined as landfilling no more than 10% waste. <u>Diversion Rates</u> San José's 2017 diversion rate was conservatively assumed to be 74% based on an EPA Zero Waste Case Study. This rate was combined with the 2017 inventory activity data on waste tons sent to landfill to calculate a total waste generation value for 2017.The 2030 forecast activity data for waste sent to landfills was used to estimate a total 2030 waste generation value assuming no change in diversion rate from 2017 (i.e., 74%). This 2030 total waste generation value was then combined with an assumed 90% waste diversion rate consistent with the City's Zero Waste goal to calculate the remaining amount of waste to be landfilled in 2030. <u>Emissions Factor</u> Assumes no change in the emissions per ton of landfilled waste from 2017 to 2030. The 2017 GHG inventory modeled the City's landfill waste profile based on the CalRecycle *2014 Disposal-Facility-Based Characterization of Solid Waste in California*. As the City continues to implement aspects of its Zero Waste Strategic Plan, including organic waste diversion to the ZWED facility, the composition of landfilled waste will change; likely in a way that decreases the amount of degradable organic content present in the waste stream that could decompose anaerobically in a landfill to produce methane emissions.
Caltrain Modernization Project	**75% of diesel trains converted to electric powered by PG&E grid;** **Approximately 33,000 daily VMT reductions in San José from increased Caltrain daily ridership** <u>Electrification</u> Caltrain is currently implementing an electrification project through its Caltrain Modernization (CalMod) Program that would convert 75% of its diesel engine trains to electric propulsion models. The electrification project would cover the route from the 4th/King St. station in San Francisco to Tamien station in San José.

	Participation Rates Caltrain diesel consumption within the City's boundary by train route is provided in the 2017 inventory. Diesel use associated with the Tamien southbound route was omitted from this calculation; Caltrain will continue to operate diesel engines along this route to Gilroy since the track cannot be electrified through the CalMod Program. 75% of the diesel consumed for the Tamien northbound and Diridon northbound routes was converted to electricity (the remaining 25% was maintained as diesel use). VMT Reductions The CalMod Program estimates 619,000 VMT are reduced per day by 2040 as a result of program implementation. These reductions were interpolated for 2030 assuming 0 VMT reductions in 2017, for a 2030 daily VMT reduction estimate of 350,000. San José's pro rata share of these daily VMT reductions were estimated based on 2018 Caltrain Annual Passenger Count data that shows 9.5% of total average midweek ridership in the Caltrain system occurs at San José's stations (Diridon and Tamien). The daily VMT reduction estimate was converted to a yearly value using the same annualization factor as in the 2017 inventory on-road calculations (i.e., 347), and then compared to total 2030 VMT estimates in the GHG forecasts (collected from the 2040 General Plan) to calculate the percentage of 2030 on-road emissions that the VMT reductions represent.
Water Conservation	**107 MGD water consumption in 2030** (12% reduction in total water use below 2017 level; 23% reduction in gallons per capita per day 2017 level) Implementation Rate Per CSSJ Strategy 1.2, San Jose reduces water consumption to 107 million gallons per day (MGD) in 2030. This compares to 122 MGD consumption stated in the 2017 inventory. Based on population growth estimates, this would require a 23% reduction in gallons per capita per day below 2017 levels. Energy Savings The ratio of kWh/MG of water consumption from the 2017 inventory were held constant through 2030 to estimate the energy reductions associated with the water conservation. The energy savings were multiplied by the eGRID electricity emissions factor used to calculate the 2017 potable water inventory emissions.