PLACEWORKS

MEMORANDUM

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SUBJECT Climate Action Plan Update – Draft Greenhouse Gas Forecast

Introduction

PlaceWorks has prepared draft projections of future community-wide and County operations greenhouse gas (GHG) emissions for Butte County as part of the Climate Action Plan Update. PlaceWorks prepared these projections for the calendar years 2030, 2040, and 2050. The results of this analysis are built off of the 2019 GHG inventory PlaceWorks completed and will serve as a foundation for identifying GHG emission targets and policies in the updated Climate Action Plan to achieve the necessary GHG reductions, which should help to reduce adverse climate impacts already occurring in the county. More detail on existing GHG emissions can be found in the Community and Government Operations GHG Inventories - Summary of Results memorandum dated May 5, 2021.

Community-wide Forecast

The community-wide forecast includes a projection of emissions from activities engaged in by the community such as driving a car, using power in their homes, or using water. The draft community-wide forecast of GHG emissions is based on the results of the 2019 community-wide GHG emissions inventory, combined with Butte County's 2019 and future demographic projections. Table 1 shows the demographic projections used to prepare the community-wide GHG emissions forecast. These demographic projections are for the unincorporated county, which excludes incorporated areas such as the cities or Chico, Oroville, Gridley, Biggs, and the Town of Paradise.

Table 1: Butte County Community-wide Demographic Projections, 2006 – 2050

	2006	2019	2030	2040	2050	Percent Change 2006 to 2050	Relevant sectors
Population	89,410	76,930	88,600	94,570	100,940	9%	Off-road equipment
Households	34,980	29,510	38,730	41,560	44,610	24%	Residential energy, off-road equipment
Residents per household	2.56	2.61	2.29	2.28	2.26	-12%	None
Jobs	7,740	14,050	14,360	15,620	16,990	117%	Nonresidential energy, off-road equipment
Vehicle miles traveled	464,302,670	533,627,000	613,632,270	705,759,230	811,857,710	75%	Transportation
Service population*	97,150	90,980	102,960	110,190	117,930	18%	Solid waste, water and wastewater, off-road equipment

* Service population is the sum of populations and jobs.

All numbers are rounded to the nearest 10.

Demographic numbers are from US Census, the Department of Finance, and the Butte County Association of Governments. Vehicle miles traveled are derived from the Butte County Association of Governments Regional Travel Demand Forecasting Model, adopted in 2020.

The draft forecast assumes that each person in Butte County will continue to contribute the same amount of GHG emissions to the community total, so that the amount of GHG emissions changes proportionally to the projected change in community demographics. Table 2 shows Butte County's forecasted community-wide GHG emissions.

Table 2: Butte County Draft Community-wide GHG Emissions, 2006 – 2050

Sector	2006 Inventory $MTCO_2E$ [1]	2019 Inventory $MTCO_2E$ [1]	2030 $MTCO_2E$	2040 $MTCO_2E$	2050 $MTCO_2E$	Percent Change 2006 to 2050
Residential energy	133,350	90,720	119,070	127,760	137,140	3%
Nonresidential energy	58,670	37,350	38,180	41,520	45,160	-23%
Transportation	264,420	229,110	261,560	298,740	341,330	56%
Solid waste	40,830	61,120	65,820	72,580	79,070	94%
Water and wastewater	20,190	16,960	19,190	20,540	21,980	9%
Agriculture [2]	521,650	501,620	501,620	501,620	501,620	-4%
Off-road equipment	56,070	59,310	118,510	77,290	83,350	49%
Total (without land use and sequestration)	**1,095,190**	**996,190**	**1,123,950**	**1,140,050**	**1,209,650**	**10%**
Land use and sequestration [3]	-346,340	-346,330	-346,330	-346,330	-346,330	0%
Total (with land use and sequestration)	**748,850**	**649,860**	**777,620**	**793,720**	**863,320**	**15%**
Stationary sources	*3,960*	*108,259*	*108,259*	*108,259*	*108,259*	-
Fires [4]	*8,280*	*15,730*	-	-	-	-

1: Data shown for 2006 and 2019 reflect GHG emissions inventories and are provided as a reference to see change over time. The data shown for 2030, 2040, and 2050 are GHG emission forecasts that predict future emissions. The forecast numbers for 2030, 2040, and 2050 are based on projections from the 2019 inventory.

2: GHG emission projects for the agriculture and for the land use and sequestration sectors remains constant due to the variable nature of each sector and the activities within them. For example, annual amount of agricultural burning is highly variable, impacting overall GHG emissions from the agriculture sector and activities such as restoration efforts. As reliable forecasts of County-specific agricultural activity are not available, these emissions are held constant.

3: The forecast assumes that new development in unincorporated areas will take place on infill sites or on previously developed land, such as reconstruction following wildfires, and that development occurring on previously undeveloped land will occur after annexation to an incorporated community. As a result, the forecast does not assume a change in the average annual amount of carbon sequestered by natural lands.

4: Due to significant uncertainty about the amount of fire in any given year, emissions from fires are not forecasted.
All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

Relative to 2006 levels, Butte County's GHG emissions are expected to increase 10 percent by 2050 when not accounting for emission changes from land use and sequestration. When accounting for land use and sequestration, GHG emissions would increase by 15 percent between 2006 and 2050. However, although GHG emissions when accounting for land use and sequestration would increase 15 percent over this time frame, these emissions remain below where they would be without the reductions afforded by land use and sequestration. These increases assume that no action is taken at any level, including by state, regional, and local agencies.

The solid waste and off-road equipment sectors show a significant increase in GHG emissions from the 2006 levels. This is primarily due to the 2018 Camp Fire. For solid waste-related GHG emissions, the 2018 Camp Fire resulted in a large increase in the tons of solid waste disposed of at the Neal Road Landfill, as a result of fire cleanup activities. This caused a significant increase in landfill-related GHG emissions, which will continue in future years as the debris from the 2018 Camp Fire slowly decomposes. The forecast assumes that the large increase in solid waste tonnage in 2019 was a one-time event rather than a future trend, and the forecast of future emissions in this sector is based on a multi-year average from 2015-2018 rather than the 2019 point-in-time data.

Additionally, GHG emissions in the off-road equipment sector saw a large increase after 2019 due to the beginning of post Camp Fire reconstruction efforts. The increased construction activity related to rebuilding is responsible for the large increase in off-road equipment GHG emissions seen in the 2030 forecast, and while the projected emissions decline after 2030, continued population growth is expected to keep off-road equipment GHG emissions well above 2006 levels.

ANNEXATION

If any land currently in the unincorporated County is annexed during the forecast period, GHG emissions associated with the annexed area would be assigned to the jurisdiction that has annexed the land. As a result, annexations would cause a decrease in GHG emissions for unincorporated Butte County. County staff have spoken with individual jurisdictions and identified potential annexations that may occur by 2030. Table 3 shows these annexations, including the potential land acreage and dwelling units in the potential annexation areas.

Table 3: Potential Annexations in Butte County

Community	Annexation	Dwelling Units	Non-residential Acres	Jobs [1]	Agricultural Acres	Agricultural Jobs [2]	Open Space Acres
Biggs	Phased Annexation Plan	28 [3]	-	-	577.6	1	-
Chico	Island Annexation Plan	535	-	-	-	-	-
	Valley's Edge	-	-	-	-	-	1,448
	North Chico	630	146	175	1,480	1	13
Gridley	No planned annexations						
Oroville	No planned annexations						
Paradise	No planned annexation						
Total		**1,193**	**146**	**175**	**2,057**	**2**	**1,461**

1: Jobs are estimated using the average in the unincorporated County of approximately 1.2 jobs per acre of nonresidential non-agricultural land.

2: Agricultural jobs are estimated using estimated average in the unincorporated County of one job per 990 agricultural acres.

3: Estimated based on aerial photography of the proposed annexation area.

Totals may not equal the sum of individual rows.

Due to the decrease in dwelling units, jobs, and other land use and demographic indicators, these annexations would cause future GHG emissions to be lower than those reported above in **Table 2**. However, due to the relatively small size of the areas proposed for annexation, the annexations do not have a substantial impact on total GHG emissions. Assuming all of the above annexations occur by 2030, Butte County's GHG emissions are projected to increase to approximately 9 percent above 2006 levels by 2050 when not accounting for emission changes from land use and sequestration, and to 13 percent when accounting for these changes. **Table 4** and **Figure 1** show the results of the inventory with effects of annexation.

Table 4: Butte County Draft Community-wide GHG Emissions with Annexations, 2006 – 2050

Sector	2006 Inventory $MTCO_2E$*	2019 Inventory $MTCO_2E$*	2030 $MTCO_2E$	2040 $MTCO_2E$	2050 $MTCO_2E$	Percent Change 2006 to 2050
Residential energy	133,350	90,720	115,370	124,100	133,450	0%
Nonresidential energy	58,670	37,350	37,820	41,140	44,740	-24%
Transportation	170,310	229,110	250,990	269,200	288,720	52%
Solid waste	40,840	61,120	64,990	71,750	78,250	92%
Water and wastewater	20,190	16,960	18,580	19,930	21,370	6%
Agriculture	521,650	501,620	499,560	499,560	499,560	-4%
Off-road equipment	56,070	59,310	117,380	76,140	82,250	47%
Total (without land use and sequestration)	**1,095,190**	**996,190**	**1,104,690**	**1,101,820**	**1,148,340**	**9%**
Land use and sequestration	-346,330	-346,330	-345,010	-345,010	-345,010	Less than 1% less
Total (with land use and sequestration)	**748,860**	**649,860**	**759,680**	**756,810**	**803,330**	**13%**
*Stationary sources***	*3,960*	-	-	-	-	-
Fires †	*8,280*	*15,730*	-	-	-	-

* Data shown for 2006 and 2019 reflect GHG emissions inventories and are provided as a reference to see change over time. The data shown for 2030, 2040, and 2050 are GHG emission forecasts that predict future emissions. The forecast numbers for 2030, 2040, and 2050 are based on projections from the 2019 inventory.

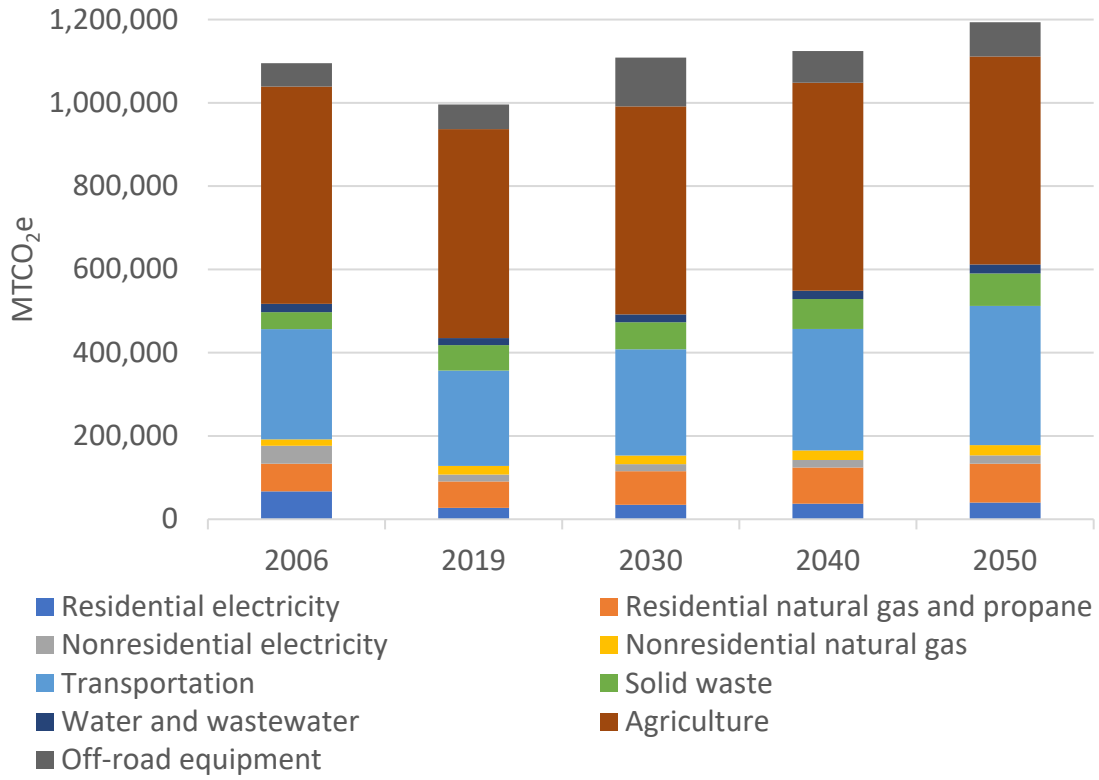
** Due to limited data availability, stationary source emissions are not available for 2019.

† Due to significant uncertainty about the amount of fire in any given year, emissions from fires are not forecasted.

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

2006 GHG emissions are provided as a reference to see change over time. The forecast numbers for 2030, 2040, and 2050 are based on projections from the 2019 inventory.

Figure 1: Butte County Draft Community-wide GHG Emissions with Annexations, 2006 – 2050



County Operations Forecast

The draft County operations forecast of GHG emissions is based on the results of the 2019 County operations GHG emissions inventory, combined with Butte County's 2019 and future demographic projections. While 2019 is the base year for the forecast projections, the 2006 GHG inventory is the baseline inventory for the entire CAP and its targets. **Table 5** shows the number of anticipated employees per year which were used to prepare the County operations GHG emissions forecast.

Table 5: County Operations Demographic Projections, 2019 – 2050

	2006	2019	2030	2040	2050	Percent Change 2006 to 2050
County employees	2,270	2,130	2,250	2,350	2,460	8%

All numbers are rounded to the nearest 10.

County employee numbers are from County reports.

Relative to 2006 levels, Butte County's operational GHG emissions are expected to increase 67 percent by 2050. These increases assume that no action is taken at any level, including by state, regional, and local agencies. The draft forecast assumes that each County employee will continue to contribute the same amount of GHG emissions to the County total, so that the amount of GHG emissions increases proportional to the projected increase in County employees. Table 6 shows Butte County's forecasted County operations GHG emissions.

Table 6: Butte County Draft County Operations GHG Emissions, 2006 – 2050

Sector	2006 Inventory $MTCO_2E$*	2019 Inventory $MTCO_2E$*	2030 $MTCO_2E$	2040 $MTCO_2E$	2050 $MTCO_2E$	Percent Change 2006 to 2050
Energy	5,900	2,640	2,790	2,910	3,050	-48%
Commute	6,850	5,330	5,630	5,880	6,160	-10%
Fleet	4,550	5,140	5,430	5,670	5,940	31%
Solid waste	21,340	32,310	40,050	44,990	49,550	132%
Water and wastewater	90	60	60	70	70	-22%
Refrigerants**	-	20	20	20	-	-
Total	**38,730**	**45,500**	**53,980**	**59,540**	**64,770**	**67%**

* Data shown for 2006 and 2019 reflect GHG emissions inventories and are provided as a reference to see change over time. The data shown for 2030, 2040, and 2050 are GHG emission forecasts that predict future emissions. The forecast numbers for 2030, 2040, and 2050 are based on projections from the 2019 inventory.

** Due to limited data availability, refrigerant emissions are not available for 2006.

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

Similar to the community-wide forecast, the solid waste sector saw unusually high 2019 activity data due to debris from the 2018 Camp Fire being deposited at the Neal Road Landfill facility. This caused a significant increase in landfill-related GHG emissions, which is reflected in the Solid Waste sector for County Operations since the County operates this facility. The forecast assumes that the large increase in solid waste tonnage in 2019 was a one-time event rather than a future trend, and the forecast of future emissions in this sector is based on a multi-year average from 2015-2018 rather than the 2019 point-in-time data. As this is treated as a one-time event rather than a projection of future trends, future emissions are based on a multi-year average of 2015-2018 waste deposition at the Neal Road landfill, rather than the 2019 point-in-time data. However, since the waste has already been deposited in the landfill, it continues to result in high GHG emissions through 2050 as it slowly decomposes.

The proposed annexations are not expected to affect the County operations GHG emissions forecast.

Next Steps

PlaceWorks will confirm these results with County staff and conduct an analysis of existing and planned activities on the State and local level. PlaceWorks will then work with the County to review the draft GHG emissions forecast and analysis of the existing and planned activities. These results will form the foundation of work to identify suitable GHG emission reduction targets for the updated Climate Action Plan and to develop policies to achieve these targets.