

Landfill Gas Emissions Destruction, Beneficial Use and Solar Utility, EV Refuse Trucks & Charging System and Recycling Center, Community Center Backup Power Generation facilities, Greenhouse Gas Reduction Measures and Facilities

Detailed Budget, Expenditure of Awarded Funds and Reasonableness of Costs

a. Narrative

This is a funding request that accompanies and is complementary to the Workplan submitted for this grant application. It is for implementation measures and infrastructure facilities that will deeply benefit the disadvantaged communities in Waco and surrounding region by reducing greenhouse emissions. Infrastructure projects that include the following:

1. Full buildout of a landfill gas collection system to deliver collected landfill gas to a novel combination of a landfill gas emissions destruction and beneficial use and Solar Utility plant (not in the grant request but will enable more collection of landfill gas through a landfill gas wellfield that conveys the landfill gas for emissions destruction and through a geomembrane cap as part of the Solar Utility that also captures emissions not collected by the wellfield for conveyance to the destruction plant.) The collected landfill gas and GHG will be combusted and serve other beneficial uses and will destroy greenhouse gases more efficiently due to a Baylor-Waco combustion system that will result in near zero emissions;
2. Increased recycling and diversion through construction of new recycling center;
3. Reduce fossil fuel emissions from coal powered plants thru construction of four natural gas-powered generators at community centers in disadvantaged areas of Waco;
4. Replacement of diesel-powered refuse trucks with all Electric Recycling Trucks;
5. Renewable power generation through a solar utility plant at a closed landfill site; and,
6. The addition of EV Charging stations at multiple locations at or within disadvantaged communities in Waco.
7. Reporting, Tracking and Coordination with Planning Grant Awardees and, High-Quality Workforce Training. These projects will create high tech, high paying jobs within the local disadvantaged communities from skilled, semi-skilled to labor class, significantly reduce greenhouse gases, add resilience to the grid, defer use of fossil fuels to generate power, add renewable energy and improve the local air quality and climate. Funding from the EPA Grant will be used to provide job training thru established high tech programs at local colleges and workforce training centers.

These measures combine to benefit multiple disadvantaged communities, add resiliency to the grid system, significantly reduce carbon and methane emissions, address climate adaptation and create venues for positive climate change.

The budget proposed within this grant application conforms to “Interim General Budget Development Guidance for Applicants and Recipients of EPA Financial Assistance (Last Revised: January 12, 2023).” Waco accepts that costs must be allowable under the Uniform Administrative Requirements, Cost Principles and Audit Requirements for Federal Awards (2 CFR 200). This includes cost eligibility¹ and reasonableness² of expenses.

The proposed Budget Detail lists costs that are expected as a result of a post-grant award and do not include pre-award costs. The project listed will not receive any other non-federal contribution other than the day-to-day expenses of landfill operation, or tasks previously allocated under the City of Waco Capital Improvement program. It is noted that Baylor University-Waco received a \$1M National Science Foundation grant with the Department of Energy as the funding partner.³ While this grant is intended to provide a near-zero flare emissions, the project is not a part of this funding grant, but the combination of a Solar Utility and Landfill Gas Emissions Destruction Beneficial Use plant wellfield installation and a future landfill gas beneficial use plant will directly benefit the reduction of greenhouse gas emissions. It is therefore relevant to include the emission reductions in the calculations.

¹ A cost is eligible if it is permitted by statute, program guidance, or regulations.

² A cost is reasonable if it does not exceed that which would be incurred by a prudent person under the circumstances prevailing at the time the decision was made to incur the cost.

³ SCC-CIVIC-FA Track A: Novel Fuel-Flexible Combustion to Enable Ultra-Clean and Efficient Waste-to-Renewable Energy in Changing Climate

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Indirect costs of operating and maintaining facilities, depreciation, and administrative salaries are examples of the types of costs that are treated in the application as indirect costs.

Equipment that is listed as part of this budget narrative having a value of more than \$5,000 and/or a useful life of more than one year are provided in the detailed budget. Only equipment essential to the performance of the facility in operation and achieving reductions in greenhouse gases are listed. Specific manufacturers that are listed only for examples of expected performance and equivalent manufactures are allowed. The City of Waco has standing policies and procedure for the purchases of equipment and services that ensure competitive requirements under Texas State Laws and Federal Guidelines. The City of Waco has a Fiscal Services Department that is responsible for procurement of all purchases and services, including professional and architectural services and independently monitors them. For each category of purchases, the City of Waco Legal Services Department monitors applicable adherences to rules, and laws that pertain to such purchases, develops contracts and acts as legal counsel. City of Waco Contract documents for purchases, by its policies and legal procedures includes the following:

A. Contract Requirements (1) City of Waco General Terms and Conditions (2) Additional Terms for Services (3) Insurance & Indemnification Requirements (4) Sales Tax Information (5) House Bill 89 Energy Form (6) House Bill 89 Gun Form (7) House Bill 89 Israel Form (8) HB1295 Information Sheet (9) Protest Procedure	B. Forms to Complete and Return (1) Submission of Proposal and Acknowledgement of Addenda (2) Business Identification Form (3) Conflict of Interest Questionnaire (CIQ Form) (4) Disclosure of Relationships with City Council/Officers (City Charter) (5) Minority/Women Owned Business (6) Litigation Disclosure (7) Certification Regarding Debarment (8) Non-collusion Affidavit (9) Resident Certification (10) Texas Public Information Act (11) Drug Free Workplace
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Consultancy costs for individuals who are not employees of the recipient are contractual. Individual consultants typically receive 1099 forms for Federal tax purposes. In all instances, the Project Manager Reviews invoices and expenditures related to the project, determines their reasonableness and submits invoices to the budget accounting and purchasing group of the City of Waco. External Contractors must submit an audited form of their labor classification and hours, equipment, rentals, supplies, sub-contracted services, fees and any related expenditures prior to approval. A narrative summary of budget steps follows in the subsections below.

Annual Audits Annual Audits of all expenses will be conducted. Audits will be performed in accordance with § 200 and 320 of the Office of Management and Budget (OMB Circular A-133. Reports on these audits will be submitted to the Federal Audit Clearinghouse (FAC) within the earlier of 30 days after receipt or nine months after the fiscal year's end and submit audit reports and Standard Form SACs electronically to the Federal Audit Clearinghouse	Accounting System The accounting system, includes: Reports expenditures separately by federal program. Charts of accounts. Receipts and Receivables ledger maintained electronically and documented. Disbursements. Documentation will be maintained to support all disbursements. Disbursements pre-approved with approval levels and responsible persons identified. Expenditures will be valued as reasonable and in accordance with competitive requirements (bids, quotes, etc.)	Consultants and Contractors Only approved scope of services under the grant will be outsourced. In-house services will be evaluated before obtaining external assistance. Selection process is defined by Texas Lawas and City Process and subject to approval of the City Council. All procurement transactions are independently reviewed by successive higher levels to provide full and open competition to the maximum extent practical. Contractor performance is established by scope and external monitoring by	Expenditure Analysis Actual and budgeted expenditures are compared to discern differences. Differences will be investigated independently. Significant variances between actual and budgeted expenditures will be resolved to ensure total costs do not exceed the amounts budgeted for the grant period.	Indirect Costs Existing or planned indirect cost rates and the type of rate used as well as both the content of pooled expenses and the type of allocation base used, will be evaluated. If all costs are charged direct, the full cost accounting method will be used	Credit Cards Credit cards are issued only to individuals who have been successfully trained on policies and restrictions regarding their use. The issuing credit card company restricts purchases to only those allowed by the City Financial Director. All expenditures must be pre-approved. Individual credit cards have strict daily and monthly limits. Personal expenses are prohibited and violate Texas and City of Waco laws and policies. All receipts be submitted for review and comparison with credit card statements
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	Segregation of duties over creation of vendor accounts/making payments via Electronic Fund Transfer methods. Authorizations required on all physical on all checks over \$1,000 with only designated officials authorized to sign.	inspectors and quality assurance and quality control (QA/QC) independents. Work from other similar projects are compared to work from activities related to this project to ensure costs and fees are reasonable. Prior to selecting a new consultant or contractor, the Excluded Parties List System, within the System for Award Management will be reviewed to ensure the individual or entity is not prohibited from receiving federal funds.			
Timekeeping Internal city employees use "Time and Attendance" software system that has multiple levels of approval required for time spent. Federal projects are given unique time accounting that must be logged each week. The distribution of salary and wages charged to federal awards is based on actual employee activity as reflected in personnel activity reports (timesheets), prepared after-the-fact, that include the total activity for which employees were compensated. Timesheets are certified as accurate by either the employee or a supervisor familiar with the employee's activities.	Travel Travel other than local mileage must be pre-approved, per City Policies. All travel must be reasonable and approved prior to travel. Travel credit cards are issued to individuals that limit, meals and incidentals, and lodging charged to federal programs to the rates published in the Federal Travel Regulations, unless otherwise justified. Airfare and car rental is limited to coach or economy class to mid-sized, unless otherwise justified. Travel costs not included by the Travel Credit card may be reimbursed based on expenditures reports or the like listing each cost individually along with original receipts.	Property Control Purchased property records will be maintained that include a description, cost, purchase date, source of funding, location, and condition of each property item. Periodic physical inventories are taken and reconciled to the property records no less than every other year. Property purchased with government funds will be tagged. Property will be safeguarded to prevent loss or theft.	Conflict of Interest Policies and procedures are in place to prevent employees, consultants, members of governing bodies, and others involved in grant-supported activities from using their positions for purposes that are, or give the appearance of being, motivated by a desire for private financial gain for themselves or others, such as those with whom they have family, business, or other ties. These policies and procedures: Address the conditions under which outside activities, relationships, or financial interests are proper or improper. Provide for advance notification of outside activities, relationships, or financial interests to a responsible organizational official. Include a process for notification and review by the responsible official of potential or actual	Drug-Free Workplace Prohibited are: The unlawful manufacture, distribution, dispensing, possession, or use of controlled substances is prohibited in the workplace. Employees must notify management, as a condition of employment, in writing immediately if they are convicted of violating a criminal drug statute (Zero Tolerance Policy). Violations result in automatic termination. Federal agencies will be notified in writing, within 10 calendar days, if any employee engaged in the performance of an award is convicted of violating a criminal drug statute.	Allowability of Costs Costs must be reasonable, allocable, and will be adequately documented. A cost is reasonable if it does not exceed what a prudent person would incur under similar circumstances. A cost is allocable to a federal award to the extent the goods or services benefited the program. A cost is adequately documented if it is supported by accounting records and source documentation, such as purchase orders, vouchers, invoices, payroll allocation reports, payroll summaries, timesheets, etc.

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			violations of the standards. Specify the nature of penalties that may be imposed for violations.		
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b. **Budget Detail**

The following section includes a more detailed cost breakdown of various measures and infrastructure. A table detailing projected expenses needed to accomplish the implement GHG reduction measures are included in a tabulated cost metrics table as follows:

Description		Budgetary Cost Estimate
Landfill Gas Wellfield		
Full Buildout (Permitting, Construction & Oversight) GHG Capture		\$3,415,500
Contingency (20%)		\$683,100
	Construction Quality Assurance	\$204,930
Subtotal Wellfield		\$4,303,530
Citizens Collection Station (Recycling Center with Waste Diversion)		
Engineering and permitting*		\$250,000
Mobilization		\$200,000
Site Work, Excavation and Removal		\$268,000
Structural Fill		\$525,000
Lime Stabilization		\$58,000
3" AC Overlayment		\$375,000
Retaining Walls		\$687,000
Modular Building & Storage		\$350,000
Roll-Off Bins		\$15,000
Property Purchase		2,300,000
Contingency (20%)		\$545,600
Subtotal Citizens Collection Station		\$5,573,600
Enhanced Recycling Collections Using EV Fleet		
EV Recycling Collection Trucks (2)		\$1,400,000
Dual-Port DC EV Chargers		\$1,364,000
Electrical Interconnections to Substation		\$250,000
Subtotal Recycling Collections Enhancements		\$3,014,000
1MW Solar Utility System		
Preliminary, Final Design & Bid Assistance and Permitting		\$2,400,000
Solar Modules		\$8,507,750
Inverters		\$670,000
Ballasted Fixed Tilt Racking		\$1,961,253
Data Monitoring + RGM		\$1,498,450
480 V Switchboard		\$2,401,030
Flexible Reinforced Geomembrane Final Cover		\$1,500,000
Utility Interconnection		\$1,194,044
Site Mobilization		\$750,000
Subtotal		\$20,882,527
Construction Quality Assurance		\$200,000
Contingencies		\$3,863,233
Subtotal Capital Costs Solar Utility		\$24,945,760
Community Center Generator Costs		
South Waco Gas		\$486,500
Animal Shelter		\$468,400
Combined Multi-Purpose and Doris Miller		\$2,342,000

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Description		Budgetary Cost Estimate
	Dewey	\$466,300
	Total Community Center Clean Power	\$3,763,200
	5 Year Administration Costs	\$6,129,524
	First Year Training and Operating Costs	\$1,240,470
	SUB TOTAL	\$1,240,470.00
	Installation EV Charging Stations (10 @ \$635587)	\$6,355,587.00
	Electrical to Charging Stations (\$50,000x14)	\$500,000.00
	EV Charging Infrastructure	\$6,855,587.00
	Job Training to Create Highly Skilled, High Paying Jobs, Interagency/Stakeholder coordination and monitoring Activities	\$1,000,030
	Grand Total	\$56,825,701.00

The following paragraphs define the nature of the work included in the cost table above.

- A. Preliminary, Final Design & Bid Assistance and Permitting. These tasks include analytical studies, modeling of data to evaluate the performance of greenhouse reductions, costing, preliminary and detailed engineering and bid assistance, studies, assessments, data collection, and analytics needed to develop and implement the GHG reduction facility or measure:
1. Determine landfill gas generation (calculations, computer modeling, test wells). Scope the project (location selection, sizing energy output to LFG supply, Contacting surrounding energy customers, technology and equipment identification).
 2. Conduct feasibility analysis (detailed technical and economic assessments, estimation of project revenues and other measures of economic performance). Site Visits. Laboratory and field analyses of greenhouse gas constituents to model upwind and downwind effectiveness as part of climate modeling.
 3. Preliminary and detailed engineering evaluates design parameters, electrical interconnection requirements with the site's serving utility, and assess the feasibility of connecting the waste to energy and the solar installation to the grid. It will identify any grid integration challenges, voltage regulation and potential upgrades needed to meet the utilities or onsite electrical requirements. It will also identify the need for Distributed Generation registration with ERCOT if the proposed project(s) meet the required capacity thresholds. It includes the plants design the plant, pipeline and project elements, selection of equipment based on the results of the feasibility analytics and modeling results, selection of primary equipment, contacting vendors, assessment of price, performance, schedule and guarantees. A financial pro forma will be created (updates to feasibility analysis using information submitted in actual bids from vendors).

B. Specific Projects and GHG and Cost Metrics

a. Total Grant Cost and GHB Cost Metrics

Although they are also calculated separately, the total costs divided by the GHG emission reductions are also provided, The following tabulates the entire grant costs (\$56,825,701) and divides by the respective quantity of GHG reduced for the time period of 2025 to 2030 and for 2030 to 2050.

The resulting fraction provides the cost per unit of GHG (MH₄and CO₂) reduced. In a study published in Nature, the social costs – CO₂ were estimated at \$185 per ton of CO₂ (\$44–\$413 per ton CO₂: 5%–95% range, 2020 US dollars) at a near-term risk-free discount rate of 2% and were based on the Greenhouse Gas Impact

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Value Estimator (GIVE) model⁴

The EPA has also estimated the social costs at 2030 and 2050 at the 2% near term rate.⁵ The following table calculates the resultant GHG to the cost metric.

TOTAL COSTS: \$56,825,701	Waco	GIVE Model*	EPA**
2025 to 2030 Cost/MTCh ₄	\$871.8		
2025 to 2030 Cost/MTCO ₂	\$302.7	\$44	\$230
2025 to 2030 Cost/MTCO ₂	\$120.8		
2030 to 2050 Cost/MTCO ₂	\$6.65	\$413	\$308

*In a study of *Nature*, the social costs – CO₂ were estimated at \$185 per ton of CO₂ (\$44–\$413 per ton CO₂: 5%–95% range, 2020 US dollars) at a near-term risk-free discount rate of 2% and were based on the Greenhouse Gas Impact Value Estimator (GIVE) model⁶

The measures greatly demonstrate that carbon dioxide is very cost effectively controlled and the methane metrics are comparable. The measures proposed in this grant application reflect the anticipated social-cost benefits.

b. Project/Measure: Expanded Landfill Gas Wellfield: \$4,303,500

Description: Construction of the landfill gas wellfield to its fullest extent across the 232-acre landfill is intended to capture as much emissions as possible.

1. Drilling and completion of vertical LFG extraction wells.
2. Installation of QED Quick-Change Orifice Plate Wellheads.
3. Installation of below-grade SDR 17 lateral piping.
4. Installation of above-grade HDPE SDR 17 lateral piping.
5. Installation of single-contained condensate drain lines.
6. Connection to blower/flare facilities, including grading, subgrade preparation, and surface completion.
7. Engineers Construction Quality Assurance documentation and filing of completion reports as required by regulatory authorities.

Project/Measure: Expanded Landfill Gas Wellfield: \$4,303,500 (see Table Expanded landfill Gas Wellfield)

Estimated Annual Greenhouse Gas Benefits:

252,918 metric tons CH₄ and 8,619,460 metric tons of CO₂e from 2025 through 2050

Expected Community Benefits:

Improved Health and Well-Being; decreased odors, Increased Resiliency and Adaptability; Job Creation and Economic Development and Increased Awareness and Understanding.

COSTS: \$4,303,530

2025 to 2030 Cost/MTCh₄: \$262/MT Ch₄

2025 to 2030 Cost/MTCh₄: \$13.1/MT Ch₄

2025 to 2030 Cost/MTCO₂: \$10.5/MTCO₂

2030 to 2050 Cost/MTCO₂: \$0.52/MTCO₂

This cost was calculated by SCS Engineers that are the Site Engineer for the landfill site and have developed many landfill gas wellfield installations.

b. Project/measure: Citizens Collection Station with Waste Diversion

A citizen collection station would be constructed at am strategic location to be determined and may either be on land currently owned by the city, or land that would be purchased by the city following a community needs assessment and recommendation to the Waco

⁴ Rennert, K., Erickson, F., Prest, B.C. *et al.* Comprehensive evidence implies a higher social cost of CO₂. *Nature* **610**, 687–692 (2022). [https://doi.org/10.1038/s41586-022-](https://doi.org/10.1038/s41586-022-022-)

⁵ Report on the Social Cost of Greenhouse Gases: November 2023; United States EPA

⁶ Rennert, K., Erickson, F., Prest, B.C. *et al.* Comprehensive evidence implies a higher social cost of CO₂. *Nature* **610**, 687–692 (2022). [https://doi.org/10.1038/s41586-022-](https://doi.org/10.1038/s41586-022-022-)

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City Council. This measure will greatly expand the area of citizen access to recycling opportunities. The proposed citizen collection station would be open to the general public, regardless of residency. Anyone can bring in household recyclables, regardless of residency at no fee. The facility would accept bottled glass, metal, paper, cooking oil, batteries, plastics, electronic wastes and bulky wastes and C & C wastes. This greatly enhances the diversion of waste from landfilling, reduces emissions from trucks that would collect the waste at curbside if not delivered to the facility and reduces greenhouse gases. The collected recyclable waste would be taken to a nearby processing center. The project would involve civil site work, grading and infilling, pavement construction, concrete walls and building infrastructure for an office.

Project/Measure: Recycling Center with Waste Diversion: \$5,573,600

Estimated Annual Greenhouse Gas Benefits:

34,239 from 2025 to 2030, and 171,197 from 2030 to 2050 metric tons metric tons of CO_{2e}

Expected Community Benefits:

Improved Health and Well-Being; Increased Resiliency and Adaptability; Job Creation and Economic Development; increased recycling and waste diversion, decreased recyclable waste going to landfill, and Increased Awareness and Understanding.

Increased Access to Recycling Services and Diversion of Wastes

This measure will result in Increased Access to Recycling Center drop off of materials that would otherwise be disposed of in the landfill. This widens the service area and lessens the impact of additional recyclable waste transported by waste collection trucks (this lessens greenhouse gas emissions).

COSTS: \$5,573,600 (See Table "Citizens Collection Station")

2025 to 2030 Cost/MTCO₂: \$162.7/MTCO₂

2030 to 2050 Cost/MTCO₂: \$32.56/MTCO₂

- c. Project/measure: Enhanced Recycling Collections Using EV Fleet (See Table "Enhanced Recycling Using Enhanced EV Fleet")

Enhanced recycling operations would be proposed through the use of Electric Recycling Trucks, specifically manufactured for the waste industry. These would be either a Class 6 or a Class 8 type truck that would be primarily devoted to the growing downtown area where quite in the early morning operations is advantageous so collection noise would be minimal. Also due to frequent stops for collection, the emissions due to idling with diesel fuel, would be eliminated. Electric Recycling Trucks feature a three-phase Permanent Magnet Synchronous 260 horsepower motor powered by Nickel Manganese Cobalt (NMC) Oxide lithium-ion batteries, rated at a 240kWh and good for an estimated range of up to 230 miles. The project would also include DC Type 3 charging ports.

Project/Measure: EV Recycling Trucks and Battery Storage: \$3,014,000

Estimated Annual Greenhouse Gas Benefits:

4,750 metric tons metric tons of CO_{2e} from 2025 through 2030

19,000 metric tons of CO_{2e} from 2030 through 2050

Expected Community Benefits:

Improved Health and Well-Being; Increased Resiliency and Adaptability; Job Creation and Economic Development; decreased reliance on fossil fuels and Increased Awareness and Understanding.

COSTS: \$3,014,000 (See Table "Enhanced Recycling Using EV Fleet")

2025 to 2030 Cost/MTCO₂: \$3,014/MTCO₂

2030 to 2050 Cost/MTCO₂: \$886.47/MTCO₂

- d. Project/measure: 1.4 MW Solar Utility Plant: \$24,945,760

A feasibility study is currently underway at a City of Waco budgeted cost of \$124,419 with the intent of conducting a wide range of technical assessments that would lead

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to the installation of a 1.4 MW solar array on the closed city landfill MSW 948A. The proposed utility-scale solar plant would be constructed on the surface of the closed landfill site MSW 948A⁷. Combined with the Landfill Gas to Energy project, the landfill has built-in connections to the power grid for sale. The system would not become operational until 2030. The project has similarities to a Community Solar project like the Sunnyside Project located in Houston. In a Community Solar project, Waco will not offtake the power but rather a third-party developer will lease Waco's land and send the solar power to the grid for consumption by Community Solar Subscribers which will included may include low-to-moderate income residents and disadvantaged residents.

Project/Measure: Solar Utility Plant: \$24,945,760

Estimated Annual Greenhouse Gas Benefits:

31,250 metric tons metric tons of CO₂e from 2030 through 2050

Expected Community Benefits:

Improved Health and Well-Being; Increased Resiliency and Adaptability; Job Creation and Economic Development; mitigation of high utility bills for disadvantaged communities, reduction of landfill gas emissions from under liner below solar panels deployed and Increased Awareness and Understanding.

COSTS: \$30,249,290 (See Table "1.4 MW Solar Utility System")

2030 to 2050 Cost/MTCO₂: \$121/MTCO₂

- e. Community Center (Clean Power) Generator (See Table "Community Center (Clean Power)")

The proposed Community Center Emergency Backup natural gas generators include vital installations within disadvantaged communities and include South Waco, Multi-purpose and Doris Miller, Dewey and the Animal Shelter. These community centers provide shelter during climatic conditions such as extremes in weather or other natural disasters, (reference Winter Storm "Uri") that can knock out Conventional electric power distribution throughout Texas. As Animal Shelters provide needed service to animals they are considered critical facilities by FEMA.

Project/Measure: Clean Fuel Community Center Power Generators: \$3,763,200

Estimated Annual Greenhouse Gas Benefits:

17.4 metric tons of CO₂e from 2025 through 2050, depending on the level of usage.

Expected Community Benefits:

Improved Health and Well-Being; Increased Resiliency and Adaptability; Job Creation and Economic Development; resiliency and safety during extreme climatic events, and Increased Awareness and Understanding.

COSTS: \$3,763,200 (See Table "Community Center Natural Gas Generators")

2030 to 2050 Cost/MTCO₂: \$7,408/MTCO₂

- f. Project/Measure: EV Charging Stations at Various Locations (See Table "Community Center (Clean Power)")

This would provide 10 EV Charging Stations to encourage EV use and provide wider access to EV Charging Stations where none, limited, or no availability currently exists. These would consist of primarily Level 2 or 3 charging units. The City of Waco has already advertised these stations and received cost quotations from multiple vendors but lacks the funding to implement them.

⁷ Utility scale solar plant includes is large scale (sometimes defined as greater than 1 MW_{AC}) from a photovoltaic power system that includes solar panels,, anchors and a geomembrane that acts as a final cap to the landfill surface.

Project/Measure: EV Charging Stations: \$6,855,587**Estimated Annual Greenhouse Gas Benefits:**

104,650 metric tons of CO₂e from 2025 through 2050, depending on the level of EV charging usage.

Expected Community Benefits:

Improved Health and Well-Being; decreased use of fossil fuels for gasoline powered vehicles, Increased Resiliency and Adaptability; Job Creation and Economic Development; and Increased Awareness and Understanding.

COSTS: \$6,855,587 (See Table “EV Charging Stations”)

2025 to 2030 Cost/MTCO₂: \$261.86/MTCO₂

2030 to 2050 Cost/MTCO₂: \$65.47/MTCO₂

- g. Project/Measure: Job Training to Create Skilled, High-Paying Jobs, Interagency Stakeholder coordination and Monitoring Activities.

Using this transformative opportunity to achieve both the GHG reduction goals described in this application, and expand economic opportunities, cost allocations are set aside for this purpose. An analysis will be conducted of the anticipated workforce shortages due to the advent of the proposed projects and measures. This information will become a part of the reporting back to the EPA to show trends and next steps. As noted by the Brookings Institute⁸ “CAPs have emerged as the leading way for cities to define their climate ambitions and activities. CAPs also serve as ways to boost coordination among the multiple local jurisdictions and entities involved in climate planning, including counties and related authorities (such as transit agencies and utilities). Ideally, workforce goals and strategies would appear in these plans too, as cities look to adopt clean electricity, protect vulnerable populations, and achieve other climate-focused outcomes.”

Project/Measure: Job Training to Create Skilled, High-Paying Jobs, Interagency Stakeholder coordination and Monitoring Activities.**Estimated Annual Greenhouse Gas Benefits:**

Specific GHG reductions are highly difficult to calculate. However, without a skilled work force and interagency discussion on the creation of jobs to operate and maintain these features.

Expected Community Benefits:

Improved Health and Well-Being; decreased use of fossil fuels for gasoline powered vehicles, Increased Resiliency and Adaptability; Job Creation and Economic Development; and Increased Awareness and Understanding.

TABLE OF ALL PROGRAMMED COSTS

The total capital costs \$56,825,701, including initial start-up costs which is the sum of the CRPG Grant that is requested.

<u>TOTAL COSTS:</u> \$56,825,701	Waco	GIVE Model*	EPA**
<u>2025 to 2030 Cost/MTCh₄</u>	\$871.8		
<u>2025 to 2030 Cost/MTCO₂</u>	\$302.7	\$44	\$230
<u>2025 to 2030 Cost/MTCO₂</u>	\$120.8		
<u>2030 to 2050 Cost/MTCO₂</u>	\$6.65	\$413	\$308

*In a study of Nature, the social costs – CO₂ were estimated at \$185 per ton of CO₂ (\$44–\$413 per ton CO₂: 5%–95% range, 2020 US dollars) at a near-term risk-free discount rate of 2% and were based on the Greenhouse Gas Impact Value Estimator (GIVE) model⁹

a. Reasonableness of Costs

The cost estimated developed were obtained either from similar projects, engineers estimates, of contractor estimates to validate their reasonableness. Included in the costs

⁸ “Why Green Jobs Plans Matter and Where Cities Stand in Implementing Them: Joseph W. Kane, Adie Tomer; July 25, 2023

⁹ Rennert, K., Erickson, F., Prest, B.C. et al. Comprehensive evidence implies a higher social cost of CO₂. *Nature* **610**, 687–692 (2022). [https://doi.org/10.1038/s41586-022-](https://doi.org/10.1038/s41586-022-022-)

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are contingencies which are needed due to uncertainties in material and labor costs over the five-year project total. These are conservatively figured as 20 percent. To evaluate the costs for the measures and projects, a number of sources were reviewed, including direct communication with a company that implements similar systems. Those sources were:

1. Landfill gas Wellfield at Full Buildout: Engineers Estimate of Probable Costs for remaining top deck landfill gas collection wells by SCS Engineers for the wellfield full buildout January 2024.
2. Landfill Gas Emissions Destruction Beneficial Use and Solar Utility: (1) Email correspondence between Chuck Dowdell and Clarke Energy, dated February 12, 2024 (Provided cost breakdown for components listed and confirmation costs for the were reasonable) (2) Anchorage Regional Landfill, Landfill Gas to Energy Project – grant application submitted to Alaska Energy Authority Renewable Energy Fund (RFA AEA-09-004), dated October 8, 2008; (3) Feasibility Study of Economics and Performance of Solar Photovoltaics at the Sky Park Landfill Site, Eau Claire Wisconsin; prepared in partnership with the EPA (NREL), dated January 2013; (4) Final Landfill gas to Energy Feasibility Report Cinder Lake Landfill, Flagstaff Arizona; prepared by Geosyntec Consultants, dated June 2013. (5) Landfill gas to Energy Feasibility Study, City of Waco MSW 948A; prepared by SCS Engineers, dated May 16, 2016. (5) Winnebago County Board of Supervisors, Solid Waste Management Board, Sunnyview Landfill Gas Utilization report, dated March 20, 2019; (6) Cost Performance for Utility Scale Electric Power Generating Technologies; by Sargent & Lundy, dated 2020. (7) City of Austin, Texas Contract No. NA130000072, Preventative & Corrective Maintenance Agreement for Jenbacher Biogas generator; dated March 2, 2021; (8) Approval of Funds for New Raw Landfill Gas to Renewable Natural gas Production Facility; awarded to Ameresco Chiquita RNG, LLC for the Chiquita Canyon Landfill; by California Alternative Energy and Advanced Transportation Financing Authority; dated March 16, 2021; (9) Scholl Canyon Landfill Biogas Project, City of Glendale California City Council Agenda Item Approval; dated January 24, 2024. Project is for installing four Jenbacher gas engine generators for \$66.7 million at the Scholl Canyon Landfill, and be maintained for an estimated \$2.5 million a year. (10) RFB New Hanover County Secure Landfill, Operation, Maintenance and Monitoring of Hanover County Secure Landfill, prepared by SCS Engineers, dated May 15, 2023.
3. EV Charging Stations: (1) Bid quote 2023 provided by BLINK; (in response to City of Waco RFP; (2) Sourcewell public bidding cost tables for BLINK; (3) March 2024 email between Jennifer Kline and Chuck Dowdell providing cost Proposals for EV Charging and Installation.
4. Citizens Collection Station with Waste Diversion: Walker Partners Engineers Estimate of Probable Costs, dated 2022.
5. EV Recycle Trucks: March 2024, Communications between Kody Petillo, Director of Solid waste and Mack Trucks.
6. Clean Fuel Community Center Power Generators: 90% plans and specifications and Engineers Estimate of Probable Costs by TLC Engineering, March 2024.
7. City of Waco Administration Costs, Job Training to Create Highly Skilled and Highly Paying Jobs, Interagency/Stakeholder coordination and monitoring Activities: March, 2024 Email correspondence with financial supervisors in the Solid waste Department.

Many of these costs are based on bid costs, are provided by professional engineers who design and bid/construct similar scale projects or from other related sources considered reliable.