

PLANNING AND DEVELOPMENT DEPARTMENT

MEMORANDUM 18-23

DATE: June 4, 2018
TO: Honorable Mayor Carol Dodge and City Council Members
FROM: James A. Hayes, AICP, City Manager *JH*
Brook Svoboda, Director of Planning and Development *BS*
Becky Smith, AICP, Planning Manager *BS*
SUBJECT: Sustainability Program Update

PURPOSE

Staff and the Consultant team (ICLEI and EPS) will be presenting City Council with the Sustainability Targets, Indicators and Possible Strategies that the internal Sustainability Team developed. EPS will also be presenting Cost-Benefit Analyses on two possible strategies the team identified.

Staff is seeking to engage the City Council to provide feedback and direction on the following:

- Sustainability Targets, Indicators and Possible Strategies
- Cost-Benefit Analyses: Electric Vehicles and Synthetic Turf
- Creation on Sustainability Advisory Task Force
 - Number of representatives
 - Mix of representatives

BACKGROUND

This project was first presented to City Council at the April 16, 2018 Study Session. At that time, the consultant provided a summary of the project method and introduced the vision and high level goals that the internal Sustainability Team developed.

The Goal of the Northglenn Sustainability Work Program is to develop a Work Program that sets a vision and high level goals for the City to work towards becoming more environmentally, fiscally and socially sustainable. Attachment 1, **Targets, Indicators and Possible Strategies**, identifies how the City can track progress towards the high level sustainability goals. The targets can be measured by the indicators listed. The possible strategies listed are actions staff identified that can be explored to make progress towards the sustainability targets. The assessment matrix to the right of the possible strategies identifies items that need to be considered or studied prior to deciding to move forward with an action. The colors associated with the matrix identify at a very high level the following:

- Green = lower cost, easy, minimum resources
- Yellow = mid-level cost, medium difficulty, some resources required
- Red = higher cost, difficult, resources required

EPS conducted cost-benefit analyses (Attachment 2) on two possible strategies, converting existing field(s) to synthetic turf to conserve water and transitioning the fleet to electric vehicles. The analysis provided for each serves as an example of a decision-making tool Council can use to inform whether or not they would like to move forward with a possible strategy. While some

strategies might be less complicated to implement, such as setting all computers to default print on double sided paper, many on the list require additional study.

UPDATE

N/A

BUDGET IMPLICATIONS

N/A

SCHEDULE/TIME IMPLICATIONS

N/A

NEXT STEPS/CITY COUNCIL OPTIONS

- Creation of Sustainability Advisory Task Force – consisting of both internal and external stakeholder representation to review the Sustainability Work Program and provide feedback
- Solicit meaningful participation on the Sustainability Work Program from community and City stakeholders
- Summer 2018 – Adoption of Sustainability Vision and Goals – with work program to support progress towards reaching those goals

STAFF RECOMMENDATION

N/A

STAFF REFERENCE

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ATTACHMENTS

Attachment 1	Targets, Indicators and Possible Strategies
Attachment 2	Sustainability Strategies Cost-Benefit Analysis – Electric Vehicles and Synthetic Turf
Attachment 3	Presentation

GOAL AREA
Resource Conservation

1. Significantly decrease overall community consumption (residents and businesses), specifically the consumption of non-local, non-renewable, non-recyclable and non-recycled materials, water, and energy and fuels.
2. The City will demonstrate leadership by encouraging sustainable procurement, extended producer responsibility and modeling innovative strategies to become a zero-waste city.
3. Within renewable limits, encourage the use of local, non-polluting, renewable and recycled resources (water, energy, and material resources).

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT							
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co Benefits	
<ul style="list-style-type: none"> • Increase citywide landfill diversion rate to 20% by 2023 • Become a “zero waste” city by 2050 • Implement citywide composting program by 2030 • Establish a business recycling program by 2019 	Solid Waste <ul style="list-style-type: none"> • Generation • Landfilled • Diversion Recycling Rate <ul style="list-style-type: none"> • Paper • Glass • Metals 	Adopt new ordinances, such as “Pay-As-You-Throw.” (Ordinance is the only way to control individual diversion rates)	●	●	●	●	●	●	waste reduction, cost savings, behavior shift, increased revenue potential	
		Identify and evaluate innovations in waste reduction	●	●	●	●	●	●	●	cleaner city, cost savings
		Provide compost containers at all City events	●	●	●	●	●	●	●	cleaner city, behavior/culture shift
		Standardize household waste requirements <i>(note: currently recycle waste is being sent to landfill due to market conditions for recyclable materials. If considered, should be a discussion about what truly is best for environment/cost)</i>	●	●	●	●	●	●	●	cleaner city, cost savings
		Rebate program for backyard composting	●	●	●	●	●	●	●	cleaner city, positive incentive, culture shift

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						Co Benefits
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	
		Conduct a waste audit of City facilities <i>(include print management policies to reduce higher printing cost and reduce waste)</i>	●	●	●	●	●	●	● understanding of city waste streams & priority areas for waste reduction
		Help fund a recycling program to support business recycling (incentives, equipment, trucks, roll offs, polycarts)	●	●	●	●	●	●	● behavior/culture shift, green business development, cost savings
		Business recycling ordinance	●	●	●	●	●	●	● green business development, cost savings, culture shift
		Operationalize Medical Prescription Drop Off – annual / semi annual or drop off compliant location <i>(consider working with local pharmacies & medical facilities)</i>	●	●	●	●	●	●	● reduction of pharmaceuticals and chemical hazards in waste stream
		Create a recycling and compost station that has city staff available to assist people in how to direct materials	●	●	●	●	●	●	● improved divestment, behavior shift

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT								
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co Benefits		
		Eliminate individual roll offs and special pickups in favor of designated Ward round up days to save in operational costs and use savings to start other initiatives	●	●	●	●	●	●	●	cost savings, revenue	
		Reduce yard waste operation hours to peak times in order to offset operation cost and put savings towards other higher yield programs.	●	●	●	●	●	●	●	cost savings, revenue	
<ul style="list-style-type: none"> • Reduce petroleum-based fuel use by 15% by 2023 in the municipal fleet • Reduce vehicle miles traveled for all municipal fleet by 15% by 2023 from 2017 levels • Convert to all alternative or renewable energy fleet for passenger sedans by 2030 	Municipal Fleet <ul style="list-style-type: none"> • Fuel Use • VMT 	Implement route optimization of solid waste and recycling collection	●	●	●	●	●	●	●	cost savings	
		Review fleet composition to ensure that vehicles are matched to the job and not to the individual	●	●	●	●	●	●	●	●	efficiency, effectiveness
		Purchase alternative/renewable energy fleet vehicles are turned over and/or CNG for light duty trucks and up	●	●	●	●	●	●	●	●	City as leader in EV, culture shift
		Review opportunities to share large, heavy duty vehicles across departments	●	●	●	●	●	●	●	●	Reduction in resource need, culture shift, interdepartmental cooperation
		Develop a non-motorized transportation policy for employees in the duties of their position – PD & Code on Bikes vs cars.	●	●	●	●	●	●	●	●	Reduction in resource need, culture shift, healthy transportation

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						Co Benefits
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	
		Standardize City vehicles to make maintenance consistent among the fleet	●	●	●	●	●	●	● Efficiency, cost savings
		Add EV charging stations at City facilities	●	●	●	●	●	●	● EV encouragement, culture shift, public access
		Consider a city stipend or car allowance for personal car usage to reduce fleet requirements and usage	●	●	●	●	●	●	● Potential cost savings
		Incorporate co-generation at the WWTP using on-site biosolids	●	●	●	●	●	●	● Green power generation, waste management
		Implement more frequent facility/equipment maintenance schedule	●	●	●	●	●	●	● Cost savings, efficiency, effectiveness
		Install energy efficient equipment upgrade for municipal facilities, streetlights	●	●	●	●	●	●	● Cost savings, efficiency, effectiveness

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT									
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co Benefits			
<ul style="list-style-type: none"> • Reduce Wastewater Treatment Plant energy use by 20% by 2023 • Reduce municipal energy usage by 25% by 2030 • Reduce community-wide commercial energy usage by 15% by 2025 • Reduce community-wide residential energy usage by 15% by 2025 	Energy Use/Generation <ul style="list-style-type: none"> • Total municipal use • Total citywide use 	Implement community outreach campaign around LED lights	●	●	●	●	●	●	●	Cost savings, community education, culture shift		
		Leverage any and all municipal, commercial, residential XCEL Programs to meet Targets	●	●	●	●	●	●	●	●	Cost savings, community education, culture shift	
		Evaluate partnership opportunities with the Colorado GEO.	●	●	●	●	●	●	●	●	●	●
		Adopt IECC 2018 code	●	●	●	●	●	●	●	●	●	Efficient buildings
		Green Business Challenge, Xcel business programs	●	●	●	●	●	●	●	●	●	Efficient buildings, reduced electricity usage, green business development
		Deploy a marketing campaign that targets businesses and residents to encourage them to implement measures that work towards achieving water conservation goals	●	●	●	●	●	●	●	●	●	Reduced water usage, green business development, community education

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT								
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co Benefits		
		Put a new roof on City Hall to increase energy efficiency	●	●	●	●	●	●	●	City facility as pilot site/leadership, energy efficiency, green building, cost savings	
		Budget the standard deviation of utility usage and put the extra towards capital improvements in renewable energy and energy efficient upgrades	●	●	●	●	●	●	●	Cost savings	
<ul style="list-style-type: none"> • Reduce Potable Water use by 17-20 % by 2021 and by 25% by 2030 • Reduce Non-Potable Water use by 15% by 2021 • Decrease total & per capita water usage by 5% each year from the previous 5 years average • Increase water efficiency of businesses by 17-20% • Decrease total water usage for parks landscaping by 15% by 2025 	<ul style="list-style-type: none"> • Total citywide use (self-sufficiency) • Total citywide use (per capita) • Potable vs. non-potable 	Consider Infrastructure life cycle costs, for example Reduce KY bluegrass turf with low water options in city parks and facilities	●	●	●	●	●	●	●	Cost savings, water savings	
		Residential, commercial, municipal water conservation programs	●	●	●	●	●	●	●	●	Cost savings, community education, culture shift
		Increase Garden in a Box program participation	●	●	●	●	●	●	●	●	Cost savings, community education, culture shift
		Study: Possible recapture WWTP to use as non-potable irrigation for parks system <i>(use old force main pipe to send back to NG from Section 36)</i>	●	●	●	●	●	●	●	●	Reduced stress on fresh water sources

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co Benefits
		Study Evaluation: Non-potable water for Parks irrigation system – could help with reduction of per capita usage	●	●	●	●	●	●	● Reduced stress on fresh water sources
		Adopt low impact development requirements in the UDO	●	●	●	●	●	●	● Green buildings, water conservation
		Increase water rates	●	●	●	●	●	●	● Co-benefits: Culture shift, revenue generation, community education
		Xeriscape yard awards in lieu of yard of the month to encourage yards that require minimum irrigation	●	●	●	●	●	●	● Culture shift, community education, water conservation
		Focus a marketing campaign towards Multifamily residential to encourage low impact development & xeriscaping to reduce the irrigation water usage	●	●	●	●	●	●	● Culture shift, community education, water conservation

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						Co Benefits	
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans		
		Increase sprinkler system efficiency in Parks through improved equipment and sprinkler layout	●	●	●	●	●	●	●	Efficiency, reduced fresh water usage, cost savings
		Replace pressure valve that moves water from Stanley Lake to the Water Treatment Plant with a turbine - Use the energy created by the turbine to offset energy used at the WTP	●	●	●	●	●	●	●	Energy savings, green energy generation
		Voluntary year round water restrictions	●	●	●	●	●	●	●	Community education, water conservation, culture shift
		Replace pump at EB Rains to allow irrigation with non-potable water throughout the park	●	●	●	●	●	●	●	Reduces stress on fresh water sources
		Explore the cost vs water savings for recirculation pumps at splash pad for Memorial Parkway (and existing splash pad a EB Rains)	●	●	●	●	●	●	●	cost or water savings
		Rebate program for low flow toilets and shower heads	●	●	●	●	●	●	●	Community education, culture shift, water conservation

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			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co Benefits
		Explore the possibility of eliminating requirements for paper contracts and use e-signatures instead	●	●	●	●	●	●	● Culture shift, waste reduction, efficiency, simplicity
		Create e-forms for businesses and residents to conduct City business	●	●	●	●	●	●	● Culture shift, waste reduction, efficiency, simplicity
		Issue Ipads/tablets to employees and Council to eliminate the need to print agendas and materials for every meeting	●	●	●	●	●	●	● Waste reduction, culture shift, efficiency
• Decrease paper use in City operations by 15% by 2021	Paper usage	Set up all conference rooms with computer system and screen to reduce the need for printing paper materials	●	●	●	●	●	●	● Waste reduction, culture shift, efficiency, culture shift
		Set computers/printers to default on double sided paper <i>(evaluate the most cost effective printing methods)</i>	●	●	●	●	●	●	● Easy to do, waste reduction, efficiency, culture shift

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			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co Benefits
<ul style="list-style-type: none"> • 5% of Northglenn businesses participating in Xcel's Renewable Energy program by 2021 • 30% of Northglenn single family homes with solar PV installed by 2030 • 10% of electricity use in city owned buildings is on-site renewables by 2030 	Renewable energy mix <ul style="list-style-type: none"> • Municipal • Business • Residents 	Explore Renewable Connect Programs and outreach support offered by Xcel							 Green business development, divestment in fossil fuels, community education, local clean energy development
		Codes for new home development of a certain size require solar installed by builder							 Green buildings, divestment in fossil fuels, community education, local clean energy development, culture shift
		Add Commercial for Green Roof program – solar/landscaped roofing							 Green buildings, divestment in fossil fuels, community education, local clean energy development, culture shift

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			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co Benefits
		Incentivize residential solar installation through a rebate program	●	●	●	●	●	●	● Green buildings, divestment in fossil fuels, community education, local clean energy development, culture shift
		Implement a Sustainable Public Procurement policy	●	●	●	●	●	●	● Culture shift, community education, cost savings
		Explore local sourcing for City apparel/uniforms	●	●	●	●	●	●	● Culture shift, community education, local economy development, potential cost savings
		Supply sharing to reduce waste	●	●	●	●	●	●	● Culture shift, employee education, interdepartmental collaboration, waste reduction

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co Benefits
<ul style="list-style-type: none"> • Increase the percentage of City spending identified as sustainable spend by 10% by 2020 and by 30% by 2025 	Sustainable Procurement	Work with vendors that operate at City Events to include sustainable products (e.g. food truck carnival)							<ul style="list-style-type: none"> • Culture shift, community education, investment in local businesses
<ul style="list-style-type: none"> • 100% of municipal buildings designed in 2019 and later will strive to achieve LEED GOLD standards • As of 2020, all renovated commercial spaces of 50,000 square feet or more must submit a construction and demolition waste management plan as described by USGBC's LEED v4 	Construction Materials	Review LEED standards to the current adopted building code (IECC)							<ul style="list-style-type: none"> • Culture shift, green buildings
		Evaluate USGBC standards for new development over 50,000 SF							<ul style="list-style-type: none"> • Culture shift, green buildings

GOAL AREA

Environmental and Public Health

1. Protect and enhance environmental health and public health by minimizing and where possible eliminating:
 - a. The use of hazardous or toxic materials by residents, businesses and city operations;
 - b. The levels of pollutants entering the air, soil and water; and
 - c. The risks that environmental problems pose to human and ecological health.
2. Ensure that no one geographic or socioeconomic group in the city is being unfairly impacted by environmental pollution.
3. Increase consumption of fresh, locally produced, organic produce to promote public health and to minimize resource consumption and negative environmental impacts.

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT							
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits	
<ul style="list-style-type: none"> • Increase number of community gardens/markets by 15% by 2023 • Increase number of participants/members for community gardens by 15% 2021 • Decrease average residential distance from fresh produce access by 15% by 2030 • Increase the enrollment of the proportion of SNAP eligible but not enrolled in the program by 25% by 2025 • Increase participation of HEAL Businesses 5% by 2020 	<p>Food Access</p> <ul style="list-style-type: none"> • % of people who grow their own food • Distance living from fresh produce access • Number of HEAL businesses <ul style="list-style-type: none"> • Number of community gardens • % of food cost as part of income <ul style="list-style-type: none"> • Socioeconomic characteristics of residents with low food access 	See food access assessment report								equity, food access, nutrition, public health risks reduction
		Work with food providers (Grocery/Restaurants) to connect with service providers (churches/non-profits)								

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT							
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits	
		Collaborate with Food for Hope, Growing Home and Adams 12 Five Star School District to help connect Northglenn residents in need of food assistance with resources and services that provide that	●	●	●	●	●	●	●	food waste reduction, food access, nutrition, public health risks reduction, community building
		Expand on existing partnerships and programs at the recreation center, such as the summer lunch program for kids and the Rocky Mountain Food Bank program offered	●	●	●	●	●	●	●	food waste reduction, food access, nutrition, public health risks reduction, equity
		Community Garden Program that utilizes underutilized commercial and non profit properties for community gardens that "could" be used for farmer's market food sales and/or to food banks (community lead effort / start up by city).	●	●	●	●	●	●	●	equity, food access, nutrition, public health risks reduction, community education, community building
		Community garden water rebate program	●	●	●	●	●	●	●	equity, food access, nutrition, public health risks reduction

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT							
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits	
		Assess primary barriers to SNAP enrollment and find ways to reduce barriers and motivate individuals that are eligible to enroll in the program	●	●	●	●	●	●	● equity, food access, nutrition, public health risks reduction, community education	
<ul style="list-style-type: none"> • Decrease volume of material use from city and businesses by 10% by 2020 • Zero health incidents related to material exposure by City staff by 2030 • Decrease number of affected neighborhoods/sites, particularly those in low income and communities of color by 30% by 2030 • 10% decrease in loading of FOG at the wastewater treatment plant by 2025 • Achieve 100% compliance with the cross-connection program by end of 2020 	<ul style="list-style-type: none"> • Hazardous/toxic materials • Amount of materials used by City of Northglenn • Materials used by businesses • Neighborhoods affected by materials • Number of city staff exposed to hazardous material • Number of brownfield sites 	Industrial Uses Assessment Program – storage / recycle / maintenance.	●	●	●	●	●	●	● community education, public health	
		Food Oil Waste Recycle Program – connect restaurants with 3 rd party food oil recovery end users (Bio Diesel) – instead of paying to haul, could be paid to take away	●	●	●	●	●	●	●	● cost savings, waste reduction, hazard reduction
		Look at developing more comprehensive policies for drop off and collection of food oil materials	●	●	●	●	●	●	●	● cost savings, waste reduction, hazard reduction
		City Fleet Incident response vehicle – develop a 1 st responder vehicle to hazardous spills (triage/stabilization until 3 rd party crew arrives)	●	●	●	●	●	●	●	● public health, emergency response
		Upgrade City force main and lift stations	●	●	●	●	●	●	●	● public health

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			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits	
		Provide salary incentives for obtaining state license to handle hazardous material (might lead to better application of pesticides at parks?)	●	●	●	●	●	●	●	public health
		Implement third party compliance monitoring for cross-connection and black flow program	●	●	●	●	●	●	●	public health
		Education and information to Single Family and Multi-Family residential properties about things to not put down the drain (Fat, Oil, & Grease (FOG) program)	●	●	●	●	●	●	●	community education, culture shift
		Continue education to the business community about pre-industrial treatment and grease interceptor requirements	●	●	●	●	●	●	●	community education, culture shift, waste management
		Develop Standard Operating Procedures for emergency situations that involve hazardous materials	●	●	●	●	●	●	●	public health, efficiency, emergency response
		Explore using alternative pesticides at City Parks, trails and properties and or reduce the usage of pesticides by implementing best practices in spraying (consider volunteer "weed puller" program for parks to offset the increased weeds)	●	●	●	●	●	●	●	reduced chemicals, reduced environmental impact, cost savings

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
<ul style="list-style-type: none"> • Decrease level of stormwater, air and raw water quality pollutants by 20% by 2025 • Develop no smoking in public places 	Pollution <ul style="list-style-type: none"> • Water quality • Soil contamination • Air quality • Stormwater quality • Neighborhoods affected 	Conduct a GHG inventory to set baseline to set targets							 identification of priority areas, establishing data collection practices
		Adopt air quality standards for industrial and commercial uses							 public health, pollution reduction
		Implement community and school educational campaign on pollution							 public health, community education, culture shift
		Adopt ordinance prohibiting smoking on public grounds							 public health, community education, culture shift
		Take a more proactive approach to enforce the City's adopted Watershed Protection Ordinance (This action would require additional staff, but reducing the amount of pollutants in the raw water will reduce the amount of treatment required)							 community education, culture shift, reduced water treatment, cleaner water

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			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
		Develop BMPs for water quality using non-traditional methods (vegetation that cleans stormwater)	●	●	●	●	●	●	● green infrastructure, reduced water treatment, cleaner water, more sustainable integration of infrastructure, aesthetically pleasing
		Alternative fertilizer program	●	●	●	●	●	●	● reduced chemicals, reduced waste

GOAL AREA

Transportation

1. Create a multi-modal transportation system that minimizes and, where possible, eliminates pollution and motor vehicle congestion while ensuring safe mobility and access for all without compromising our ability to protect public health and safety.
2. Facilitate a reduction in automobile dependency in favor of affordable alternative, sustainable modes of travel.

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
<ul style="list-style-type: none"> • Increase number of students biking or walking to school by 25% by 2025 • Install 10 miles of on-street bicycle facilities by 2023 • Increase number of bikes refurbished in the Bike Program participants by 15% by 2020 • Zero traffic incidents involving cyclist/pedestrians by 2030 • Increase modal shift to active transportation based on baseline data by 2020 • Increase participation in Derby Day bike rodeo by 10% annually • Install 100 bike racks around the community by 2028 	<ul style="list-style-type: none"> Active transportation <ul style="list-style-type: none"> • Number of cyclists/pedestrians • Number of bike paths Number of participants in Bike program Modal shift to active transportation <ul style="list-style-type: none"> • Traffic counts • Transit Ridership Business Bike Rack Program Traffic accidents 	Adopt Vision Zero policy							 reduced mortality, public health, walkable neighborhoods
		Adopt Complete Streets Policy							 reduced mortality, public health, walkable neighborhoods
		Update Standards and Specs							 reduced mortality, public health, walkable neighborhoods
		Implement Connect NG							 increased connectivity, increased mobility

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
		-CDBG	●	●	●	●			
		-Residential streets program	●	●	●	●	●	●	● increased mobility, reduced mortality, walkable neighborhoods
		-Traffic calming	●	●	●	●	●	●	● increased mobility, reduced mortality, walkable neighborhoods
		Life cycle cost program for sidewalks and trails	●	●	●	●	●	●	● efficiency
		Continue to grow Bike Repair Program (potential to maybe incorporate into Neighborhood Engagement or increase marketing to influence donations)	●	●	●	●	●	●	● increased mobility, public health, active transportation, equity

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT							
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits	
		Bike rack grant program	●	●	●	●	●	●	●	increased mobility, culture shift, public health, active transportation
		Pursue grant funding to complete infrastructure improvements and/or purchase/install equipment like bike racks or bicycle repair stations	●	●	●	●	●	●	●	increased mobility, culture shift, public health, active transportation
		Install 10 bike racks annually	●	●	●	●	●	●	●	increased mobility, culture shift, public health, active transportation
		Wayfinding	●	●	●	●	●	●	●	increased mobility, culture shift, public health, active transportation

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			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
		Implement a pedestrian counts program	●	●	●	●	●		● data collection
		Offer bike safety classes	●	●	●	●	●	●	● reduced injuries, public health, active transportation
		Offering bike parking for events (or bike valet)	●	●	●	●	●	●	● increased mobility, culture shift, public health, active transportation
		Regional bike share	●	●	●	●	●	●	● increased mobility, culture shift, public health, active transportation
		Designate a City Staff from Public Works Engineering to attend CDOTs Bicycle Facility Design workshop annually to learn best practices and liability considerations	●	●	●	●	●	●	● employee training, culture shift

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
<ul style="list-style-type: none"> • Increase transit ridership by 30% by 2020 • All neighborhoods served by at least one RTD bus route / connector to light rail by 2020 • Increase number of attainable housing sites/units served by transit by 10% by 2025 	<ul style="list-style-type: none"> Public Transit • Ridership trends • Number of routes • Cost of fare • Neighborhoods served • Modal shift to transit • Transit time reliability • Transit asses condition 	Participate in semi-annual formal consultations with RTD to raise issues of transit reliability, affordability and access							 employee training, culture shift
		Collaborate with SmartCommute to educate and promote public transit for businesses and their employees							 culture shift, community education, increased mobility
		NG employee use – Ecopass/subsidies/incentives etc.							 culture shift, increased mobility, employee education
		First mile program improvements from transit stops							 increased mobility, increased access, equity, increased connectivity
		Implementation of regional bike share to help with first and last mile challenges							 increased mobility, increased access, equity, active transportation

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT							
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits	
		Pursue grant funding for transit stop enhancements	●	●	●	●	●	●	●	increased mobility, increased access, equity, active transportation
		Market transportation options to all residents; target top LMI census tracks with public transit opportunities	●	●	●	●	●	●	●	increased mobility, increased access, equity, active transportation
<ul style="list-style-type: none"> • Provide one public charger for each 25 parking spaces for new and redevelopment commercial centers by 2025 	Electric Vehicles <ul style="list-style-type: none"> • Number of public chargers 	Ref UDO Policy revisions	●	●	●	●	●		●	EV expansion, culture shift
		City lead Pilot Program – Civic Campus	●	●	●	●	●	●	●	●
<ul style="list-style-type: none"> • Decrease commute times from Northglenn to/from downtown Denver by 25% by 2038 • Decrease total community vehicle miles traveled by 15% by 2025 • Maintain road condition at 70 pavement condition index (PCI) 	Sustainable transportation system <ul style="list-style-type: none"> • Commute times • Daily miles traveled • Road Condition 	RTD light rail and regional bus service	●	●	●	●	●	●	●	increased mobility, increased access, equity, increased connectivity

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
		Promote SmartCommute drive share program	●	●	●	●	●	●	● increased mobility, increased access, equity, increased connectivity
		Bike share	●	●	●	●	●	●	● increased mobility, increased access, equity, active transportation
		Continue residential street improvement program by prioritizing based on PCI	●	●	●	●	●	●	● increased mobility, efficiency
		Maintain RTD transit hub at 106 th Ave	●	●	●	●	●	●	● increased mobility, efficiency, increased access
<ul style="list-style-type: none"> • Increase employee participation in commuter programs by 20% by 2020 and by 40% by 2025 • Increase number of city employees teleworking at least one day per week by 10% by 	Municipal employee commute <ul style="list-style-type: none"> • Number of employees' community by car, bike/ped, transit etc. • Number of employees' using commuter programs 	Survey City employees to get a baseline information about employee commutes	●	●	●	●	●	● data collection, GHG inventorying data	

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
2020 and 20% by 2025		Implement RTD Eco Pass program or similar program	●	●	●	●	●	●	● employee education, increased access
		Instead of eco pass, the City purchased a block of passes to gauge interest as pilot project.	●	●	●	●	●	●	● employee education, increased mobility, increased access, culture shift
		Ride Share Program – partner with Smart Commute Metro North (Karen Stewart) – Partner with SCMN and DRCOG Way to Go to educate employees on options available.	●	●	●	●	●	●	● employee education, increased access
		Implement telework policy	●	●	●	●	●	●	● employee well being, flexibility, efficiency
		EV charger in Civic Center might influence employees' vehicle choice	●	●	●	●	●	●	● culture shift, EV expansion

GOAL AREA

Sustainable Economy

1. Create a sustainable and diverse tax base that allows the City to maintain a high level of service for Northglenn residents and businesses.
2. Encourage private capital investment that contributes to job creation in Northglenn.
3. Reduce water consumption through policies that require low impact development.
4. Increase energy efficiency of City businesses through encouraging the use of alternative energy sources and partnerships with the City's energy provider.
5. Implement policies that create vibrant business centers through multi-modal transportation options.
6. Create social opportunities that contribute to a sense of place and attracts both new residents to the community as well as retains existing residents and businesses.
7. Work to become a Smart City by fostering technologies that generate and aggregate data; analytical tools which convert that data into usable information. Encourage collaboration, innovation, and the application of that information to solve public problems.

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT								
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits		
Green Business Targets • Increase the bike racks in commercial centers 10% by 2020 • Implement a city recycling program for businesses in 2019 • Target for Increasing the number of green businesses will be established once a baseline is understood through the business survey (see strategies)	Green Business • Number of NG green business • Identify types of green programs and efforts business • Define utility programs available to businesses • Commercial bike racks	Green business challenge: Businesses that conserve resources (water, natural gas, and electric) add renewables, reduce waste, or otherwise support the city's sustainability objectives	●	●	●	●	●	●	●	green business development, energy efficiency, water conservation, waste reduction, culture shift	
		Survey businesses on types of green initiatives businesses have in place in 2018	●	●	●	●	●	●	●	●	baseline of sustainability initiatives, culture shift, community education, data tracking
		Survey businesses to see if they would be interested in a city recycling program in 2018	●	●	●	●	●	●	●	●	●

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
		Educate and market Xcel Energy and other programs to encourage businesses to lower electrical use annually beginning in 2018	●	●	●	●	●	●	● community education, culture shift, energy savings, cost savings, green business development
		Educate and market water conservation efforts annually beginning in 2018	●	●	●	●	●	●	● community education, culture shift, water savings, cost savings, green business development
		Develop database to track green businesses and initiatives, and survey businesses every other year to track increases	●	●	●	●	●	●	● community education, culture shift, green business development, data tracking
		Create a financial incentive program for businesses that make upgrades using green construction, materials, and equipment	●	●	●	●	●	●	● culture shift, green business development, waste reduction, circular economy

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
		Develop public recognition to X businesses annually for community outreach efforts to support the city (Snow Stormers, HEAL, etc)	●	●	●	●	●	●	● community building
• Increase private sector capital investments by 25% by 2025	<ul style="list-style-type: none"> Private sector capital investment Redevelopment Opportunities Number of industry sectors represented and # of businesses per sector Total number of businesses Total number of jobs Programs/Grants to assist companies to invest in business improvements to maximize private sector investments 	Develop and implement a target industry strategy to attract businesses with quality jobs, and higher wages	●	●	●	●	●	●	● equity, sustainable economy
		Increase opportunities for businesses to participate and engage in community outreach and business related efforts	●	●	●	●	●	●	● community building
		Increase funding for grants for exterior, utility upgrades and improvements	●	●	●	●	●	●	● community building, energy efficiency, green buildings
		Develop and fund new business assistance programs to assist companies with improvements, including interior improvement grants	●	●	●	●	●	●	● energy efficiency, green buildings, green business development
• Increase BRE (business retention & expansion) meetings by 15% by 2020	• # of BRE visits	Stabilize and attract more retail businesses to increase sales taxes	●	●	●	●	●	●	● sustainable economy

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
<ul style="list-style-type: none"> • Maintain or increase the median income by 2020 • Maintain or decrease unemployment rates through 2020 	<ul style="list-style-type: none"> • Total jobs & increased average wages • Job Growth • Unemployment rates 	Attract higher waged employers							 sustainable economy
<ul style="list-style-type: none"> • Strive to diversify businesses by 5% by 2025 • Increase Shop Northglenn marketing efforts and programming by 5% by 2020 	<ul style="list-style-type: none"> • Sustainable tax base • Total business • Diversification of business sector 	Create an incubator/co-working space to support entrepreneurs, and for Northglenn residents that want to work in Northglenn							 local economy development
		Develop a targeted industry sector plan to attract and retain diversified business sectors to increase jobs, capital investment, services and taxes							 local economy development, sustainable economy
		Analyze and study commercial development and redevelopment opportunities within a 1 mile area of the transit station – suggest that maybe this done on time based cycle. We did this with the STAMP – Industrial Survey							 local economy development, transit oriented development, reduced transportation emissions
		Develop a customer loyalty program for shoppers.							 sustainable economy
<ul style="list-style-type: none"> • Investigate and develop a Smart City policy and strategy for the city by 2020 	Smart City <ul style="list-style-type: none"> • Investigate best practices of other Smart City communities (technology, policies and initiatives) – to set indicators • Smart City Alliance Membership 	Develop smart city marketing and branding campaign for residents and businesses						 smart city development, strategic planning	

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/continued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
		Incorporate the data from the survey and business meetings into a database to track NG company initiatives and practices to track increased activities	●	●	●	●	●	●	● data tracking, strategic planning
		Educate and increase participation in the Smart City Alliance and other related programs	●	●	●	●	●	●	● community education
		Identify in annual Business Survey, at retention calls, and meeting with new businesses what Smart City and sustainability efforts the company participates in starting in 2018-2019	●	●	●	●	●	●	● data tracking
		Identify best practices that the city could incorporate	●	●	●	●	●	●	● smart city development, strategic planning

GOAL AREA

Open Space and Land Use

1. Implement Land Use and Transportation policies that encourage open space, parks, trails and mixed use communities.
2. Implement Land Use policies that encourage high density residential and mixed use development where appropriate.
3. Lead the Northglenn community by way of example by transitioning City parks and facilities to use water conserving plants for landscaping.
4. Foster Community Pride through Environmental Stewardship.
5. Create a regional and well utilized parks and trails system with amenities that are attractive to people of all ages and abilities.

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT										
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits				
<ul style="list-style-type: none"> • Increase number of native/drought tolerant plant species planted in new city parks/facilities by 25% by 2020 • Increase tree canopy by 10% by 2025 	<ul style="list-style-type: none"> • Native or drought tolerant species • Water usage for landscaping • Tree Canopy 	Ref UDO – LID and Landscaping Req(s)	●	●	●	●	●	●	●	●	green city, efficiency, effectiveness		
		Use Garden in a Box kits in City Gardens to be a role model and example for our citizens	●	●	●	●	●	●	●	●	●	city as leader, water conservation, community education, culture shift	
		Ref Xeriscape Yard Awards – promoting low consumptive landscaping	●	●	●	●	●	●	●	●	●	●	water conservation, community education, culture shift
		Replace removed trees at a ratio of 1:2	●	●	●	●	●	●	●	●	●	●	green city, improved air quality, aesthetics improvement








TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
Environmental Stewardship target <ul style="list-style-type: none"> • Maintain participation in recognition programs • Maintain or increase volunteer program 	Environmental Stewardship <ul style="list-style-type: none"> • Awards • Number of volunteers 	Grow volunteer adopt trail program							 community education, culture shift, community engagement/activation
<ul style="list-style-type: none"> • Improve park access to low income/people of color by 20% by 2038 • Activate 50% of neighborhood of parks with a focus on parks located in or new areas of low/medium income • Maintain 100% of paved trails accessible by bike/transit • Maintain 100% of trails open throughout the year outside of maintenance and improvement projects 	Land Use <ul style="list-style-type: none"> • Total Households within 0.25 miles of park • Number of trails accessible by bike/transit • Number of socioeconomic breakdown of visitors 	Integrate multimodal connections to parks prioritizing low income/people of color neighborhoods							 increased access, equity, increased mobility, green city, increased connectivity
		Pocket parks							 increased access, equity, green city, improved air quality
		Create a parks games and equipment library for people to check out items and actively use all of Northglenn's City Parks.							 increased access, equity, waste reduction
Implement at least one nature-based solution each year beginning 2019.	<ul style="list-style-type: none"> • # of nature based solutions implemented (both private and public) 	Bioswales, green infrastructure, green roofs,etc.							 green city, efficiency, effectiveness

GOAL AREA

Housing

1. Implement Land Use policies that create a diverse mix of housing that can accommodate all levels of homebuyers and renters.
2. Retain residents by providing new mid-level housing opportunities for next stage homebuyers and new business/social opportunities for residents in redevelopment projects.
3. Adopt policies that encourage Green and Healthy Homes.

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT							
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits	
<ul style="list-style-type: none"> • Increase number of attainable housing units (rent as 30% of income) available in city by 10% by 2020 • Increase housing by transit hubs / job centers by 10% by 2020 	<ul style="list-style-type: none"> • Socioeconomic breakdown of homeowners and renters • Average rent and house prices • Rent as proportion of income 	Ref STAMP – for target #3	●	●	●	●	●	●	●	increased access, equity
		Adopt policy – setting goals and guidelines for access to entry level housing	●	●	●	●	●	●	●	increased access, equity, human dignity
<ul style="list-style-type: none"> • Decrease total homeless by 10% by 2020 • Increase placing individuals with available services to 10% by 2020 	<ul style="list-style-type: none"> • Homelessness • Socioeconomic breakdown of homeless • Number served by community organizations • Number of services available 	Coordinate with Adams County to create a resource guide staff can use to direct homeless individuals to the right services that they would qualify for	●	●	●	●	●	●	●	increased access, equity, human dignity
<ul style="list-style-type: none"> • Decrease residential energy usage by 25% by 2038 	<ul style="list-style-type: none"> Green and Healthy Homes • Home with toxic/pollutant issues • Home energy score 	Adopt Green and Healthy homes policies	●	●	●	●	●	●	●	increased access, equity, human dignity, energy efficiency, public health, green buildings, holistic policy

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
		Create a Tool Library Program – a co-op for equipment shared in a neighborhood setting – e.g. Lawnmower, chain saw etc.							 increased access, equity, energy efficiency, waste reduction, circular economy

GOAL AREA

Human Dignity

1. Community members are able to meet their basic needs and are empowered to enhance the quality of their lives;
2. The City of Northglenn forms collaborative partnerships with service providers and communicates residents' needs to them.
3. There is respect for and appreciation of the value added to the community by differences among its members.
4. The City of Northglenn forms collaborative partnerships with service providers and communicates residents' needs to them.

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT							
			Initial Capital investment	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits	
<ul style="list-style-type: none"> • Connect 100% of households needing energy and water bill assistance with resources that can help • Maintain current participation level in food programs at the Rec Center • Increase information and education out to the community regarding food programs and energy and water bill assistance programs 	<ul style="list-style-type: none"> • Participation/utilization of food programs offered by the City (Kids Café, Kids Café Summer Program, Family/Youth Tots for Hope) • Proportion of households meeting energy and water bills • Community participation in SNAP and WIC when eligible <ul style="list-style-type: none"> • Poverty levels • Disability access 	Connect residents to Colorado Low-income Energy Assistance Program (LEAP)								increased access, equity
		Direct residents to payment options for water billing through the City of Northglenn								increased access, equity
		Help residents apply for a Utility Bill Assistance grant through the Northglenn Community Foundation								increased access, equity
		Create a resource guide that provides information to staff about services provided by external agencies so staff can provide better customer service by connecting residents to the right resources								increased access, equity, employee education
<ul style="list-style-type: none"> • Increase participation in both evidence based programs and general fitness classes to 10% by 2025 • Increase Silver Sneakers participation 15% by 2025 • Increase Senior Center attendance 10% by 2030 	<ul style="list-style-type: none"> • Participation in Evidence based programs and general fitness classes offered at the Rec Center • Participation in Senior Center Activities • Silver Sneakers membership <ul style="list-style-type: none"> • # of Volunteers • Attendance in recreation center programs 	Implement and grow Neighborhood Engagement Program (incl. Sustainable Neighborhoods Program)								increased access, equity, community building

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT							
			Initial Capital investment	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits	
<p>• Increase Citywide Volunteer base by 5% by 2030</p>	<p>programs</p> <p>• Number of participants at City Events</p>	Diversify Senior Center programing to meet the needs of baby boomers	●	●	●	●	●	●	●	increased access, equity, community building
		Conduct the DRCOG Boomer Bond assessment	●	●	●	●	●	●	●	increased access, equity
		Continue to grow participation in Snow Stormers program	●	●	●	●	●	●	●	increased access, equity
		Help facilitate the Community to feel comfortable to come into the Rec Center to participate in food programs	●	●		●	●	●	●	increased access, equity, public health, nutrition
		Join regional collaboration of RX for Health – promoting recreation center usage through partnerships with health care providers to prescribe physical activity at local rec center (prescription offers 1 month free family membership)	●	●	●	●	●	●	●	increased access, equity, public health

GOAL AREA

Arts, Culture & Events

1. Develop and nurture quality programs for the City of Northglenn’s arts, culture and events programs.
2. Increase connectivity, allowing all people access to community classes, events and programs.
3. Create a thriving set of sustainable, creative and diverse event programs.

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
<ul style="list-style-type: none"> • Maintain programming levels for both City sponsored and externally sponsored theater events • Increase participation and attendance in theater events by 10% by 2030 • Maintain theater participation affordability • Increase participation in Citywide events by 5% by 2030 • Maintain affordability and accessibility while growing recreation and theater programs by 10% by 2030 	<ul style="list-style-type: none"> • Number of event participants <ul style="list-style-type: none"> • Accessibility • Affordability • Public art pieces • Partnerships (with external organizations that bring culturally diverse programming) 	Continue collaboration with outside organizations bringing programs to the theater							 increased access, equity, community representation, diversity
		Continue to provide scholarship opportunities for theater participants that could not otherwise afford it							 increased access, equity, community representation, diversity
		Encourage artist diversity							 increased access, equity, community representation, diversity

GOAL AREA

Community Education and Civic Participation

High Level Goals:

1. Community members of all demographics participate actively and effectively in civic affairs and community improvement efforts.
2. Through effective education and messaging, community members of all ages understand the basic principles of sustainability and use them to guide their decisions and actions.

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT						
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits
<ul style="list-style-type: none"> • Increase voter registration by 10% by 2020 • Increase voting rates by 15% by 2020 	<ul style="list-style-type: none"> • Voter participation • Diversity in city committees 	Provide voting materials in appropriate languages							 increased access, equity, community representation, democracy
		Explore voting poll locations in coordination with the County to ensure the accessibility for all Northglenn residents							 increased access, equity, community representation, democracy
		Provide voter registration opportunities as City events							 increased access, equity, community representation, democracy

TARGETS	INDICATORS	POSSIBLE STRATEGIES	ASSESSMENT							
			Initial Capital investment required	Ongoing/co ntinued funding	Additional staff resources	Existing work plan item	GHG benefit	Aligns with Other Plans	Co-benefits	
		Provide computer stations at City Hall that are open and accessible to the public to use to register to the vote or update registration – these stations can also be used to access City information, Human Social Services programs and job searching	●		●	●	●	●	●	increased access, equity, community representation, democracy
		Expand venues in which we recruit for open board and commission positions in order to be inclusive to all members of the community	●	●	●	●	●	●	●	increased access, equity, community representation, democracy
<ul style="list-style-type: none"> • Launch education campaign with at least X volunteer participation • Hold at least X outreach events • Hold at least X business education event 	<ul style="list-style-type: none"> • Community Education • Education campaigns 	Launch volunteer climate ambassador campaign to educate public	●	●	●	●	●	●	●	increased access, equity, community representation, democracy, community education

MEMORANDUM

To: City of Northglenn, CO

From: Andrew Knudtsen and Elliot Kilham, Economic & Planning Systems and Angie Fyfe and Hoi-Fei Mok, ICLEI

Subject: Sustainability Strategies Cost-Benefit Analysis
Electric Vehicles and Synthetic Turf, EPS #173079

Date: May 23, 2018

The Economics of Land Use



Project Background

As part of the Sustainability Audit and Work Plan, Economic & Planning Systems (EPS), working closely with ICLEI and the City of Northglenn, has created preliminary cost-benefit analyses and models for two sustainability strategies: (1) installation of synthetic turf to reduce water consumption and (2) transitioning the City's fleet to electric vehicles to reduce carbon emissions. The two sustainability strategies were identified through the sustainability audit and conversations with ICLEI and the City's Sustainability Team.

These analyses are part of a first phase of due diligence to help determine magnitude of potential cost and benefits and prioritization for next phases of the Sustainability Work Plan. The analyses also are meant to serve as examples of how the City can work toward prioritizing potential sustainability programs and to identify the least cost or highest benefit initiatives for accomplishing the City's sustainability goals. Finally, EPS has built the cost-benefit models as tools for policy-making, allowing the City to test different scenarios and to update the models' inputs as factors change over time.

This memorandum summarizes preliminary results from the two potential programs, including estimates of costs and benefits as well as key drivers and sensitivities of model results. The analysis focuses on high level results and findings with more detailed results available as modeling assumptions become more refined. The memorandum first reviews the cost and benefits of installing **synthetic turf** and then goes on to review cost and benefits of transitioning to **electric vehicles**. At the end of each section is a discussion of additional cost and benefits not quantified in the model as well as potential next steps for the City to consider for these strategies.

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173079-Sustainability Cost-Benefit Analysis-05-23-2018

Synthetic Turf

This section summarizes the cost and benefits of investing in a synthetic turf field compared to leaving Northglenn fields as natural grass.

- **Costs:** There is an upfront capital investment in converting a natural grass field to a synthetic turf field, including the purchase of new equipment to maintain the field. It is also assumed that after 15 years, the turf on the field will need to be replaced. Partially counterbalancing these high upfront costs for synthetic turf are lower maintenance costs (O&M) compared to natural grass.
- **Benefits:** The primary benefits of a synthetic turf field considered in this model are an increase in playing time for the field and, perhaps most importantly, a decrease in water use compared to natural grass.

Model Dimensions and Variables

In this model, EPS compares the cost and benefits of leaving Northglenn fields as natural grass, which does not require further capital investment, versus investing in synthetic turf. The key factors for the model are summarized in **Table 1**. Users of the model are encouraged to input the field size as well as specific financial factors (i.e. the cells highlighted in **blue**). Other factors in the model, including annual hours, annual water usage, and estimates of field cost are based either on Northglenn, Colorado specific factors for natural grass, or Broomfield, Colorado specific factors for synthetic turf. Broomfield is a local Colorado community that had previously invested in a synthetic turf complex.

Table 1
Synthetic Model Inputs and Factors

Description	Units	Natural Grass	Synthetic Turf
INPUTS AND FACTORS			
Program			
Field Size	sq. ft.	85,000	85,000
Life-Cycle	years	25	25
Replacement	year	NA	15
Financial			
Discount Rate	%	3.00%	3.00%
Cost Escalator	%	2.00%	2.00%
Hour Usage			
Annual Hours	hrs/field/year	600	2,000
Water Usage			
Annual Water Usage	gallons/sq. ft./year	36	0
Field Costs			
Initial Capital Cost (2018)	\$/sq. ft.	\$0.00	\$26.00
Replacement Cost (2018)	\$/sq. ft.	\$0.00	\$5.25
Annual Maintenance (2018)	\$/sq. ft.	\$0.29	\$0.11
Equipment	\$	\$0.00	\$23,000

Source: City of Northglenn; Northglenn Parks Services; Economic & Planning Systems

Result Summary

The cost and benefits of synthetic turf versus natural grass are summarized in **Table 2**. EPS and the City of Northglenn estimate that synthetic turf will result in an additional 1,400 hours per year of use or a total 35,000 more hours of use over the life cycle of the field. In addition, a synthetic turf field will result in annual water savings of 3.09 million gallons of water per year or a total of 77.25 million gallons over 25 years. The vast majority of these water savings would be non-potable water. To achieve these benefits, however, the synthetic turf field would cost \$2.3 million more than natural grass over the life cycle of the field. Much of this cost is due to the upfront capital investment.

Table 2
Synthetic Turf Life cycle Cost and Benefit Summary (25 years)

Description	Units	Natural Grass	Synthetic Turf
LIFE-CYCLE BENEFITS & COSTS SUMMARY			
BENEFIT - Hour Usage			
Hours of Use	<i>hours</i>	15,000	50,000
<i>Additional Hours Provided</i>		0	35,000
BENEFIT - Water Usage			
Production	<i>gallons</i>	0	0
Upkeep	<i>gallons</i>	<u>77,250,000</u>	<u>0</u>
Total	<i>gallons</i>	77,250,000	0
<i>Water Saved</i>	<i>gallons</i>	0	77,250,000
COST - Field Costs			
Capital Costs	\$	\$0	\$2,233,000
Maintenance Costs	\$	<u>\$625,000</u>	<u>\$234,375</u>
Total	\$	\$625,000	\$2,467,375
<i>Per Hour</i>	\$	\$41.67	\$49.35
<u><i>Net Present Value</i></u>			
NPV (3.0% discount rate)	\$	\$541,094	\$2,844,257
<i>Additional Cost</i>	\$	\$0	\$2,303,164
<i>Per Hour</i>	\$	\$36.07	\$56.89

Source: City of Northglenn; Northglenn Parks Services; Economic & Planning Systems

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The answer to the question of whether or not a synthetic field is a worthwhile investment for Northglenn depends primarily how the City values the additional recreational hours and the water savings. For example, if users' willingness-to-pay for an additional hour of recreation in Northglenn is \$76 per hour then the value of the additional hours would exactly equal the cost of the field. In terms of water, Northglenn charges \$5.91 per 1,000 gallons of water for irrigation customers. If this price is applied to the water savings in the model, then benefits of the water savings would be valued at \$318,000. If Northglenn valued the water saved at \$43 per 1,000 gallons of water, then the value of the water saved would exactly equal the cost of the synthetic turf. **In short, Northglenn would only have to value non-potable at \$0.043 per gallon to recover the cost of a synthetic turf field over 25 years.**

Sensitivity Analysis

Table 1 presents the estimate net benefit of an investment in synthetic turf under different recreation and water value scenarios. The columns show different values per hour of recreation on the field ranging from \$0 to \$100 per hour. The rows show different values of water per 1,000 gallons. Finally, as net benefits, the results take into consideration the additional cost of synthetic turf. The sensitivity analysis suggests that there are significant benefits to an investment of synthetic turf under a robust number of scenarios. Net benefits are positive if recreation is valued at more than \$76 per hour or if water is valued at approximately \$43 per 1,000 gallons.

Table 3
Sensitivity Analysis of Net Benefit

Description		Value Per Hour Recreation				
		\$0	\$25	\$50	\$75	\$100
Value Per 1,000 Gal. Water	\$0	-\$2,303,164	-\$1,545,633	-\$788,102	-\$30,570	\$726,961
	\$250	\$11,148,493	\$11,906,024	\$12,663,555	\$13,421,086	\$14,178,617
	\$500	\$24,600,150	\$25,357,681	\$26,115,212	\$26,872,743	\$27,630,274
	\$750	\$38,051,806	\$38,809,337	\$39,566,868	\$40,324,399	\$41,081,930
	\$1,000	\$51,503,463	\$52,260,994	\$53,018,525	\$53,776,056	\$54,533,587

Source: Economic & Planning Systems

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Additional Considerations and Next Steps

The initial model shows that investment in synthetic turf could result in significant water savings. There are, however, a number of additional considerations for the City to take into account as it deliberates on synthetic turf as a potential sustainability strategy. In particular, there are a number of environmental issues and challenges associated with synthetic turf. For example, evidence suggests that synthetic turf has a higher carbon footprint and is more resource intensive. In making a determination to invest in synthetic turf, the City should consider how it values different resources, including increased recreation hours and water. Given the relative scarcity of water in Northglenn and Colorado in general, the City could essentially “purchase water” relatively cheaply by purchasing synthetic turf. (An inactive and/or water rich community may not be willing to make the same trade.) The City could also purchase carbon offsets or invest in natural environmental with stormwater retention and carbon sink benefits that don’t have the same irrigation requirements as a playing field.

- Value of Additional Recreation Hours and Water Savings:** The City should consider how much it values different recreation hours and water savings. These will be the primary drivers of whether or not the benefits of synthetic turf outweigh the costs. *It is important to note that value is not necessarily the same as revenue in this analysis. Currently, the City does attempt full cost recovery of recreation fields and does not charge itself for water.*

- **Demand for Field Use:** To take full advantage of the benefits of a synthetic field's higher capacity, there needs to be an equivalent amount of demand for recreation use. The City will not accrue the benefits of surplus hours where supply is greater than demand.
- **Peak Water Demand and Impact on Water Rights:** Value of water is not constant, and the value/price of water will increase during peak water demand periods. In addition, the City currently may not have an adequate amount of senior water rights to meet demand at buildout. The marginal cost of saving a gallon of water is likely much cheaper than the marginal cost of purchasing additional water rights. *The non-potable water save can also be treated and sold as potable water for new developments, such as Karl's Farm.*
- **Injury Risk:** There is a lack of consensus on whether or not synthetic turf increases risk of injury. Studies have showed a higher frequency of injuries for first and second generation of turf, but there is insufficient evidence for third generation turf. For third generation turf, there do appear to be differences in injury patterns if not higher injury rates.
- **Heat Impact:** Synthetic turf absorbs heat, resulting in higher surface and air temperature. During hotter months in Colorado, synthetic turf can become unplayable. Watering the turf can reduce the temperature and allow play to continue, but temperatures rebound quickly. Watering the turf also reduces the water savings benefits of the turf. In addition to the impact on play and operation, synthetic turf can contribute the overall heat island effect.
- **Stormwater Retention:** Synthetic turf has minimal stormwater retention, which can lead to increased runoff and other environmental problems. It is possible to include drainage systems that compensate for their inability to absorb water. These increase the upfront costs of the turf.
- **Carbon Footprint and Sink:** Studies have shown that synthetic turf has a higher carbon footprint than natural turf over its life cycle. The carbon footprint of synthetic turf comes from its production, transportation, and disposal. The carbon footprint of natural grass comes from the installation and maintenance (e.g. fertilizer production, mowing and lawn management). Moreover, natural grass is a carbon sink, converting carbon dioxide to oxygen. The City could help offset these impacts by—for example—planting more trees.
- **Disposal:** Synthetic turf is not designed to breakdown quickly, which results in end of life disposal challenges associated with removal, transportation, and landfill charges. It is possible to recycle turf; this, however, just delays the disposal. There do appear to be some more creative recycling options such as cement plants that turn synthetic turf into a clean burning energy source.
- **Changing Technology:** Synthetic turf technology is improving, including products that are less heat absorbing and potentially more recyclable. The City should keep track of these potential improvements as it considers this sustainability strategy in the future.
- **Grant Funding:** There is also a possibility that the City could pursue grant funding to cover some or all of the capital outlay for the field.

Electric Vehicles

This section summarizes the cost and benefits of transitioning the municipal fleet to electric vehicles.

- **Costs:** Electric vehicles (EV) typically have higher capital costs than vehicles with internal combustion engines (ICE) powered by fossil fuels. EVs also require additional capital investment in charging infrastructure. However, EVs have lower fuel and maintenance costs (O&M), which can help make up for the higher capital costs over time.
- **Benefits:** The benefits of electric vehicles include reduced emissions as well as reduced air pollution. In addition, municipal charging stations can help encourage City employees and potentially the wider public to purchase EVs. In this analysis, EPS focuses on emission reductions as the primary benefit from electric vehicles.

Model Dimensions and Variables

EPS focuses on a simple, but scalable question – *what are the costs and emission benefits from purchasing an EV compared to an ICE?* The model answers this question for two types of vehicles: light duty sedans and heavy duty pickups. Most EV options currently are for sedans; however, there are an increasing number of options for other vehicle types, including SUVs, minivans, pickups, and even heavier duty trucks and vans. (As of now, there are no EV options for police vehicles, but, given the rate of change in the industry, there could be options available in the near future.)

Within the model, users can select different types of EV and ICE and compare their cost and benefits. This memo focuses on a comparison between a Ford Focus (ICE) and a Nissan Leaf (EV) for sedans and a Silverado 3500 (ICE) and Workhorse W-15 for heavy pickups. In the model, users are encouraged to input how many miles per year they expect to drive their vehicles, specific financial factors, and whether or not the municipality will be able to take advantage of state and local tax incentives. The inputs are highlighted in **blue** in **Table 4** below.

Table 4
Electric Vehicle Model Inputs

Description	Units	Sedan		Heavy Pick-Up	
		ICE	EV	ICE	EV
INPUTS					
Vehicle					
Type	<i>model</i>	Ford Focus	Nissan Leaf	Silverado 3500	Workhorse W-15
Operation					
Life-Cycle	years	10	10	10	10
Lease	years	3	3	3	3
Usage	<i>miles/year</i>	3,905	3,905	14,000	14,000
Financial					
Discount Rate	%	3.00%	3.00%	3.00%	3.00%
Price Index - New Vehicle		0.14%	0.14%	0.14%	0.14%
Price Index - O&M Costs	%	2.73%	2.73%	2.73%	2.73%
Incentives					
Federal Tax Credits	Yes/No	No	Yes	No	Yes
Percent Tax Credit	%	0%	100%	0%	100%
State Credits (for leasing)	Yes/No	No	Yes	No	Yes
Percent Tax Credit	%	0%	100%	0%	100%
Charge Ahead Colorado (CAC)	Yes/No	No	Yes	No	Yes
Percent Increment	% Increment	0%	80%	0%	80%

Factors used in the model are based on the vehicle types selected (e.g. fuel economy) and, when possible, Colorado-specific cost and emission factors, as shown in **Table 5**. For example, capital vehicle costs are based off of prices listed in the Colorado State Bid List for municipal vehicle purchases, and emission factors are based on Northglenn’s specific mix of electric generation, including the percent of renewables.

There are both federal and state tax credits for purchasing an EV. It is not entirely clear that municipalities can take advantages of these tax incentives as they pay no taxes. For purchase of vehicles, the federal tax code appears to provide a carve out that allows the dealership to claim the tax benefit and pass on savings to the local government. The State of Colorado Regional Air Quality Council (RAQC) also provides funding to local governments through its Charge Ahead Colorado (CAC) Program, which offers to fund 80 percent of the incremental cost of a EV compared to an ICE—with a limit of \$8,260. Finally, the State offers a tax credit between \$5,000 and \$10,000 for private residents, depending on the type of the benefits. It is possible that this tax credit could be passed along to local governments in lease payments.

In the results of the model, EPS reports the life cycle costs (as a net present value) and total emissions of the different vehicle types. The section includes cost estimates for both purchasing price and leasing vehicles. The lease functionality of the model has been incorporated to respond to Northglenn Public Works. For simplification, this memo focuses the cost and benefits of purchasing; benefits from leasing are primarily operational, and should be looked at in later stages of analysis.

Table 5
Electric Vehicle Model Factors

Description	Units	Sedan		Heavy Pick-Up	
		ICE	EV	ICE	EV
FACTORS					
Vehicle					
Combustion Type		ICE	BEV	ICE	PHEV
Electric Range	miles	NA	151	NA	80
Colorado State Bid Pricing	Yes/No	No	Yes	Yes	No
Cost					
<u>Purchase</u>					
Car	\$	\$14,332	\$24,897	\$25,320	\$52,000
<u>Lease</u>					
Upfront Payment	\$	\$1,433	\$1,240	\$2,532	\$3,450
Annual Payment	\$/yr	\$2,753	\$2,381	\$4,863	\$6,627
<u>O&M and Fuel Costs</u>					
Charging Infrastructure	\$	\$0	\$1,435	\$0	\$1,435
Annual O&M	\$/mile	\$0.142	\$0.125	\$0.142	\$0.135
Incentives					
<u>Purchase</u>					
Federal Tax Credit	\$/yr	\$0	\$7,500	\$0	\$7,500
Charge Ahead Colorado (CAC)	\$	\$0	\$2,452	\$0	\$8,260
<u>Lease</u>					
Federal Tax Credit	\$/yr	\$0	\$7,500	\$0	\$7,500
State	\$/yr	\$0	\$5,000	\$0	\$10,000
Fuel & Emissions					
Fuel Economy	miles/unit	30 mpg	30 kWh/100 miles	14 mpg	30 kWh/100 miles
Fuel	units/year	130 gallons	1,172 kWh	1,000 gallons	4,200 kWh
Fuel Costs	\$/unit	\$2.11	\$0.0619	\$2.11	\$0.0619
Emissions	lbs CO2/unit	19.6	1.32	19.6	1.32

Result Summary

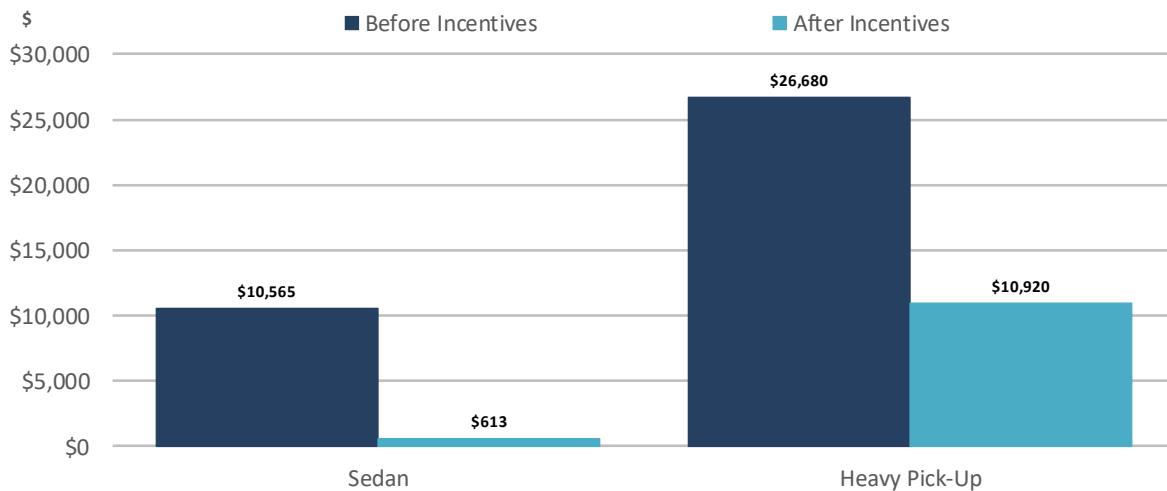
The primary driver of cost and benefits are the capital costs of EVs and miles driven per year. As mentioned previously, capital costs tend to be higher for EVs. However, the upfront costs for EVs are dropping steadily as battery technology improves. In the shorter term, incentives are potentially available for local governments. Incentives can reduce the upfront capital cost of a vehicle by approximately \$10,000 for sedans and \$16,000 for heavy pickups (**Table 6**). In turn, this can reduce the cost differential between EV and ICE from approximately \$10,565 to \$613 for sedan and from \$26,680 to \$10,920 for heavy pickups—depending on the number of miles driven per year (**Figure 1**).

Table 6
Purchase Price of Vehicles

Description	Sedan		Heavy Pick-Up	
	ICE	EV	ICE	EV
Before Incentives	\$14,332	\$24,897	\$25,320	\$52,000
Federal Incentives	\$0	-\$7,500	\$0	-\$7,500
Charge Ahead Colorado (CAC)	<u>\$0</u>	<u>-\$2,452</u>	<u>\$0</u>	<u>-\$8,260</u>
After Incentives	\$14,332	\$14,945	\$25,320	\$36,240

Source: Economic & Planning Systems

Figure 1
EV Cost Differential Compared to ICE



Source: Economic & Planning Systems

Usage impacts the cost comparison as fuel cost and O&M costs are cheaper for EVs; in the model, both costs are based on the number of miles driven per year. Summary statistics for a sample of vehicles driven in Northglenn are shown in **Table 7**. Focusing on all departments—excluding police—light duty vehicles like sedans are driven a median of approximately 3,900 miles per year while heavy pickups are driven a median of 5,100 miles per year. Police vehicles are driven at a much higher rate than vehicles from other department with a median usage of 10,000 miles per year.

**Table 7
Northglenn Fleet Mileage Per Year, 2017**

Description	Minimum	Quartile 1	Median	Quartile 3	Maximum	Average
All Departments						
Light Duty Vehicles	83	3,494	6,423	11,343	19,173	7,641
Heavy Pickups	<u>731</u>	<u>2,256</u>	<u>5,092</u>	<u>7,532</u>	<u>14,288</u>	<u>5,059</u>
All Types	83	2,660	5,655	8,810	19,173	6,400
All Departments - Excluding Police						
Light Duty Vehicles	1,774	2,999	3,905	5,981	12,823	4,930
Heavy Pickups	<u>731</u>	<u>2,256</u>	<u>5,092</u>	<u>7,532</u>	<u>14,288</u>	<u>5,059</u>
All Types	731	2,438	4,606	7,350	14,288	5,016
Police Department						
Light Duty Vehicles	83	6,493	10,063	13,725	19,173	9,770
Heavy Pickups	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
All Types	83	6,493	10,063	13,725	19,173	9,770

Source: City of Northglenn; Economic & Planning Systems

The cost and benefits of purchasing an EV are shown in **Table 8**; the reported results are the life cycle costs and benefits, assuming a 10-year lifespan, which is the approximate battery life for an EV, and assuming the median usage rate. For sedans, without incentives, an EV costs \$9,639 more over its life cycle than an ICE. With incentives, an EV costs \$313 less over a life cycle. The EV produces 5,000 fewer pounds of CO2. For the heavy pickups, without incentives, an EV costs \$28,795 more than an ICE. With incentives, an EV costs \$13,035 more. However, given the relatively poor fuel efficiency of an ICE pickup compared to the sedan, an EV saves an estimated 46,000 pounds of CO2 over the life cycle of the vehicle.

**Table 8
Electric Vehicle Life cycle Cost and Benefit Summary (10 years)**

Description	Units	Sedan		Heavy Pick-Up	
		ICE	EV	ICE	EV
COSTS					
Without Incentives					
Net Present Value	\$	\$21,994	\$31,634	\$62,247	\$91,042
Difference	\$	\$0	-\$9,639	\$0	-\$28,795
With Incentives					
Net Present Value	\$	\$21,994	\$21,682	\$62,247	\$75,282
Difference	\$	\$0	\$313	\$0	-\$13,035
BENEFITS					
Emissions					
Production	lbs CO2	14,000	19,000	14,000	19,000
Operation	lbs CO2	<u>25,513</u>	<u>15,470</u>	<u>71,288</u>	<u>20,173</u>
Total	lbs CO2	39,513	34,470	85,288	39,173
Difference	lbs CO2	0	5,042	0	46,115

Source: Economic & Planning Systems

Sensitivity Analysis

As mentioned, the two key drivers of costs and benefits in this model are the capital costs, driven largely in the short term by the level of subsidy available, and the vehicle usage. **Table 9** provides estimates of the cost differential between ICE and EV as well as the emission savings based on assumptions about the percent total subsidy achievable and the miles driven per year. The table also translates the carbon reduction into a dollar amount using an estimate of the social value of carbon reduction compiled by the Interagency Working Group (IWG). The IWG was formed by the Obama Administration in 2010. The green in the table indicates that EVs will lead to savings for Northglenn over the lifetime of the car.

Overall, the sensitivity analysis can be used to determine when it would be most beneficial to purchase an EV. For example, for both vehicle types, benefits of EVs increase with level of subsidy and annual miles driven. For sedans, the sensitivity analysis reveals cost savings at about 6,000 miles per year and approximately 75 percent of the available subsidy—which equates to a \$7,500 reduction in capital cost for the vehicle. Unlike sedans, EPS estimates that costs for heavy pickup EVs will be greater than ICE unless there is a subsidy around 75 percent and the vehicles are driven 12,000 miles per year. However, the model also shows that the emission reductions for heavy pickup are much greater than the emission reductions for sedans.

Table 9
EV Cost Benefit Sensitivity Analysis

Description	Life-Cycle Cost Differential					Benefit		
	Percent of Subsidy					Emission Reduction		
	0%	25%	50%	75%	100%	lbs/CO2	\$ [1]	
SEDAN								
		<u>\$0</u>	<u>\$2,488</u>	<u>\$4,976</u>	<u>\$7,464</u>	<u>\$9,952</u>		
Miles/Yr.	3,000	-\$10,186	-\$6,573	-\$3,710	-\$1,597	-\$234	2,715	\$110
	6,000	-\$8,373	-\$4,760	-\$1,897	\$216	\$1,579	10,430	\$321
	9,000	-\$6,559	-\$2,946	-\$83	\$2,030	\$3,393	18,145	\$531
	12,000	-\$4,746	-\$1,133	\$1,730	\$3,843	\$5,206	25,860	\$742
	15,000	-\$2,932	\$681	\$3,544	\$5,657	\$7,020	33,574	\$952
HEAVY PICK-UP								
		<u>\$0</u>	<u>\$3,940</u>	<u>\$7,880</u>	<u>\$11,820</u>	<u>\$15,760</u>		
Miles/Yr.	3,000	-\$24,533	-\$20,593	-\$16,653	-\$12,713	-\$8,773	25,115	\$722
	6,000	-\$20,951	-\$17,011	-\$13,071	-\$9,131	-\$5,191	55,230	\$1,543
	9,000	-\$17,369	-\$13,429	-\$9,489	-\$5,549	-\$1,609	85,345	\$2,365
	12,000	-\$13,787	-\$9,847	-\$5,907	-\$1,967	\$1,973	115,460	\$3,186
	15,000	-\$10,204	-\$6,264	-\$2,324	\$1,616	\$5,556	145,574	\$4,008

[1] Assumes social value of CO2 reduction is \$0.02/lb CO2 based on Obama Administration's Interagency Working Group estimates on the social value of carbon reduction.

Source: Economic & Planning Systems

Additional Considerations and Next Steps

There are a number of additional consideration and next steps for this analysis; many of which were identified during the research for the cost and benefits as well as discussions with staff from the Northglenn Public Works Department. These include the following:

- **Infrequent of Use Vehicles:** EPS's review of Northglenn's municipal vehicle report revealed that there are a significant number of vehicles in the City's fleet that are infrequently used with some vehicles not being used at all. Reducing the number of vehicles purchased and implementing a vehicle sharing system or other types of strategies has the potential to lead both to significant cost savings for the City as well as emission benefits.
- **Fleet Management:** This study focused primarily on a comparison of purchasing one vehicle. However, as part of the next steps, it will be important think about a fleet management strategy on the best way to transition to EVs. This strategy may include maintenance plans, decisions on purchasing versus leasing, availability of incentives, and rates of transition.
- **Tax Incentives and Subsidy:** The City should further research what tax incentives are available for local government, either directly through the state or as a pass through from the dealerships. The City should reach out to other municipalities in the ICLEI network in Colorado that have experience with transitioning to EVs.
- **Improving EV Technology and Changing Prices:** EV technology has been improving at a relatively rapid rate, increasing vehicle range as well as decreasing costs. As part of the evaluation into when and how to transition to EVs and their costs and benefits, it will be important to monitor these changes, as well as the price of fossil fuels.
- **Changes to Power Generation Mix:** An increase in the percentage of renewables as a percentage of power generation will continue to increase the emissions benefits of EVs. The cost-benefit model should be updated to reflect these changes in the power generation mix as well as changes in ICE fuel efficiency.
- **EVs for Municipal Employees and Wider Public:** Investment in charging stations for the municipal fleet could also benefit City employees interested in purchasing EVs. The municipal fleet would most likely be charged at night, allowing employees to take advantage of the infrastructure in the daytime. In addition, the charging station infrastructure could be made available to the wider public, which would help promote EV use in the region.
- **Air Quality Benefits:** Emissions for EVs occur at the site of non-renewable power generation, and not locally. In contrast, ICE vehicles are the point-source of carbon dioxide emission and other potentially hazardous pollutants. As a result, EVs provide air quality benefits for Northglenn and the Denver Metro Area.
- **Idling:** During EPS's research, a number of City staff mentioned that idling for extended periods of time was common for a number of departments, including police, trash vehicles, graffiti trucks, and TV van. Data were not available for idling times of the municipal fleet, and, as currently structured, the model does not take into consideration idling times. Instead, emissions estimates are based on miles driven per year. Incorporating idling into the model would likely increase the benefits of EVs.
- **Hybrid Vehicles & Compressed Natural Gas (CNG):** In future analyses, the City may explore the cost and benefits of purchasing hybrid vehicles and converting to CNG.

NORTHGLENN SUSTAINABILITY STRATEGIES

Preliminary Cost-Benefit Analysis: Synthetic Turf & Electric Vehicles

INTRODUCTION

ABOUT EPS – PROJECT TEAM



Andrew Knudtsen | Managing Principal
Principal-In-Charge | Project Manager



Elliot Kilham | Associate
Primary Analyst

INTRODUCTION

ABOUT EPS – EXPERTISE



REAL ESTATE ECONOMICS

EPS advances realistic and achievable land use and development programs with rigorous market and financial analysis.



PUBLIC FINANCE

EPS assembles comprehensive financing plans, funding sources, and tools for public infrastructure and services.



LAND USE & TRANSPORTATION

EPS informs land use and transportation planning with socio-economic fundamentals.



ECONOMIC DEVELOPMENT & REVITALIZATION

EPS fosters economic vitality and opportunity in distressed, transitioning, or under-served neighborhoods and regions.



FISCAL & ECONOMIC IMPACT ANALYSIS

EPS identifies the economic and budgetary implications of land use projects, activities, and policies.



HOUSING POLICY

EPS crafts housing policies and strategies that address regional needs, market realities, and community objectives, including affordability.



PUBLIC-PRIVATE PARTNERSHIP (P3)

EPS combines public and private-sector resources for innovative development projects and partnerships.



PARKS & OPEN SPACE ECONOMICS

EPS provides economic strategies and analysis that support the use of land for parks, recreation, agriculture, and habitat conservation.

INTRODUCTION

PROJECT OVERVIEW

- Economic & Planning Systems (EPS), working with ICLEI and Northglenn staff, selected and created preliminary cost–benefit analyses for two potential sustainability strategies
 1. Installation of **synthetic turf** to reduce water consumption
 2. Transitioning the City’s fleet to **electric vehicles** to reduce carbon emissions

- The preliminary cost–benefit analyses are meant to:
 - Be the first phase of due diligence to size cost and benefits
 - Help work toward prioritizing strategies for the next phase of the Sustainability Work Plan
 - Serve as examples for prioritization of future potential strategies
 - Identify the least cost and highest benefit initiatives for accomplishing City goals

- Detailed memorandum and cost–benefit model will be made available

INTRODUCTION

AGENDA

1. Introduction

- About EPS
- Project Overview

2. Synthetic Turf

- Model Dimensions and Key Variables
- Results Summary & Sensitivity Analysis
- Additional Considerations and Next Steps

3. Electric Vehicles

- Model Dimensions and Key Variables
- Results Summary & Sensitivity Analysis
- Additional Considerations and Next Steps

SYNTHETIC TURF

MODEL OVERVIEW

- **Overview**
 - Comparing investment in synthetic turf vs. leaving field as natural grass
 - 25-year lifespan assumption
 - 15-year turf replacement
 - 85,000 sq. ft. field (~size of soccer field)

- **Costs**
 - Upfront capital investment (including purchasing new equipment)
 - Replacement cost after 15 years

- **Benefits**
 - Increased playing time on field
 - Reduced water consumption
 - Lower O&M costs

SYNTHETIC TURF

MODEL INPUTS AND FACTORS

- **Local Calibration**
 - *Important to calibrate model to local climate*
 - Northglenn specific inputs for natural grass
 - Broomfield specific inputs for synthetic turf
 - **Thank you to the Parks and Public Works*

- **User Inputs**
 - Cells highlighted in **blue** are factors that model users are encouraged to change

Description	Units	Natural Grass	Synthetic Turf
INPUTS AND FACTORS			
Program			
Field Size	sq. ft.	85,000	85,000
Life-Cycle	years	25	25
Replacement	year	NA	15
Financial			
Discount Rate	%	3.00%	3.00%
Cost Escalator	%	2.00%	2.00%
Hour Usage			
Annual Hours	hrs/field/year	600	2,000
Water Usage			
Annual Water Usage	gallons/sq. ft./year	36	0
Field Costs			
Initial Capital Cost (2018)	\$/sq. ft.	\$0.00	\$26.00
Replacement Cost (2018)	\$/sq. ft.	\$0.00	\$5.25
Annual Maintenance (2018)	\$/sq. ft.	\$0.29	\$0.11
Equipment	\$	\$0.00	\$23,000

Source: City of Northglenn; Northglenn Parks Services; Economic & Planning Systems

SYNTHETIC TURF

RESULT SUMMARY

- Cost and Benefits over 25 years
- Benefits
 - 35,000 additional hours of recreations
 - 77.3 million gallon water
- Costs
 - \$2.3 million additional expense

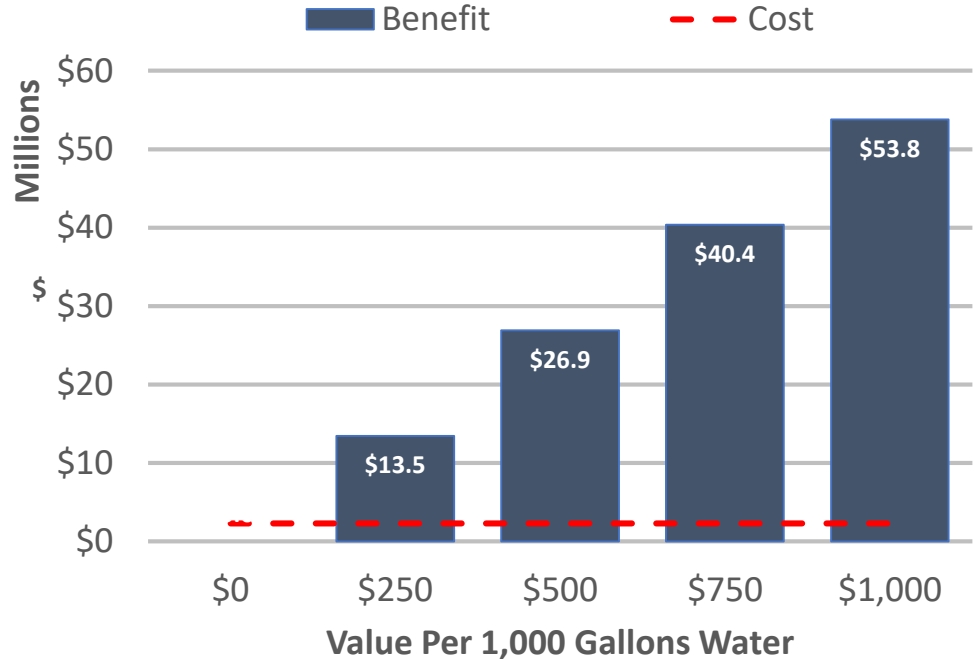
Description	Units	Natural Grass	Synthetic Turf
LIFE-CYCLE BENEFITS & COSTS SUMMARY			
BENEFIT - Hour Usage			
Hours of Use	hours	15,000	50,000
<i>Additional Hours Provided</i>		0	35,000
BENEFIT - Water Usage			
Production	gallons	0	0
Upkeep	gallons	<u>77,250,000</u>	<u>0</u>
Total	gallons	77,250,000	0
<i>Water Saved</i>	gallons	0	77,250,000
COST - Field Costs			
Capital Costs	\$	\$0	\$2,233,000
Maintenance Costs	\$	<u>\$625,000</u>	<u>\$234,375</u>
Total	\$	\$625,000	\$2,467,375
<i>Per Hour</i>	\$	\$41.67	\$49.35
<i>Net Present Value</i>			
NPV (3.0% discount rate)	\$	\$541,094	\$2,844,257
<i>Additional Cost</i>	\$	\$0	\$2,303,164
<i>Per Hour</i>	\$	\$36.07	\$56.89

Source: City of Northglenn; Northglenn Parks Services; Economic & Planning Systems

SYNTHETIC TURF

SENSITIVITY ANALYSIS – WATER

- **How to value resources?**
 - The results of the cost-benefit strategy depends on how you value the benefits
 - **Value different than revenue*
- **Value of Water**
 - Northglenn charges \$5.91 per 1,000 gallons for irrigation customers
 - At \$43 per 1,000 gallons, Northglenn would recover the cost of a synthetic turf field over 25 years
 - Northglenn, as a City, does not currently pay for its use of water on City property; however, it nevertheless represents value

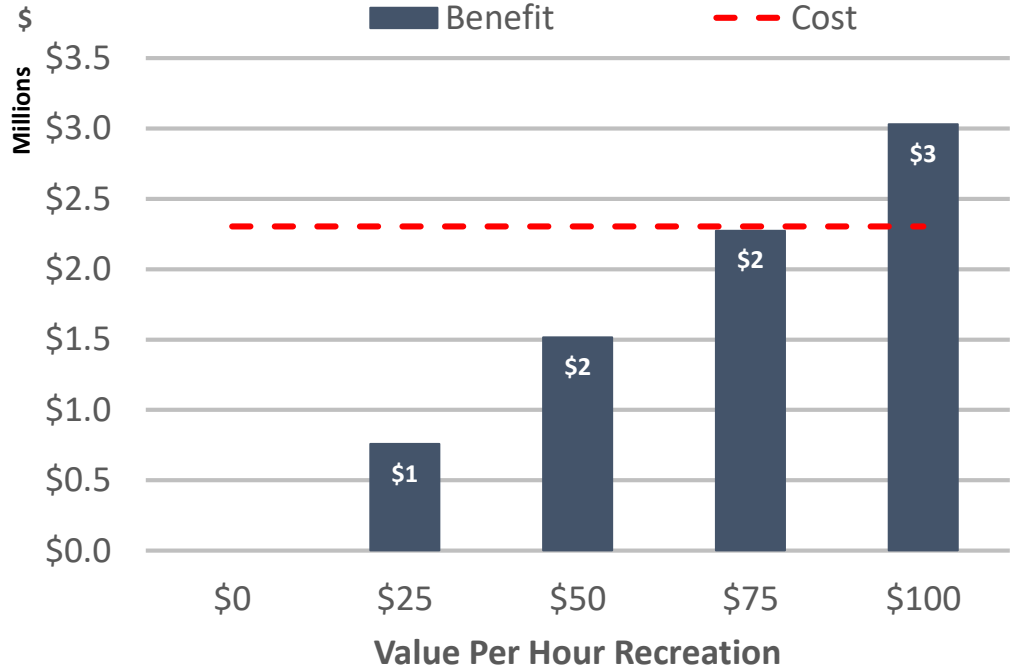


Source: City of Northglenn; Northglenn Parks Services; Economic & Planning Systems

SYNTHETIC TURF

SENSITIVITY ANALYSIS – RECREATION HOURS

- **How to value resources?**
 - The results of the cost-benefit strategy depends on how you value the benefits
 - **Value different than revenue*
- **Value of Recreation Hours**
 - At \$76 per hour, Northglenn would recover the cost of the synthetic turf field over 25 years



Source: City of Northglenn; Northglenn Parks Services; Economic & Planning Systems

SYNTHETIC TURF

SENSITIVITY ANALYSIS – COMBINED

- **Scenarios**
 - Columns = Values per hour of recreation on the field ranging from \$0 to \$100 per hour
 - Rows = Values of water per 1,000 gallons
- **Net Benefits**
 - Significant benefits to an investment of synthetic turf under a robust number of scenarios

Description		Value Per Hour Recreation				
		\$0	\$25	\$50	\$75	\$100
Value Per 1,000 Gal. Water	\$0	-\$2,303,164	-\$1,545,633	-\$788,102	-\$30,570	\$726,961
	\$250	\$11,148,493	\$11,906,024	\$12,663,555	\$13,421,086	\$14,178,617
	\$500	\$24,600,150	\$25,357,681	\$26,115,212	\$26,872,743	\$27,630,274
	\$750	\$38,051,806	\$38,809,337	\$39,566,868	\$40,324,399	\$41,081,930
	\$1,000	\$51,503,463	\$52,260,994	\$53,018,525	\$53,776,056	\$54,533,587

Source: Economic & Planning Systems

H:\173079-Northglenn Sustainability Audit and Work Program\Models\183009-Synthetic Turf vs. Natural Grass-05-17-2018.xlsx]T-NPV

SYNTHETIC TURF

ADDITIONAL CONSIDERATIONS

- Value of additional recreation and water savings
 - City needs to determine how it values additional recreation and water savings
- Demand for field use
 - The City will not accrue benefits if supply is greater than demand
- Peak water demand and impact on water rights
 - Value of water is not constant and will change during peak periods
 - Non-potable water save can be treated and sold as potable water for new developments such as Karl's Farm
 - Consider marginal cost of savings
- Environmental Factors
 - Injury risk
 - Heat impact
 - Carbon footprint and sink
 - Disposal and potential recycling
 - "Trading resources"
- Grant funding
 - Grant funding potentially available

ELECTRIC VEHICLES

MODEL OVERVIEW

- **Overview**
 - *What are the costs and emission benefits from purchasing an electric vehicle (EV) compared to an internal combustion engine (ICE)?*
 - 10-year lifespan (~ battery life of an EV)

- **Costs**
 - Higher capital costs, including investment in charging infrastructure

- **Benefits**
 - Reduced emissions
 - Reduced air pollution
 - Lower O&M and fuel costs

ELECTRIC VEHICLES

MODEL INPUTS

User Inputs

- Cells highlighted in **blue** are factors that model users are encouraged to change

Vehicle Selection

- Model allows selection of different vehicle types
- Includes sedans and heavy pickups
- **Memo and presentation focuses on:**
 - Ford Focus (ICE) vs. Nissan Leaf (EV)
 - Silverado 3500 (ICE) vs. Workhorse W-15 (EV)

Key Drivers

- Usage (miles driven per year)
- Incentives

Description	Units	Sedan		Heavy Pick-Up	
		ICE	EV	ICE	EV
INPUTS					
Vehicle					
Type	<i>model</i>	Ford Focus	Nissan Leaf	Silverado 3500	Workhorse W-15
Operation					
Life-Cycle	years	10	10	10	10
Lease	years	3	3	3	3
Usage	<i>miles/year</i>	3,905	3,905	14,000	14,000
Financial					
Discount Rate	%	3.00%	3.00%	3.00%	3.00%
Price Index - New Vehicle		0.14%	0.14%	0.14%	0.14%
Price Index - O&M Costs	%	2.73%	2.73%	2.73%	2.73%
Incentives					
Federal Tax Credits	Yes/No	No	Yes	No	Yes
Percent Tax Credit	%	0%	100%	0%	100%
State Credits (for leasing)	Yes/No	No	Yes	No	Yes
Percent Tax Credit	%	0%	100%	0%	100%
Charge Ahead Colorado (CAC)	Yes/No	No	Yes	No	Yes
Percent Increment	% Increment	0%	80%	0%	80%

ELECTRIC VEHICLES

MODEL FACTORS

- Models factors based on vehicle selection and other inputs

- State and Federal Tax Incentives
 - Potential for municipal government to take advantage of tax incentives through pass-throughs
 - Federal = \$7,500 per vehicle
 - State = \$5,000–\$10,000 per vehicle
 - Charge Ahead Colorado = 80% of incremental cost between ICE and EV

- Lease vs. Purchase
 - Model also examines question of lease vs. purchase
 - Memo and presentation focus on purchase options

Description	Units	Sedan		Heavy Pick-Up	
		ICE	EV	ICE	EV
FACTORS					
Vehicle					
Combustion Type		ICE	BEV	ICE	PHEV
Electric Range	miles	NA	151	NA	80
Colorado State Bid Pricing	Yes/No	No	Yes	Yes	No
Cost					
<u>Purchase</u>					
Car	\$	\$14,332	\$24,897	\$25,320	\$52,000
<u>Lease</u>					
Upfront Payment	\$	\$1,433	\$1,240	\$2,532	\$3,450
Annual Payment	\$/yr	\$2,753	\$2,381	\$4,863	\$6,627
<u>O&M and Fuel Costs</u>					
Charging Infrastructure	\$	\$0	\$1,435	\$0	\$1,435
Annual O&M	\$/mile	\$0.142	\$0.125	\$0.142	\$0.135
Incentives					
<u>Purchase</u>					
Federal Tax Credit	\$/yr	\$0	\$7,500	\$0	\$7,500
Charge Ahead Colorado (CAC)	\$	\$0	\$2,452	\$0	\$8,260
<u>Lease</u>					
Federal Tax Credit	\$/yr	\$0	\$7,500	\$0	\$7,500
State	\$/yr	\$0	\$5,000	\$0	\$10,000
Fuel & Emissions					
Fuel Economy	miles/unit	30 mpg	30 kWh/100 miles	14 mpg	30 kWh/100 miles
Fuel	units/year	130 gallons	1,172 kWh	1,000 gallons	4,200 kWh
Fuel Costs	\$/unit	\$2.11	\$0.0619	\$2.11	\$0.0619
Emissions	lbs CO2/units	19.6	1.32	19.6	1.32

ELECTRIC VEHICLES

RESULT SUMMARY

Assumptions

- Assuming 0% or 100% of available incentives
- Median usage rates

Costs

- With incentives, difference between EV and ICE can be greatly reduced
- For sedans, it can be brought down to a nominal amount

Benefits

- EVs reduce CO2 emission
- Emission benefits especially large for heavy pick-ups

Description	Units	Sedan		Heavy Pick-Up	
		ICE	EV	ICE	EV
COSTS					
Without Incentives					
Net Present Value	\$	\$21,994	\$31,634	\$62,247	\$91,042
Difference	\$	\$0	-\$9,639	\$0	-\$28,795
With Incentives					
Net Present Value	\$	\$21,994	\$21,682	\$62,247	\$75,282
Difference	\$	\$0	\$313	\$0	-\$13,035
BENEFITS					
Emissions					
Production	lbs CO2	14,000	19,000	14,000	19,000
Operation	lbs CO2	<u>25,513</u>	<u>15,470</u>	<u>71,288</u>	<u>20,173</u>
Total	lbs CO2	39,513	34,470	85,288	39,173
Difference	lbs CO2	0	5,042	0	46,115

Source: Economic & Planning Systems

ELECTRIC VEHICLES

SENSITIVITY ANALYSIS

Scenarios

- Columns = Percent Subsidy
- Rows = Usage (miles/year)

Sedans

- Positive benefits at 75% subsidy and/or > 6,000 miles per year

Heavy Pickups

- Positive benefits at 75% subsidy and >12,000 miles per year
- Emission reduction, however, is much greater than compared to sedans

Description	Life-Cycle Cost Differential					Benefit		
	Percent of Subsidy					Emission Reduction		
	0%	25%	50%	75%	100%	lbs/CO2	\$ [1]	
SEDAN								
		<u>\$0</u>	<u>\$2,488</u>	<u>\$4,976</u>	<u>\$7,464</u>	<u>\$9,952</u>		
Miles/Yr.	3,000	-\$10,186	-\$6,573	-\$3,710	-\$1,597	-\$234	2,715	\$110
	6,000	-\$8,373	-\$4,760	-\$1,897	\$216	\$1,579	10,430	\$321
	9,000	-\$6,559	-\$2,946	-\$83	\$2,030	\$3,393	18,145	\$531
	12,000	-\$4,746	-\$1,133	\$1,730	\$3,843	\$5,206	25,860	\$742
	15,000	-\$2,932	\$681	\$3,544	\$5,657	\$7,020	33,574	\$952
HEAVY PICK-UP								
		<u>\$0</u>	<u>\$3,940</u>	<u>\$7,880</u>	<u>\$11,820</u>	<u>\$15,760</u>		
Miles/Yr.	3,000	-\$24,533	-\$20,593	-\$16,653	-\$12,713	-\$8,773	25,115	\$722
	6,000	-\$20,951	-\$17,011	-\$13,071	-\$9,131	-\$5,191	55,230	\$1,543
	9,000	-\$17,369	-\$13,429	-\$9,489	-\$5,549	-\$1,609	85,345	\$2,365
	12,000	-\$13,787	-\$9,847	-\$5,907	-\$1,967	\$1,973	115,460	\$3,186
	15,000	-\$10,204	-\$6,264	-\$2,324	\$1,616	\$5,556	145,574	\$4,008

[1] Assumes social value of CO2 reduction is \$0.02/lb CO2 based on Obama Administration's Interagency Working Group estimates on the social value of carbon reduction.
Source: Economic & Planning Systems

ELECTRIC VEHICLES

ADDITIONAL CONSIDERATIONS

- Infrequent use of vehicles
 - A significant number of vehicles in Northglenn are underused or not used at all
 - Potential benefit from improved fleet management and reducing vehicle purchases
- Fleet management
 - In next steps, it will be important to focus on fleet transition and management
- Tax incentives and subsidy
 - Further research on available incentives will be critical
- Improving EV technology, changes to power generation, and changing prices
 - EV and battery technology improving rapidly
 - Vehicle range increasing and costs decreasing
 - Increased percentage of renewable in power generation mix will increase EV benefits
 - What will happen to gas prices?
- EVs for municipal employees and the general public
 - Charging infrastructure will benefit employees looking to purchase EVs and the wider public
- Hybrid vehicles & Compressed Natural Gas (CNG)
- Air quality benefits

APPENDIX

APPENDIX

NORTHGLENN FLEET MILEAGE PER YEAR

Description	Minimum	Quartile 1	Median	Quartile 3	Maximum	Average
All Departments						
Light Duty Vehicles	83	3,494	6,423	11,343	19,173	7,641
Heavy Pickups	<u>731</u>	<u>2,256</u>	<u>5,092</u>	<u>7,532</u>	<u>14,288</u>	<u>5,059</u>
All Types	83	2,660	5,655	8,810	19,173	6,400
All Departments - Excluding Police						
Light Duty Vehicles	1,774	2,999	3,905	5,981	12,823	4,930
Heavy Pickups	<u>731</u>	<u>2,256</u>	<u>5,092</u>	<u>7,532</u>	<u>14,288</u>	<u>5,059</u>
All Types	731	2,438	4,606	7,350	14,288	5,016
Police Department						
Light Duty Vehicles	83	6,493	10,063	13,725	19,173	9,770
Heavy Pickups	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
All Types	83	6,493	10,063	13,725	19,173	9,770

Source: City of Northglenn; Economic & Planning Systems