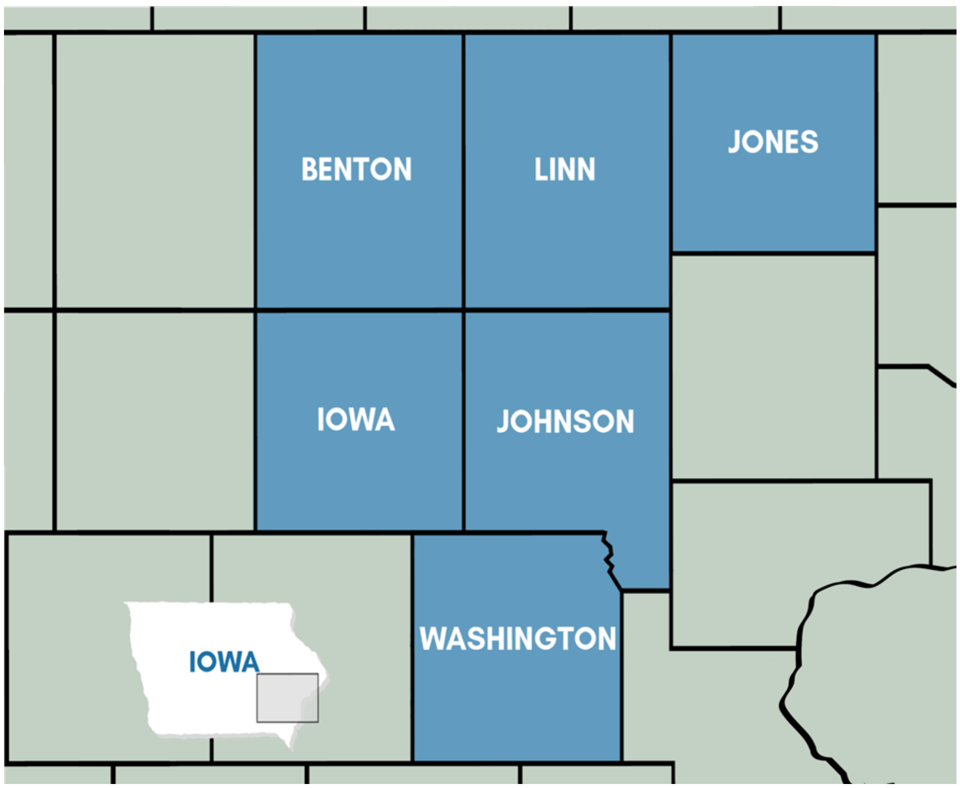
EAST CENTRAL IOWA
PRIORITY CLIMATE ACTION PLAN



March 1, 2024

Prepared by the East Central Iowa Council of Governments and submitted to the United States Environmental Protection Agency on behalf of Benton, Iowa, Johnson, Linn, and Washinton counties for eligibility to apply to the Climate Pollution Reduction Grant Program Implementation General Competition.

ECICOG
EAST CENTRAL IOWA
COUNCIL OF GOVERNMENTS
YOUR REGIONAL PLANNING AGENCY

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Acknowledgements

This priority climate action (PCAP) was prepared by the East Central Iowa Council Governments (ECICOG) with direction from the East Central Iowa Climate Pollution Reduction Grant Program (CPRG) Technical Advisory Committee. This plan is the first regional PCAP prepared for the East Central Iowa region including Benton, Iowa, Johnson, Jones, Linn, and Washington counties.

To incorporate existing expertise within the region, the CPRG Technical Advisory Committee included the sustainability and climate action staff from Cedar Rapids, Iowa City, Johnson County, and Linn County.

East Central Iowa CPRG Technical Advisory Committee

Sara Maples, Cedar Rapids Sustainability Program Manager
Sarah Gardner, Iowa City Climate Action Coordinator
Becky Soglin, Johnson County Sustainability Coordinator
Tamara Marcus, Linn County Sustainability Director[1]

ECICOG appreciates the invaluable knowledge and experience shared by committee members as ECICOG works to build capacity and expertise in climate action planning, program development, and implementation. In addition, stakeholders from local governments and organizations in the region shared crucial input through various engagement activities described in the Coordination and Outreach section.

This plan was prepared with financial support from the Climate Pollution Reduction Grant Program that is funded by the Inflation Reduction Act and administered by the Environmental Protection Agency (EPA). ECICOG appreciates the cities, counties, and organizations that provided a letter of support to help secure two planning grants for the region.

Letters of Support for Planning Grants

Cedar Rapids MSA	Iowa City MSA
City of Cedar Rapids	City of Iowa City
Linn County	Johnson County
Linn County Public Health	City of Coralville
Corridor MPO	MPO of Johnson County

[1] Terminated committee participation in November 2023 following announcement of the intent to resign from her position with Linn County on December 31, 2023 to pursue private consulting.

The planning grants and this PCAP establish eligibility for cities and counties in the region to apply to EPA's CPRG Implementation General Competition.
As a planning grant lead entity, ECICOG appreciates the technical resources provided by EPA staff and contractors. Throughout the PCAP preparation process, ECICOG participated in EPA Technical Assistance Forums and EPA Region 7 Office Hours.

Finally, ECICOG appreciates the support from its Board of Directors to implement two CPRG planning grants on behalf of the region. The Board of Directors includes local officials, city/county staff, and residents from Benton, Iowa, Johnson, Jones, Linn, and Washington counties.

Key Definitions and Acronyms

Term or Acronym	Definition
CCAP	For the Climate Pollution Reduction Grants (CPRG) program, a Comprehensive Climate Action Plan (CCAP) provides an overview of a region's significant GHG sources/sinks and sectors, establishes near-term and long-term GHG emission reduction goals, and provides strategies and measures to help the region meet its goals.
CDBG	Community Development Block Grant
CPRG	Climate Pollution Reduction Grants Program
East Central Iowa	For this plan, the East Central Iowa region includes Benton, Iowa, Johnson, Jones, Linn, and Washington counties, and all communities located within the six counties.
ECICOG	The East Central Iowa Council of Governments (ECICOG) is an intergovernmental council established in 1973 under Chapter 28E and provided for under Chapter 28H of the Code of Iowa.
EPA	United States Environmental Protection Agency (EPA)
GHG Inventory	A greenhouse gas (GHG) inventory is a list of emissions sources and the associated emissions quantified using standard methods.
HUD	U.S. Department of Housing and Urban Development
LIDAC	A low-income and disadvantaged community (LIDAC) is a community with residents that have low incomes, limited access to resources, and/or disproportionate exposure to environmental or climate burdens. For this plan, the Environmental Justice Screening and Mapping Tool is used to identify LIDACs in the region. The tool identifies LIDACs by assessing indicators for categories of burden: air quality, climate change, energy, environmental hazards, health, housing, legacy pollution, transportation, water and wastewater, and workforce development.

Term or Acronym	Definition
LMI	Low- to moderate-income
PCAP	For the Climate Pollution Reduction Grants (CPRG) program, a Priority Climate Action Plan (PCAP) identifies near-term, high-priority, and implementation-ready GHG reduction measures for a geographic area. The plan is a prerequisite for eligible entities to apply to the Climate Pollution Reduction Grants (CPRG) Program Implementation Grant General Competition.
MPO	Metropolitan Planning Organization
MSA	A Metropolitan Statistical Area (MSA) is a geographic area defined by the federal government based on population and commuting patterns of residents. This PCAP includes the Cedar Rapids MSA comprised of Benton, Linn, and Jones counties and the Iowa City MSA comprised of Johnson and Washington counties. Under the CPRG planning grants funding the preparation of this regional PCAP, Iowa County is included with the Iowa City MSA.

Introduction

The East Central Iowa Council of Governments (ECICOG) has partnered with communities and organizations in East Central Iowa, to prepare this priority climate action plan (PCAP). The primary goal for the plan is to support investment in programs and technologies that reduce greenhouse gas emissions and equitably enhance the quality of life in East Central Iowa.

This project has been funded wholly by the United States Environmental Protection Agency (EPA) under assistance agreements 96704201 and 96704701 to ECICOG as the lead entity for the Climate Pollution Reduction Grants Program in the region. The contents of this document do not necessarily reflect the views and policies of the EPA, nor does the EPA endorse trade names or recommend the use of commercial products mentioned in this document.

This PCAP is organized into the following sections:

1. Introduction
2. Coordination and Outreach
3. Greenhouse Gas (GHG) Emissions Inventory
4. Priority GHG Reduction Measures
5. Low-Income and Disadvantaged Communities Benefits Analysis
6. Next Steps
7. Appendices
    a. Coordination and Outreach
    b. Greenhouse Gas Inventories
    c. Priority Measures
    d. Low-Income and Disadvantaged Communities

The greenhouse gas (GHG) reduction measures contained in this PCAP should be construed as broadly available to any entity within the geographic scope of this PCAP eligible to receive funding under the EPA's Climate Pollution Reduction Grants Program (CPRG): Implementation Grants General Competition and other funding streams, as applicable. This PCAP covers East Central Iowa, which includes Benton, Iowa, Johnson, Jones, Linn, and Washington counties.

Coordination and Outreach

East Central Iowa maintains regional plans in multiple planning areas including transportation, economic development, waste and recycling, and watershed management. This plan is the first regional priority climate action plan (PCAP) prepared for Benton, Iowa, Johnson, Jones, Linn, and Washington counties. In the PCAP development process, ECICOG's goal was to integrate existing climate action and sustainability plans or strategies from cities, counties, and organizations in the region into a focused set of implementation ready GHG reduction measures that could benefit the entire region.

To incorporate existing climate action and sustainability expertise within the region, ECICOG worked with a technical advisory committee. The CPRG Technical Advisory Committee included the sustainability and climate action staff from Cedar Rapids, Iowa City, Johnson County, and Linn County. The staff from these cities and counties in the region have previous experience in climate action and sustainability planning, program development, and implementation.

Since this PCAP determines eligibility to apply to the CPRG Implementation Grants General Competition, the timeline for plan development, coordination, and outreach occurred from September 2023 to February 2024. To meet CPRG planning grant requirements, PCAPs must include implementation ready GHG reduction strategies and be submitted to EPA by March 1, 2024.

Due to the condensed timeline for PCAP development, ECICOG's outreach and engagement focused on stakeholders eligible to apply to the CPRG Implementation Grants General Competition and stakeholders that are representative of the entities, groups, and individuals who may be impacted by the implementation of priority GHG reduction measures, especially low-income and disadvantaged communities. Stakeholders generally include, but are not limited to:

- Local government staff and elected officials,
- Metropolitan and regional planning organizations,
- Housing trust funds,
- Economic development organizations,
- Waste management organizations,
- Workforce development organizations, and
- Community-based organizations.

To incorporate low-income and disadvantaged communities in the development of this PCAP, community-based organizations that provide services directly to these communities were identified and included in all coordination and outreach activities.

The full list of stakeholders identified for direct outreach in the PCAP development process is included in Appendix A.

Outreach and engagement with stakeholders for the development of the PCAP included a webinar, survey, CPRG project webpage, and meetings. Appendix A provides a log of coordination, outreach, and engagement activities for the development of the PCAP.

To begin outreach for the PCAP, ECICOG invited all identified stakeholders to attend a webinar to learn about CPRG and climate action planning in East Central Iowa. The webinar agenda included the following items:

- Climate Pollution Reduction Program (CPRG) overview,
- Climate action planning overview per CPRG requirements
- CPRG planning and implementation grant timeline,
- Opportunities for involvement, and
- Greenhouse Gas (GHG) reduction measures identified by the CPRG Technical Advisory Committee.

The webinar also included an opportunity for participants to ask questions about CPRG and climate action planning in East Central Iowa. Following the webinar, a recording of the webinar, slides, and questions with answers were posted on the project webpage at https://www.talkto.ecicog.org/east-central-iowa-climate-pollution-reduction-grant.

ECICOG held the webinar on two different dates, one during business hours and the other in the evening, to provide flexibility for stakeholders. The webinar during business hours had the best attendance with 27 participants representing several local governments and organizations in the region. Refer to Table 1 for webinar attendance.

Table 1. Webinar Dates and Attendance

Webinar	Participants
November 28, 2023 at 1 PM	27
November 30, 2023 at 6 PM	3
Total	30

Higher attendance for the webinar during business hours is likely due to stakeholders identified for the PCAP being limited primarily to people who would be participating as staff or an elected official representing a local government or organization.

After the webinar, ECICOG invited stakeholders to complete a survey to indicate which GHG reduction measures, if any, are a priority to their community or organization. The survey was administered through the project webpage and distributed directly to stakeholders via email.

The deadline for the survey was January 10, 2024, and ECICOG received eighteen responses. Survey respondents included cities, counties, and organizations in the region.

The basis of the GHG reduction priority measures in the survey was a review of the existing climate action and sustainability plans or strategies developed by Cedar Rapids, Iowa City, Linn County, and Johnson County. In addition, other local governments and community-based organizations have existing plans or assessments with elements that address climate change or community development strategies that are GHG reduction measures. Example plans and assessments include transportation, housing, economic development, comprehensive, and strategic plans or assessments.

See Table 2 for the list of proposed GHG reduction measures and number of respondents indicating support for each measure.

Table 2. GHG Reduction Measures Survey Responses

GHG Reduction Measure	Respondents Indicating Support for GHG Reduction Measure
Energy efficiency grants for Section 8 single-family and duplex rental units	8
Energy efficiency grants for rental properties with income-qualified tenants	14
Energy efficiency grants for income-qualified manufactured homeowners	9
Energy efficiency grants for income-qualified single-family homeowners	14
Heat pump grants for income-qualified single-family homeowners	12
Financial support for recommissioning, energy efficiency audits, and/or structural analysis for solar readiness for public buildings	9
Support workforce training programs for energy efficiency audits and building practices	12
Incorporating a methane capture system in wastewater treatment facilities	8

One survey respondent indicated no support for all GHG reduction measures, but this respondent was completing the survey on behalf of a solid waste commission that would not be involved in the implementation of any of the proposed measures.

Following the survey, ECICOG communicated directly with the local governments and organizations that proposed additional GHG reduction measures to consider for inclusion in the plan. Communication focused on whether the proposed GHG reduction measures met the criteria for this PCAP, which is detailed in the Priority GHG Reduction Measures section of the plan.

To provide information and engagement opportunities online, ECICOG launched a regional climate action planning webpage through its online public engagement platform. The platform includes tools to post documents, event information, webinar recordings, and conduct surveys. Throughout the PCAP development process, the webpage was used to share information with stakeholders and conduct the GHG reduction measure survey. The webpage is available at https://www.talkto.ecicog.org/east-central-iowa-climate-pollution-reduction-grant.

Future outreach and coordination will be focused on the development of a comprehensive climate action plan (CCAP) for East Central Iowa. Refer to the Next Steps section of this plan for more information about how ECICOG plans to conduct extensive outreach and engagement with stakeholders with a greater focus on the public, low-income and disadvantaged communities, and stakeholders from each GHG emitting sector in the region.

Greenhouse Gas Emission Inventory

To understand local opportunities to reduce greenhouse gas emissions, ECICOG has developed an inventory of greenhouse gas (GHG) emissions from sources within East Central Iowa. This GHG inventory was prepared using the EPA Local Greenhouse Gas Inventory Tool and data from federal, state, and local sources.

This GHG inventory includes direct and indirect emissions for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Fluorinated greenhouse gases are generally not reported at significant levels in East Central Iowa and are not included in this inventory due to insufficient data. Emission sources are categorized into seven sectors that include transportation, commercial and residential buildings, industry, agriculture, waste and materials management, wastewater, and natural and working lands. For this GHG inventory, the industry sector includes electricity generation in the region.

Table 3. Greenhouse Gas Inventory Sectors and Gases

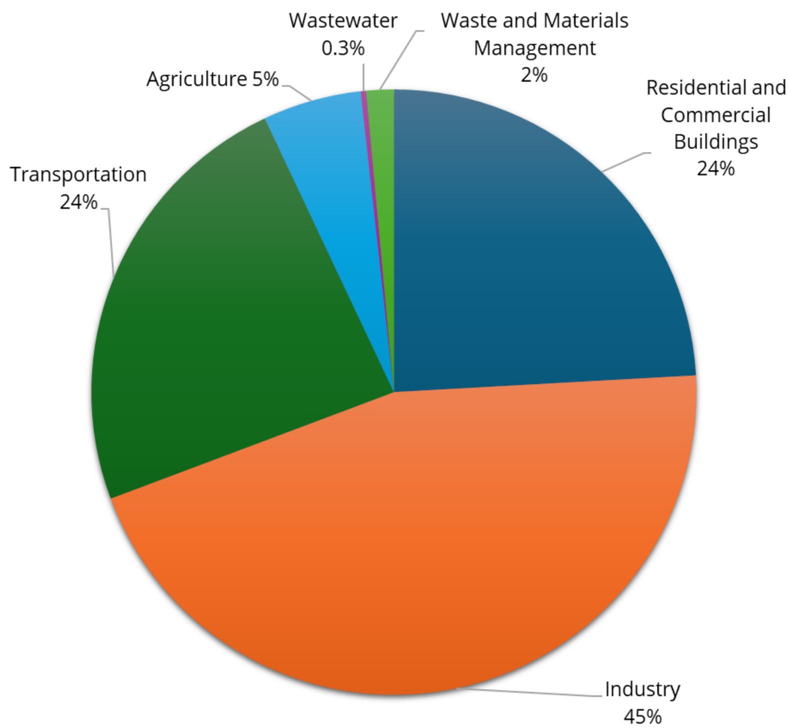
Sectors	Greenhouse Gases
Transportation	Carbon dioxide (CO_2),
Commercial and Residential Buildings	Methane (CH_4)
Industry and Electricity Generation	Nitrous oxide (N_2O)
Agriculture	
Waste and Materials Management	
Wastewater	
Natural and Working Lands	

Based on data availability, the baseline year for this GHG inventory is 2019. In cases where 2019 data was unavailable, data for the closest year was used to calculate GHG emissions. Upon review of data from other years and GHG inventories previously developed for portions of the planning area, 2019 was considered a representative year for overall emissions trends in East Central Iowa for this PCAP.

GHG inventory results are summarized at the regional and county level. This regional PCAP has been prepared with the support of separate EPA grants for the Cedar Rapids MSA and the Iowa City MSA. Due to federal requirements, specific deliverables must be met individually for each grant. In Appendix B and C, detailed GHG inventory methodology, data sources, and results are provided separately for the Cedar Rapids MSA and Iowa City MSA. In addition, the GHG inventories were developed under separate quality assurance plans prepared by ECICOG and approved by the EPA.

Figure 1 provides a breakdown of estimated emissions by sector in East Central Iowa in 2019.

Figure 1. East Central Iowa Estimate of Emissions by Sector*



*Excludes carbon sinks

Regionally, the largest emitting sector in East Central Iowa is industry (45%), which includes electricity generation. The majority of GHG emissions from the industry sector are from power generation at two facilities located in Cedar Rapids. One of the facilities, the Prairie Creek Generating Station, plans to transition from coal to natural gas by 2025.[2]

Transportation and building sectors are the next most significant sources of GHG emissions in the region. The transportation sector includes emissions from on-road and non-road mobile sources, predominantly generated from the combustion of fossil fuels in vehicles. The commercial and residential building sector includes emissions from energy usage in buildings, including electricity, natural gas, and propane (residential buildings only).

The sectors with the least GHG emissions in the region include agriculture (5%), waste and materials management (2%), and wastewater (0.3%). The agriculture sector includes emission from fertilizer usage on crops. The waste and materials management sector includes emissions from landfills in the region. Finally, the wastewater sector includes emissions from municipal wastewater treatment facilities and private septic tanks.

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[2] https://www.thegazette.com/business/alliant-shifting-largest-cedar-rapids-coal-unit-to-burn-natural-gas/

Table 1 details estimated total GHG emissions in metric tons of carbon dioxide equivalents ($MTCO_2e$) for specific GHGs across all sectors in East Central Iowa in 2019.

Table 2. East Central Iowa Estimated GHG Emissions in $MTCO_2e$ by Sector and Gas

Sector/Gas	$MTCO_2e$
Transportation	
CO_2	2,715,813
CH_4	2,507
N_2O	383
Total	**1,718,702**
Commercial and Residential Buildings	
CO_2	2,755,102
CH_4	6,341
N_2O	5,694
Total	**2,767,137**
Industry and Electricity Generation	
CO_2	5,130,361
CH_4	33,742
N_2O	17,956
Total	**5,182,060**
Agriculture	
N_2O	605,046
Total	**605,046**
Waste and Materials Management	
CH_4	168,483
Total	**168,483**
Wastewater	
CH_4	24,221
N_2O	8,050
Total	**32,271**
Natural and Working Lands	
CO_2	-99,424
Total	**-99,424**
All Sectors	
Total	**11,374,275**

The natural and working lands sector yields a negative value due to urban forestry, which acts as a net carbon sink.

Table 3 details estimated total GHG emissions in metric tons of carbon dioxide equivalents ($MTCO_2e$) for specific GHGs across all sectors by county in East Central Iowa in 2019.

Table 3. East Central Iowa Estimated GHG Emissions by Sector and County ($MTCO_2e$) *

Sector	Benton	Iowa	Johnson	Jones	Linn	Washington
Transportation	219,741	242,154	815,340	140,817	1,105,234	195,416
Commercial and Residential Buildings	148,214	120,237	770,495	132,984	1,460,374	134,833
Industry and Electricity Generation	39,012	91,278	153,334	39,220	4,793,193	66,021
Agriculture	131,565	97,068	90,708	97,929	97,463	90,313
Waste and Materials Management	9,375	9,643	18,790	3,340	127,335	0
Wastewater	5,560	3,412	6,598	4,644	8,518	3,539
Natural and Working Lands	-4,705	-1,531	-28,455	-4,879	-55,625	-4,230
Total	548,763	562,262	1,826,810	414,055	7,536,492	485,892

Table 4 provides a breakdown of estimated emissions by sector and county in East Central Iowa in 2019. The table excludes carbon sinks from natural and working lands.

Table 4. East Central Iowa Estimated GHG Emissions by Sector and County

Sector	Benton	Iowa	Johnson	Jones	Linn	Washington
Transportation	40%	43%	44%	34%	15%	40%
Commercial and Residential Buildings	27%	21%	42%	32%	19%	28%
Industry and Electricity Generation	7%	16%	8%	9%	63%	13%
Agriculture	24%	17%	5%	23%	1.3%	18%
Waste and Materials Management	2%	2%	1%	1%	2%	0%
Wastewater	1%	0.6%	0.4%	1%	0.1%	0.7%

The six counties covered by this plan are distinctly varied in terms of land use, population density, and economic activity, among other factors. As a result, some variations in the individual county GHG inventories are worth noting. Aside from Linn County, the transportation and building sectors are the largest emitting sectors in all counties. Benton, Iowa, Jones, and Washington counties are rural, which is reflected in the agriculture sector accounting for a significant share of GHG emissions compared to Linn and Johnson counties. The industry and electricity generation sector is a significant but relatively small share of GHG emissions compared to other sectors in all counties except Linn County. The waste and materials management and wastewater sectors are the smallest emitting sectors at 1% or lower in all counties.

Priority GHG Reduction Measures

The GHG reduction measures in this section have been identified as priority measures for the purpose of pursuing funding through the CPRG Implementation Grants General Competition. This list is not exhaustive of East Central Iowa's priorities. Instead, the selected priority measures included in this PCAP meet the following criteria:

- The measure is implementation-ready, meaning the design work for the policy, program, or project is complete enough that a full scope of work and budget can be included in a CPRG Implementation Grants General Competition application, which is due April 1, 2024.
- The measure can be completed in the near-term, meaning the project will be completed and all funds expended within the five-year performance period for the CPRG Implementation Grants General Competition.
- The measure is supported by existing climate action, sustainability, comprehensive, or other plans and programs in the region.

A final consideration for a GHG reduction measure to be included in this PCAP is whether substantial funding opportunities are currently available to implement the measure. Table 5 summarizes East Central Iowa PCAP priority measures.

Table 5. East Central Iowa PCAP Priority Measures

Priority Measure	Cumulative GHG Emission Reductions ($MTCO_2e$)		Implementing Agency or Agencies	Geographic Scope	Appendix
	2025–2030	2025–2050			
Residential Building Energy Efficiency Improvement	11,279	86,472	Local housing authorities, housing trust funds, public health departments, and community-based organizations	East Central Iowa region	D
Public Building Energy Efficiency Improvement	1,406	10,779	Council of Governments, counties, cities	East Central Iowa region	E
Multi-Family Housing Electric Vehicle Charger Installation	778	7,854	Regional Planning Affiliation, Council of Governments, Metropolitan Planning Organizations	East Central Iowa region	F

Priority Measure	Cumulative GHG Emission Reductions ($MTCO_2e$)		Implementing Agency or Agencies	Geographic Scope	Appendix
	2025–2030	2025–2050			
Wastewater Methane Capture Improvement	35,573	408,533	City of Cedar Rapids and City of Iowa City	Cedar Rapids and Iowa City wastewater area	G

Additional GHG reduction measures were proposed by local governments and organizations in the region, but the measures did not meet the criteria for inclusion in this PCAP. For more information, refer to Appendix H.

This section includes a summary of each priority measure including the estimated GHG emissions reductions, existing plans that support the priority measure, and the authority to implement. In addition, an appendix for each priority measure provides additional details about the following information:

- Estimate of cumulative GHG emission reductions for 2025 – 2030 and 2025 - 2050
- Implementation schedule and milestones;
- Geographic scope;
- Metrics for tracking progress;
- Cost estimates for implementation;
- Co-benefits, if available; and
- Methods and assumptions for calculating reductions.

In East Central Iowa, priority measures are focused in three sectors: commercial and residential buildings, transportation, and wastewater. The industry and electricity generation sector is the largest GHG emitting sector in the region. Additional time is necessary to build relationships with industrial entities to identify GHG reduction measures. Although opportunities to collaborate with investor-owned utilities in the region are limited, they are pursuing funding opportunities under the Inflation Reduction Act independent of this plan.

Cities, counties, and governmental organizations in East Central, which are eligible entities to apply to the CPRG Implementation Grants General Competition, have an established role in the transportation and buildings sectors. Regionally, the transportation and buildings sectors are the second largest emitting sectors. In all counties, except Linn County, the transportation and buildings sectors are the highest emitting sectors.

Although the wastewater sector is a small portion of GHG emissions in the region, wastewater facility improvements can yield a large GHG emissions reduction. Cedar Rapids and Iowa City operate the largest wastewater treatment facilities in the region, and both cities have implementation ready projects to reduce methane emissions at their wastewater treatment facilities.

Residential Building Energy Efficiency Improvement

In the building sector, this PCAP prioritizes the development of residential building energy efficiency improvement programs for existing housing focused on low-income and disadvantaged areas, low- to moderate-income areas, and low- to moderate-income residents.

The estimated GHG emissions reduction from a regional residential building energy efficiency program is 11,279 $MTCO_2e$ from 2025 – 2030 and 86,472 $MTCO_2e$ from 2025 – 2050. See Appendix D for the methods and assumptions used to calculate the GHG emissions reduction estimate.

Access to safe, healthy, and affordable housing for residents is a priority in East Central Iowa. Energy efficiency improvements for housing not only reduce greenhouse gas emissions but also reduce energy consumption and costs impacting the affordability of housing. Energy efficiency improvements could be made in all types of housing throughout the region. A residential energy efficiency program could leverage existing housing assistance programs and expand access to federal and state programs that incentivize energy efficiency improvements through tax credits and rebates.

Existing plans in the region that identify actions to address housing, energy efficiency, and/or specifically residential building energy efficiency include:

- Cedar Rapids Community Climate Action Plan Action 2 for reducing carbon emissions proposes the development of a program to support energy efficiency and appliance electrification that prioritizes vulnerable neighborhoods.
- Iowa City Climate Action and Adaptation Plan Buildings Action 1.1 specifically references energy efficiency in housing.
- Johnson County 2018 Comprehensive Plan original Volume 1 Sustainability Goal 3 supports affordable and equitable access to quality housing and Goal 4 is to supports energy efficiency, resource conservation, and renewable energy programs, policies, and uses.
- Johnson County Community Health Improvement Plan 2023-2028 identifies housing as one of four top priorities.
- Linn County Comprehensive Plan Alternative and Renewable Energy Objective 3.1 references barriers to the use of energy efficiency strategies for residential buildings.

This list of plans is not exhaustive. Comprehensive and other plans prepared for communities and organizations throughout the region include goals and actions to improve and diversify housing stock and increase the completion of energy efficiency improvements.

Local government housing authorities, housing trust funds, council of governments, and community-based organizations have established housing assistance programs that provide different types of assistance to maintain safe, healthy, and affordable housing. These entities have the expertise and authority to develop and implement a residential energy efficiency program for East Central Iowa.

Public Building Energy Efficiency Improvement

In the building sector, this PCAP also prioritizes the development of programs for public building energy efficiency improvements in East Central Iowa.

The estimated GHG emissions reduction from a regional public building energy efficiency program is 1,406 $MTCO_2e$ from 2025 – 2030 and 10,779 $MTCO_2e$ from 2025 – 2050. See Appendix E for the methods and assumptions used to calculate the GHG emissions reduction estimate.

Local governments must balance the cost of maintaining basic operations and services with the cost of investing in upgrades and new technologies. Energy efficiency improvements decrease energy usage and operational costs in the near- and long-term, but upfront costs are often prohibitive for city and county budgets. Local governments in Iowa are currently adjusting to House File 718, which limits tax levy growth. Many cities and counties have smaller than anticipated budgets, and fast-growing communities must try to provide services to additional residents with limited budget growth. Overall, local government budget constraints make the cost of energy efficiency improvements even more of a challenge.

Existing plans in the region that identify actions to address public building energy efficiency include:

- Iowa City Climate Action and Adaptation Plan Buildings Action 1.7 specifically references energy efficiency in public buildings.
- Johnson County 2018 Comprehensive Plan original Volume 1 includes Sustainability Goal #6 that specifically references reducing energy use in operations and facilities.
- Cedar Rapids Community Climate Action Plan includes a goal of reducing greenhouse gas emissions 45% by 2030.
- The Linn County Internal Sustainability Plan includes actions to address energy efficiency in public buildings.

This list of plans is not exhaustive. Comprehensive, strategic, capital improvement, or other plans prepared for communities and organizations throughout the region include goals and actions related to energy efficiency improvements in buildings.

Regional planning organizations such as councils of governments have the expertise, relationships, and authority to apply for funds to develop and administer programs that provide assistance to local governments.

Multi-Family Housing Electric Vehicle Charger Installation

In the transportation sector, this PCAP prioritizes the development of a program to fund the installation of electric vehicle chargers for residents at multi-family housing units.

The estimated GHG emissions reduction from a regional multi-family housing electric vehicle charger installation program is 778 $MTCO_2e$ from 2025 – 2030 and 7,854 $MTCO_2e$ from 2025 – 2050.

See Appendix F for the methods and assumptions used to calculate the GHG emissions reduction estimate.

Multi-family housing, such as apartment or condominium buildings, typically do not have charging options for electric vehicles. As more than 80% of charging occurs at home, limited charging options in multi-family housing units is a significant barrier for residents to switch to an electric vehicle.[3] Owners, managers, and homeowner associations may be deterred by the upfront costs and logistics required to install and maintain electric vehicle chargers.

Existing plans in the region that identify actions to address electric vehicle charging include:

- Cedar Rapids Community Climate Action Plan Action 11 for increasing the transportation sector's share of low-emission energy includes developing readiness for electric vehicle infrastructure.
- Iowa City Climate Action Plan and Adaptation Plan Transportation Action 2.2 supports the expansion of electric vehicle charging infrastructure.
- Eastern Iowa Electric Vehicle Readiness Plan promotes equitable access to electric vehicle charging and specifically identifies multi-family housing.

Regional planning organizations, such as councils of governments, metropolitan planning organizations, and local governments have the expertise and authority to apply for funds to develop, administer, and implement programs for transportation and housing.

[3] https://atlaspolicy.com/wp-content/uploads/2021/01/EV-Charging-at-Multi-Family-Dwellings.pdf

Wastewater Methane Capture Improvements

Photo: City of Iowa City

In the wastewater sector, this PCAP prioritizes wastewater treatment facility improvements that increase methane capture. The largest cities in the region, Cedar Rapids and Iowa City, operate large wastewater treatment facilities. Both cities have implementation ready wastewater facility improvements to increase methane capture at their wastewater facilities.

The estimated GHG emissions reduction in Cedar Rapids is 24,573 $MTCO_2e$ from 2025-2030 and 323,533 $MTCO_2e$ from 2025-2050, and the estimated GHG emissions reduction in Iowa City is 11,000 $MTCO_2e$ from 2025-2030 and 85,000 $MTCO_2e$ from 2025-2050. See Appendix G for the methods and assumptions used to calculate the GHG emissions reduction estimate.

Cedar Rapids and Iowa City plan to integrate biodigester systems into their wastewater treatment facility to capture, clean, and inject methane into the natural gas grid as renewable natural gas. The proposed improvements will reduce GHG emissions by capturing extra methane from biogas production. In addition, industrial waste will be transported to the wastewater treatment plant in Cedar Rapids to increase biogas production, which will provide an additional opportunity to produce renewable natural gas and reduce waste sent to the landfill and associated methane gas generation.

Photo: City of Cedar Rapids

Existing plans in the region that identify actions to address wastewater GHG emissions include:

- Iowa Climate Action and Adaptation Plan Waste Action 3.7 specifically references methane emissions from wastewater operations.
- Cedar Rapids Community Climate Action Plan includes a goal of reducing greenhouse gas emissions 45% by 2030.

Both cities have the expertise and authority to implement improvements to their wastewater treatment facility.

Low-Income and Disadvantaged Communities Analysis

All East Central Iowa residents will be impacted by climate change, but due to social, economic, and geographic factors, certain communities and groups of people in the region will face disproportionate risks. The goal of this PCAP is to give eligible entities in East Central Iowa the opportunity to pursue funding through the CPRG Implementation Grants General Competition for greenhouse gas reduction measures that benefit low-income and disadvantaged communities (LIDACs) in the region.

For this PCAP, low-income and disadvantaged communities (LIDAC) are defined by the EPA using the Environmental Justice Screening and Mapping Tool (EJScreen), and additional low-income areas are defined using the low- and moderate-income (LMI) criteria for the Community Development Block Grant Program administered by the US Department of Housing and Urban Development (HUD).

Climate Change Impacts

Since 1961, the frequency, duration, and average temperature of extreme heat events has steadily increased each decade in the United States.[4] In Iowa, the average temperature has increased more than 1ºF since 1900.[5] Of all natural hazards, extreme heat is the deadliest causing approximately 1,220 deaths every year in the United States.[6] Across the United States, low-income and minority groups have a higher risk of mortality due to extreme heat. As climate change occurs, heat-related illnesses and deaths will increase in the United States. In the Midwest, mortality rates due to extreme cold are projected to decrease, but the reduction would be offset by the increase in mortality rates due to extreme heat.[7]

Although development in East Central Iowa is largely rural, the region includes areas of dense urban development in the metropolitan areas. An urban heat mapping study was completed in Cedar Rapids and Iowa City, and both cities have areas that experience the urban heat island effect. On average, the temperature in densely developed areas can be 8.5ºF higher than other areas in the city. In the study, areas with the highest temperatures are not just dense commercial or industrial areas but also areas with single- and multi-family housing, organizations serving vulnerable populations, schools, college and university campuses, and

[4] https://www.epa.gov/climate-indicators/climate-change-indicators-heat-waves
[5] https://statesummaries.ncics.org/chapter/ia/
[6] CDC Natural Disasters and Severe Weather - Extreme Heat
[7] www.epa.gov/cira/social-vulnerability-report

public transit routes.[8] People who live, work, and travel in areas with higher average temperatures may be at greater risk for heat-related illness or death.

In addition to health impacts, extreme heat could have a financial impact on weather-exposed workers. Weather-exposed industries include agriculture, forestry, fishing and hunting, mining, construction, manufacturing, transportation, and utilities. Laborers in weather-exposed industries often earn a lower income. As a result, workers may choose to work in extreme heat despite the risk to their health to avoid losing income for basic needs. On the other hand, workers may also experience pressure from their employer to work in extreme heat to avoid loss in productivity. In the Midwest, weather-exposed workers are projected to lose an average of eleven labor hours each year with a 2ºC global temperature increase and thirty labor hours each year with a 4ºC global temperature increase.[3]

Since 1901, precipitation has increased an average of .20 inches per decade in the United States.[9] The frequency and intensity of precipitation is projected to increase in Iowa primarily in the winter and spring. Despite more precipitation, the intensity of droughts is projected to increase in Iowa. Higher temperatures increase evaporation, so naturally occurring droughts will be more severe. [10]

More frequent and intense precipitation events will increase the risk for flash and riverine flooding events that could be more severe than past flood events.[11] Many East Central Iowa communities have a history of flood disasters. Flooding affects health and safety, property, infrastructure, and natural resources.[7] In the Midwest, people with no high school diploma, minorities, and low-income individuals are more likely to currently live in areas currently projected to have the most severe flood damage with a 2ºC global temperature increase.

In general, climate change is projected to negatively impact respiratory diseases including asthma and allergies.[12] In the Midwest, asthma rates are projected to decrease due to the increase in precipitation outdoor air quality.[7] However, higher temperatures increase airborne allergens and the severity of wildfires in other regions, which results in smoke and particle pollution spreading all the way to Iowa.[13] In 2023, wildfires in Canada resulted in several days where public health agencies recommended limiting outdoor activities due to poor air quality. Both outdoor and indoor air quality will be impacted by climate change, and low-income and disadvantaged communities and residents have less resources to avoid or mitigate the negatives impacts.

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[8] https://www.cedar-rapids.org/local_government/sustainability/SpotTheHot.php
[9] https://www.epa.gov/climate-indicators/climate-change-indicators-us-and-global-precipitation
[10] https://statesummaries.ncics.org/chapter/ia/
[11] https://www.iowadnr.gov/Conservation/Climate-Change
[12] https://hhs.iowa.gov/public-health/data/environment/climate/health
[13] https://www.epa.gov/indoor-air-quality-iaq/indoor-air-quality-and-climate-change

Identification of LIDACs

For this PCAP, low-income and disadvantaged communities (LIDAC) are defined by the EPA using the Environmental Justice Screening and Mapping Tool (EJScreen), and additional low-income areas are defined using the low- and moderate-income (LMI) criteria for the Community Development Block Grant Program (CDBG) administered by the US Department of Housing and Urban Development (HUD).

To be designated a LIDAC, a census block group must meet the following criteria in EJScreen:

- Located in a census tract that is included as disadvantaged in the Climate & Economic Justice Screening Tool,
- Any census block group at or above the 90th percentile for any of EJScreen's Supplemental Indexes when compared to the nation or state, and/or
- Any geographic area within Tribal lands.

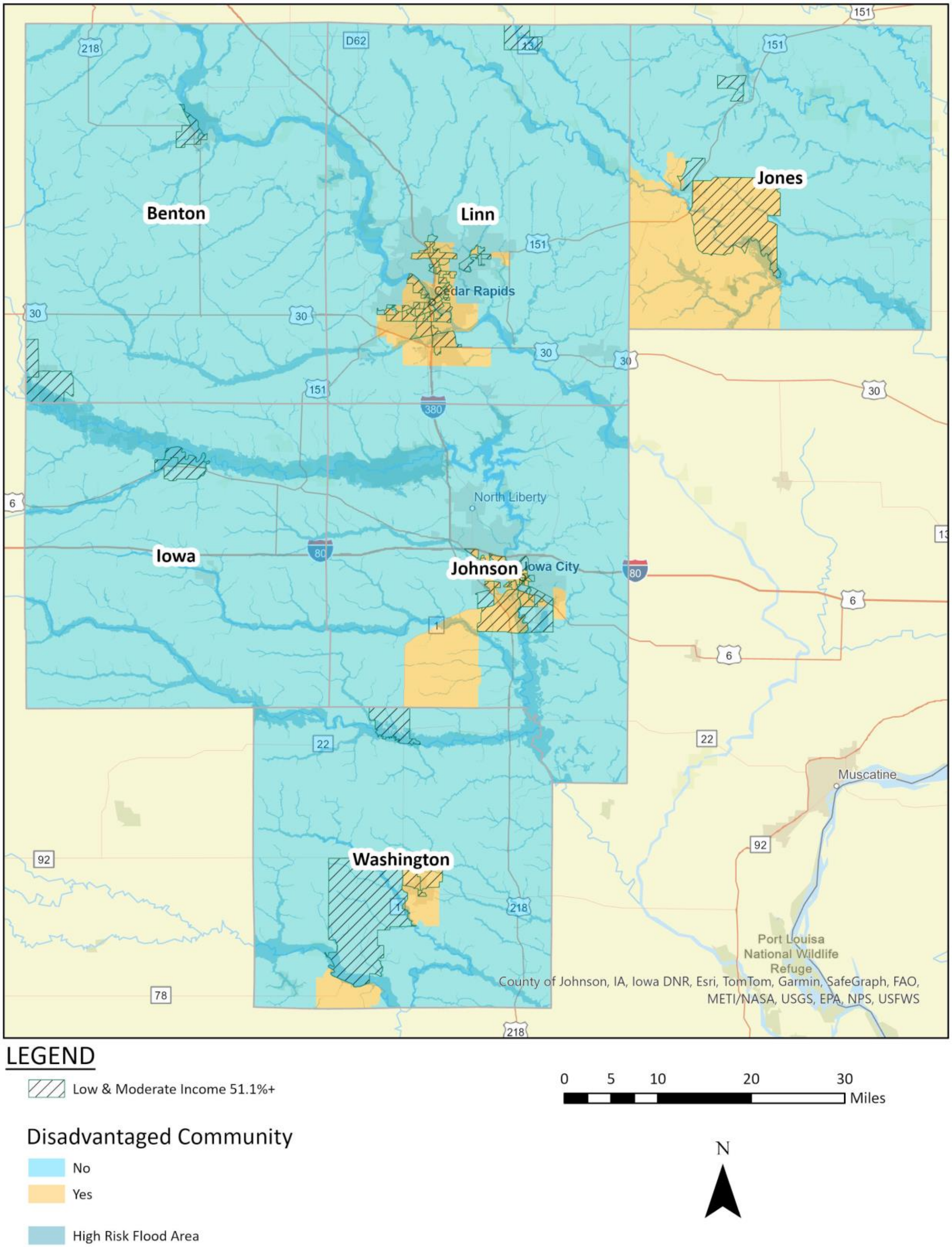
To be designated as disadvantaged in the Climate & Economic Justice Screening Tool, a census tract must meet the threshold for at least one of the tool's categories of burden or be within Tribal lands. Categories of burden include:

- Climate change,
- Energy,
- Health,
- Housing,
- Legacy pollution,
- Transportation,
- Water and wastewater, and
- Workforce development.

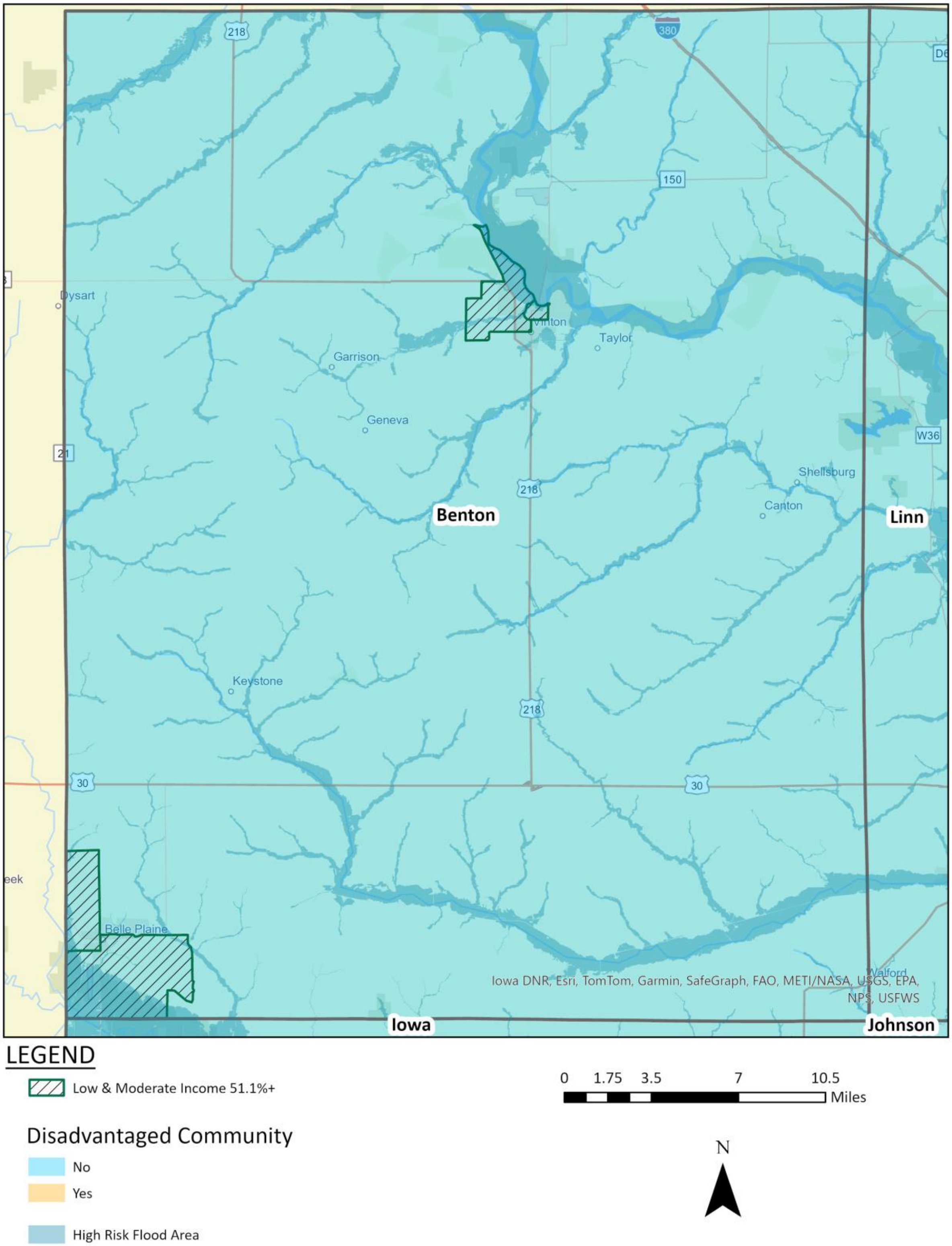
Using criteria for CDBG, LMI census blocks have at least 51 percent of residents who are considered a low- and moderate-income person based on data from the American Community Survey (ACS) or a local income survey. Widely available ACS data was used in this LIDAC analysis, so additional census blocks in the region may be designated LMI with a local income survey. These areas should also be considered when identifying communities to focus projects for the CPRG Implementation Grants General Competition.

This section includes maps of the LIDAC and LMI areas in East Central Iowa. A list of the specific census block groups that are identified as LIDAC and/or LMI is included in Appendix I. Since riverine flooding is a geographically specific hazard projected to increase as climate change occurs, the maps for LIDAC and LMI census blocks in East Central Iowa are displayed with flood risk for reference.

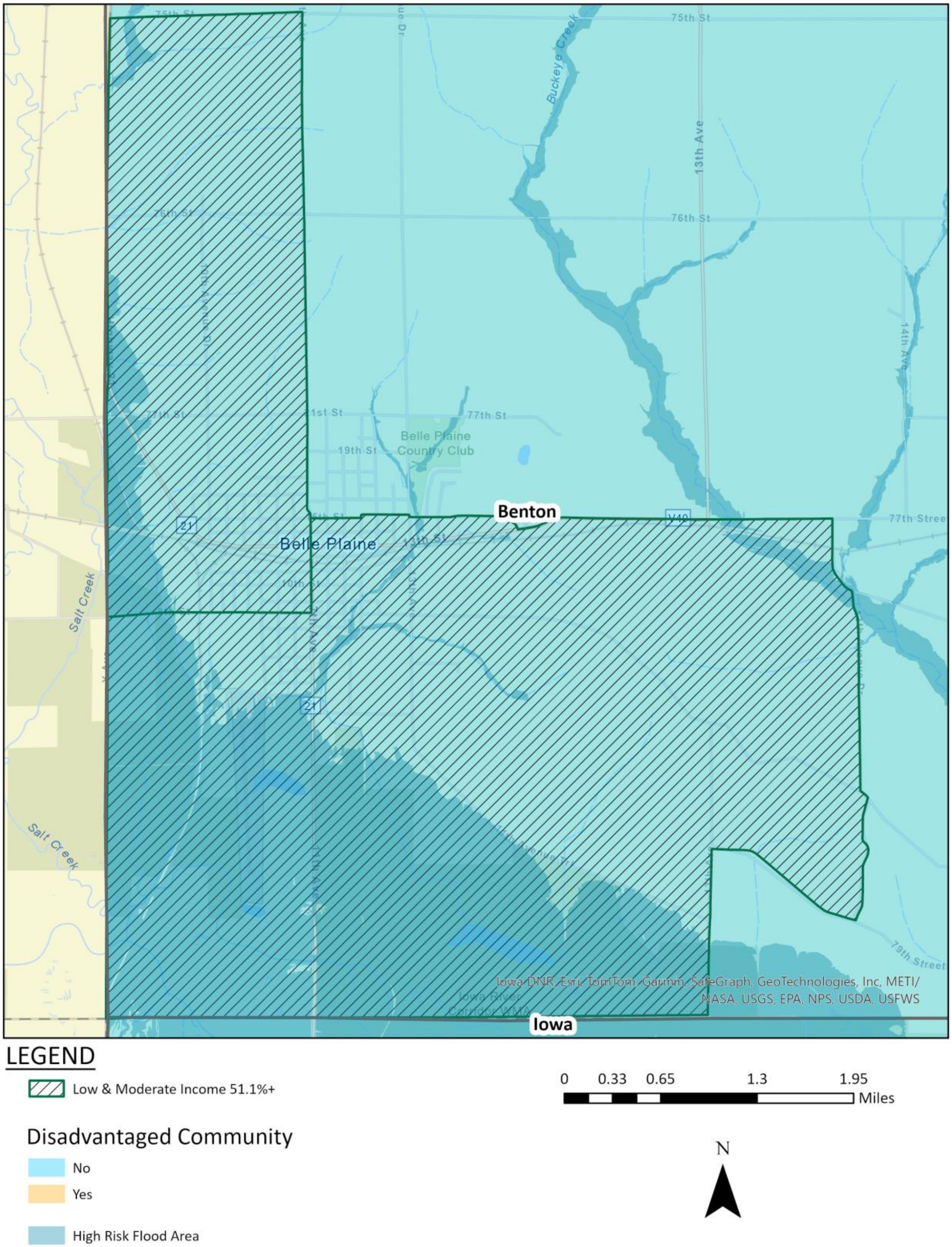
Map 1. East Central Iowa LIDAC and LMI Areas



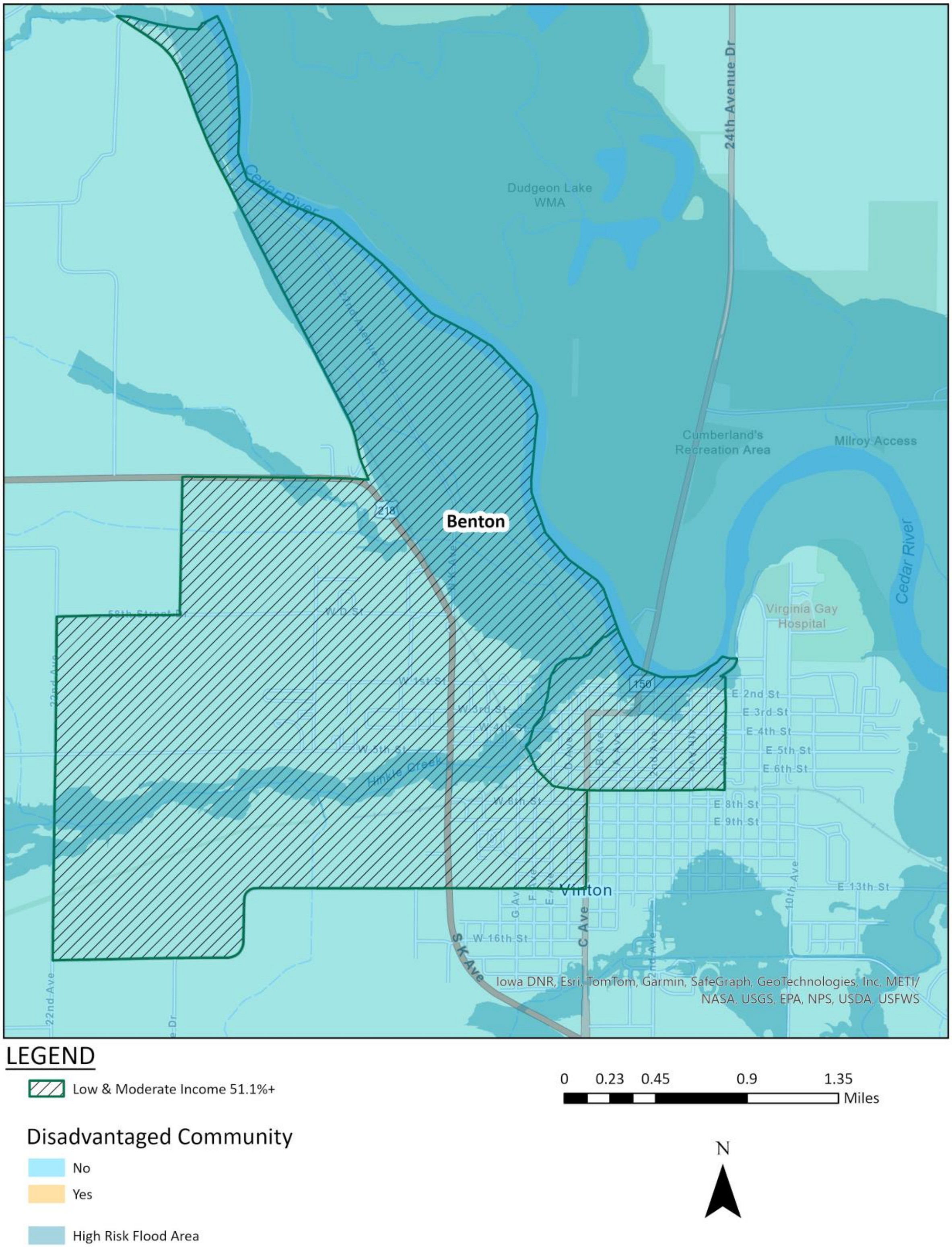
Map 2. Benton County LIDAC and LMI Areas



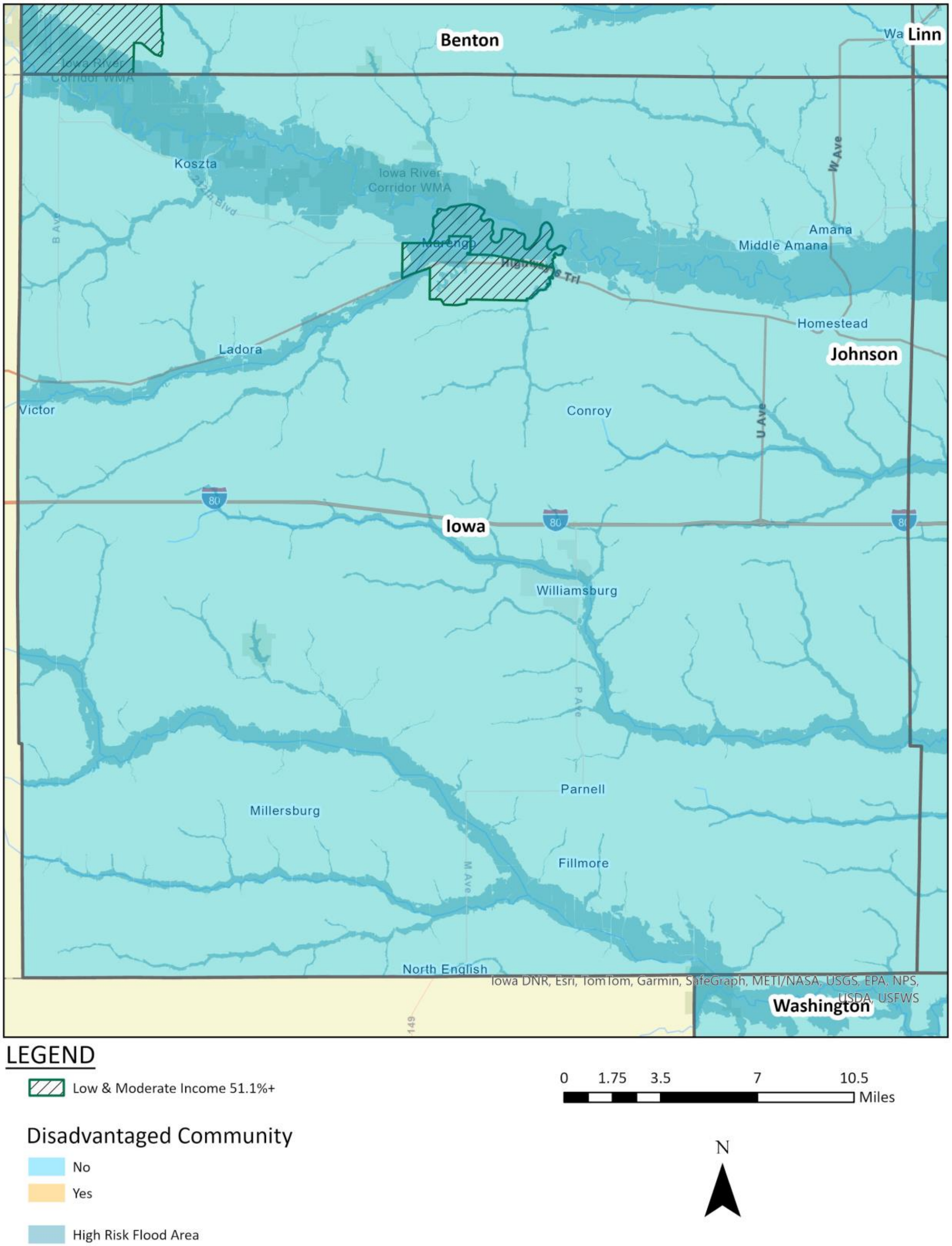
Map 3. Belle Plaine LIDAC and LMI Areas



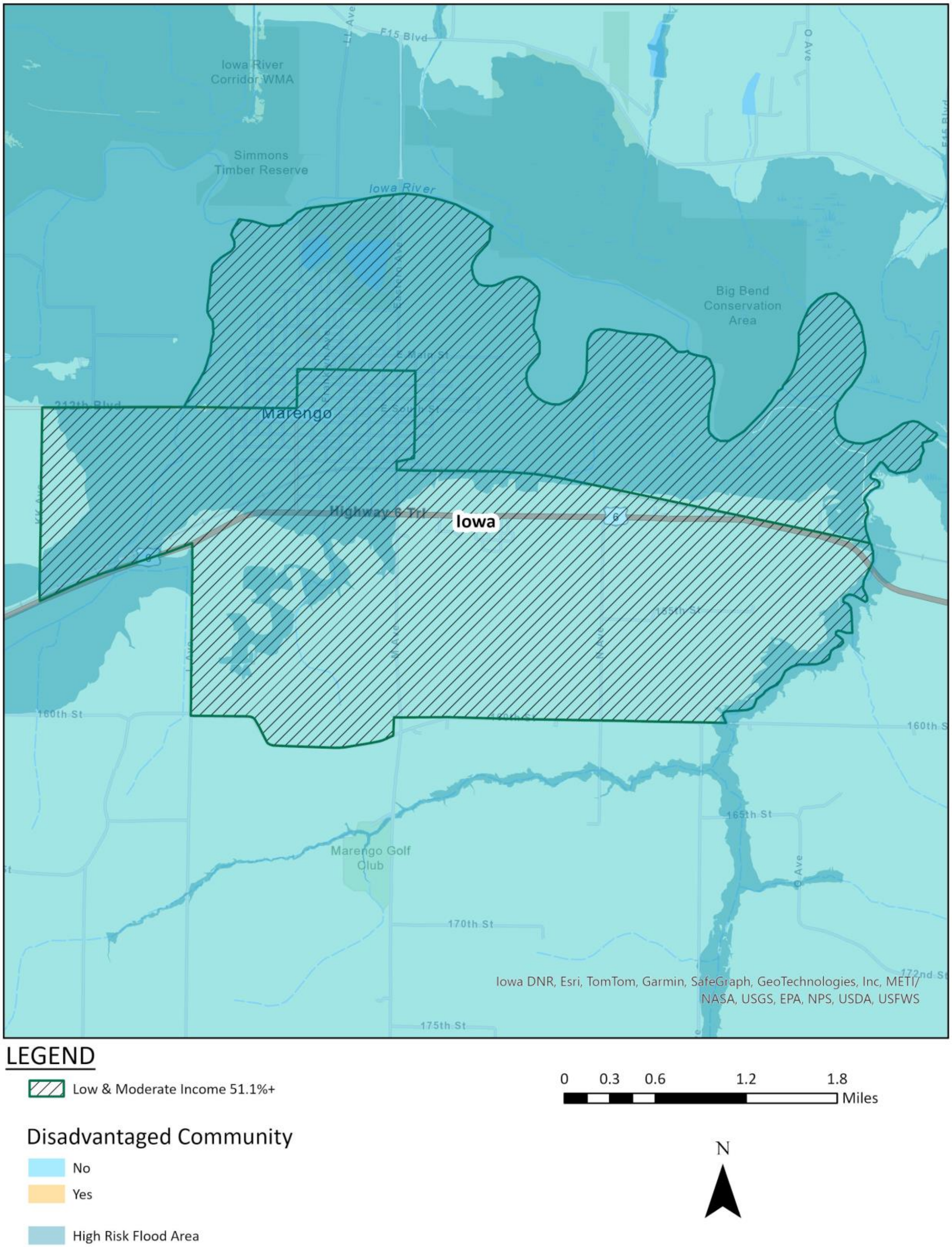
Map 4. Vinton LIDAC and LMI Areas



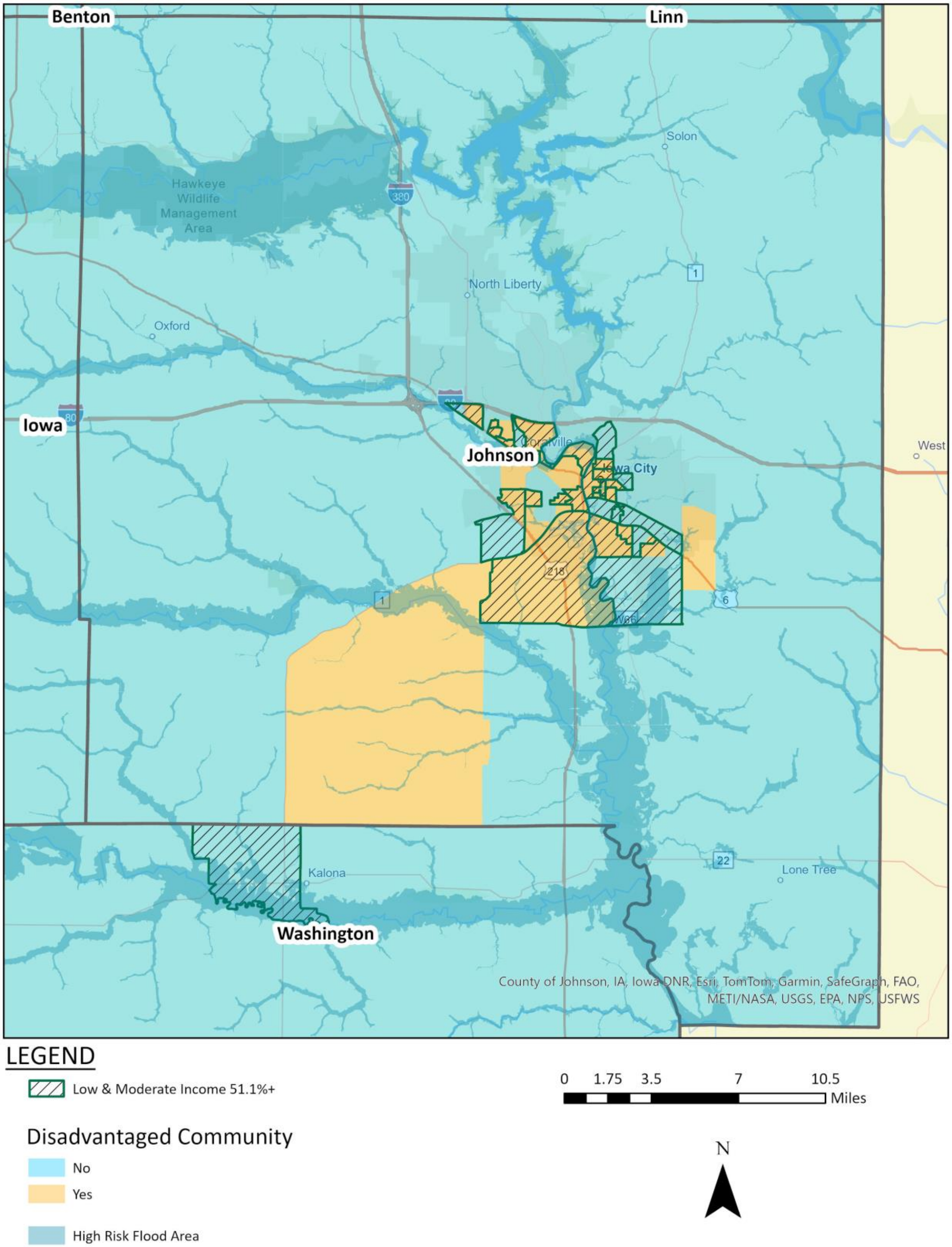
Map 5. Iowa County LIDAC and LMI Areas



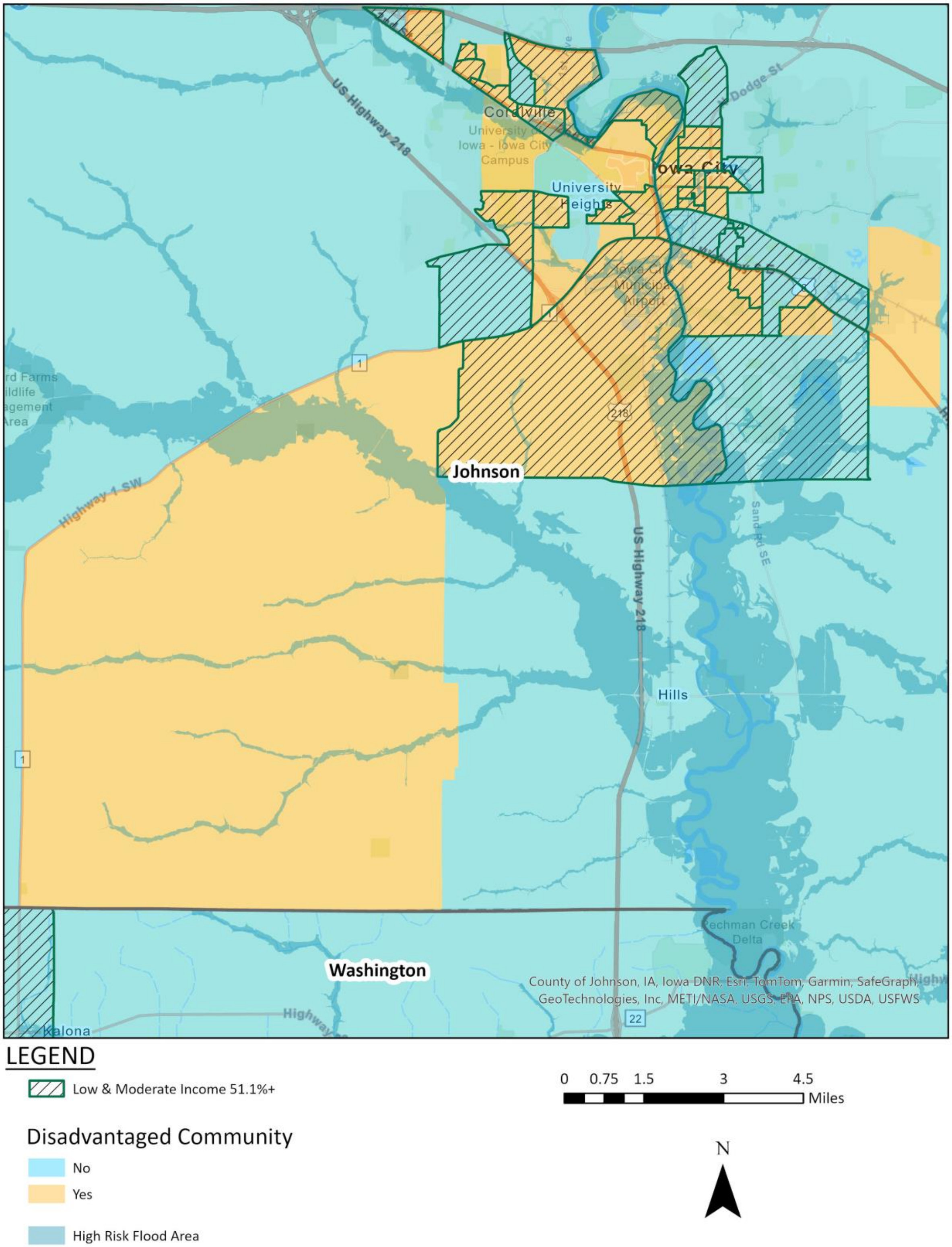
Map 6. Marengo LIDAC and LMI Areas



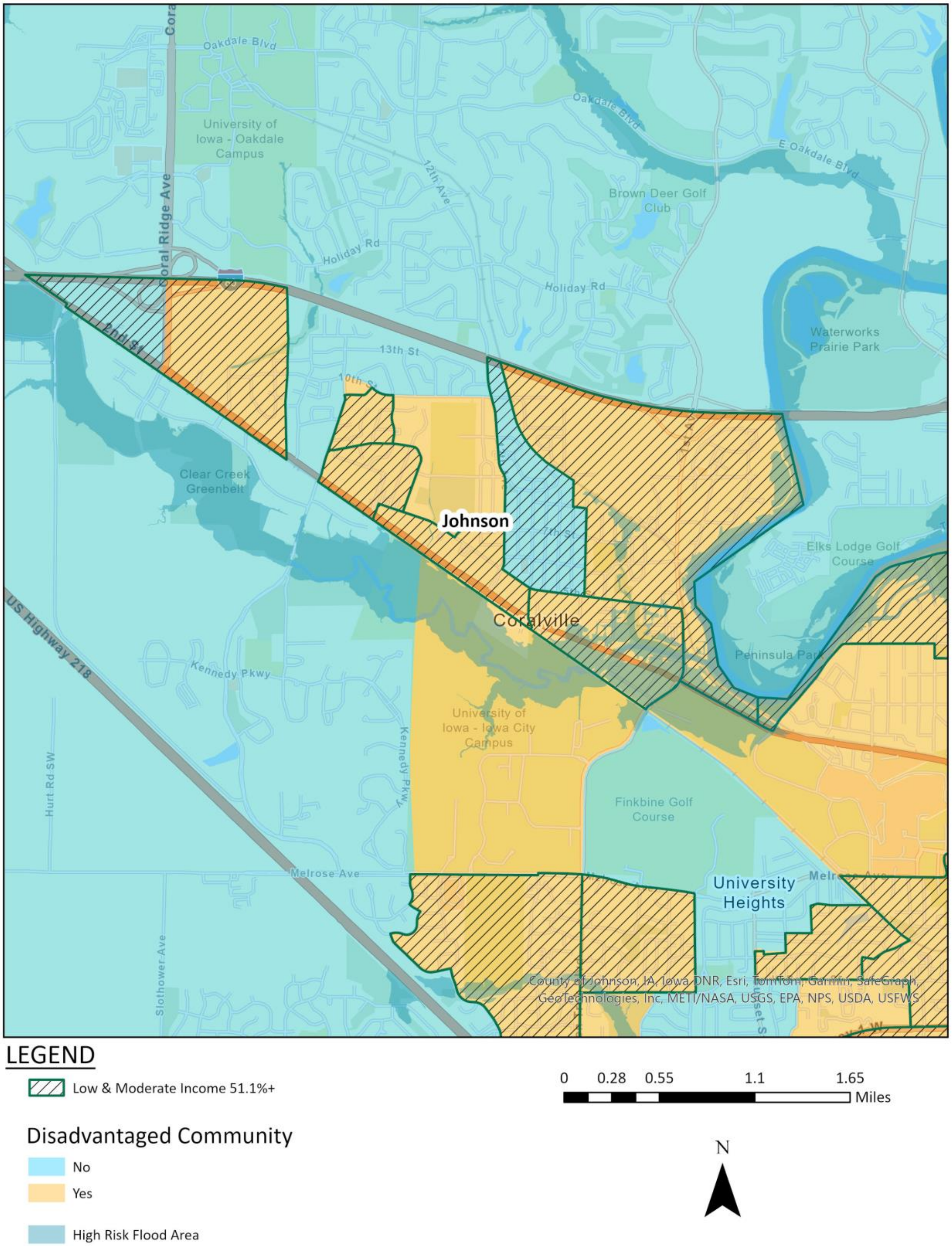
Map 7. Johnson County LIDAC and LMI Areas



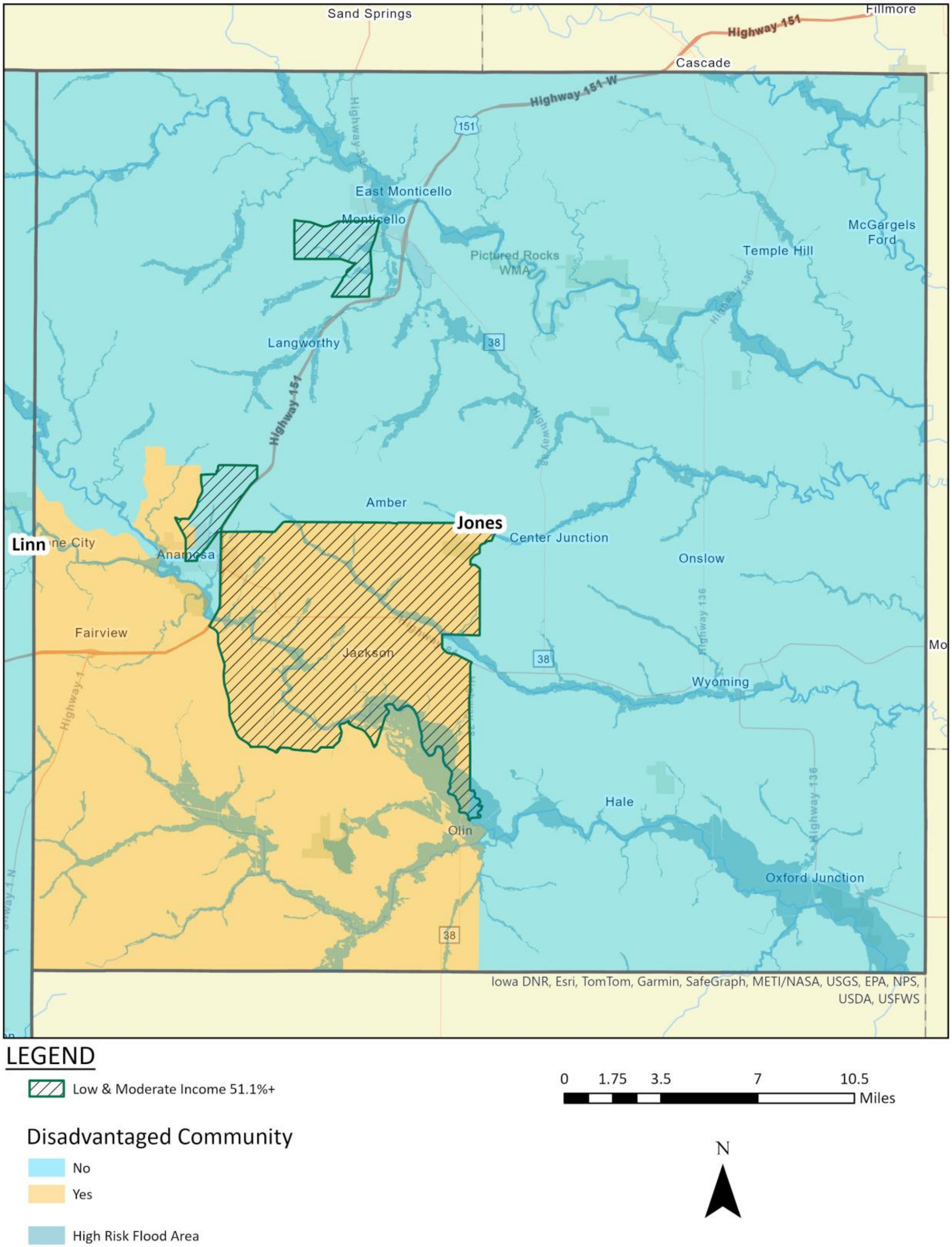
Map 8. Iowa City Area and Johnson County LIDAC and LMI Areas



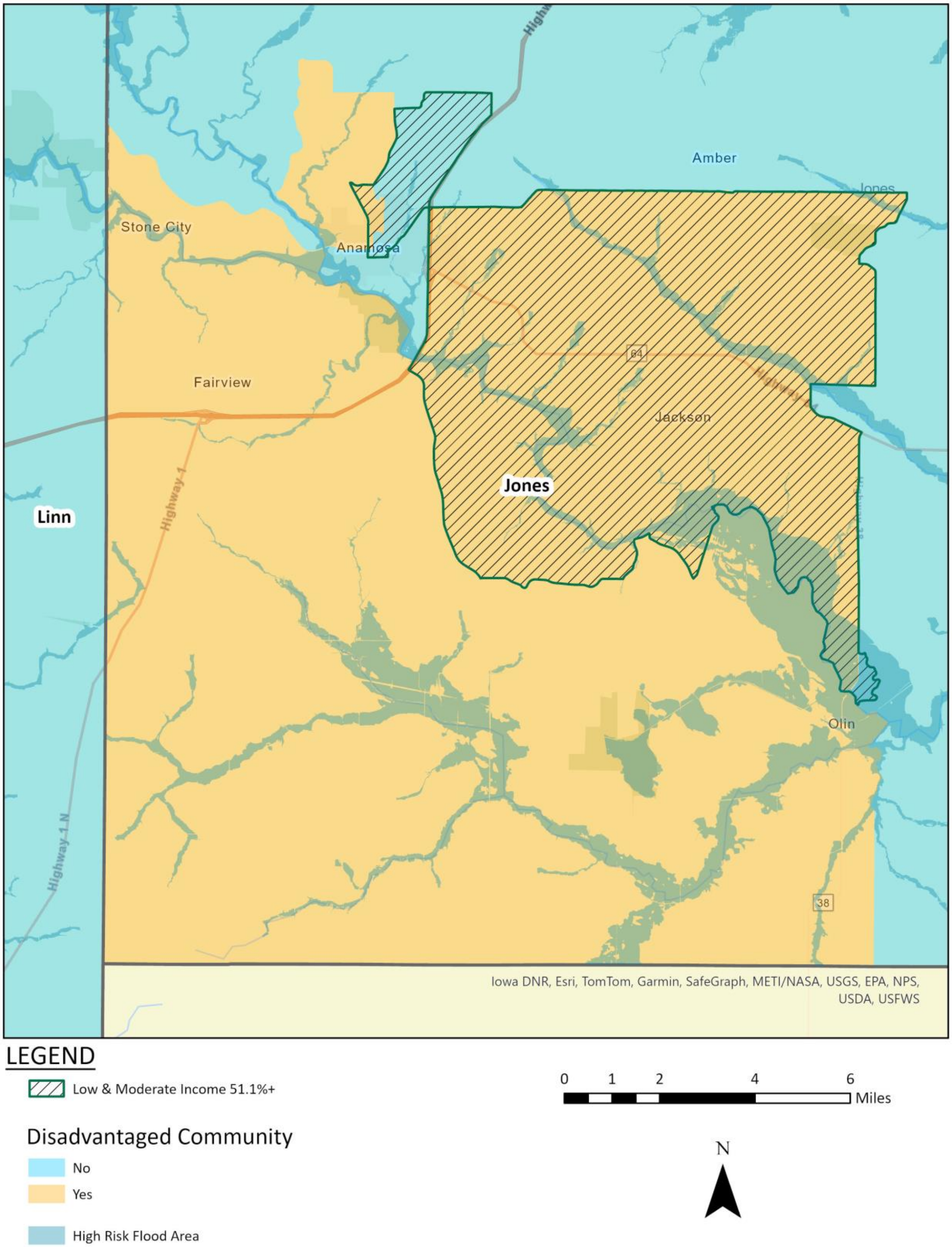
Map 9. Coralville LIDAC and LMI Areas



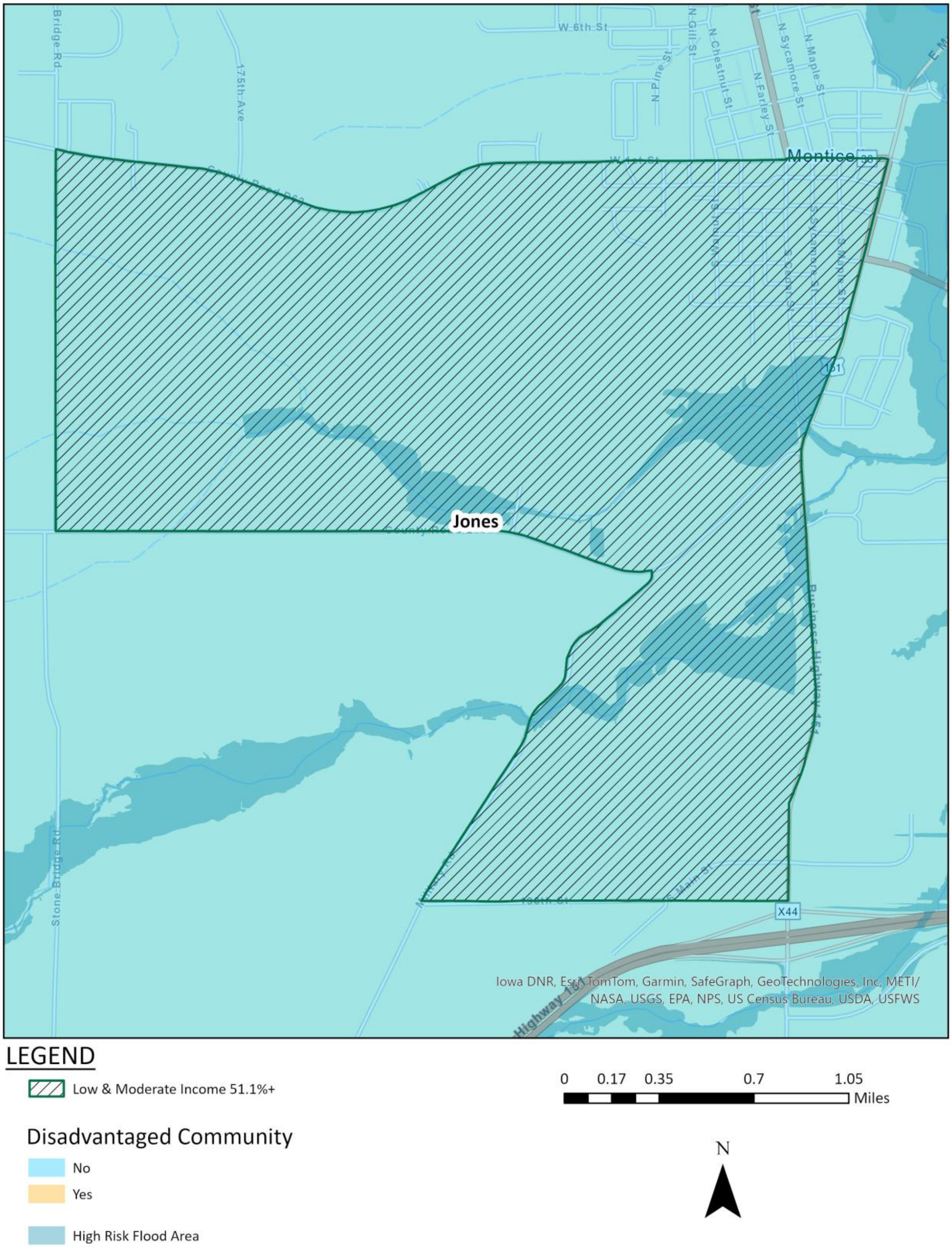
Map 10. Jones County LIDAC and LMI Areas



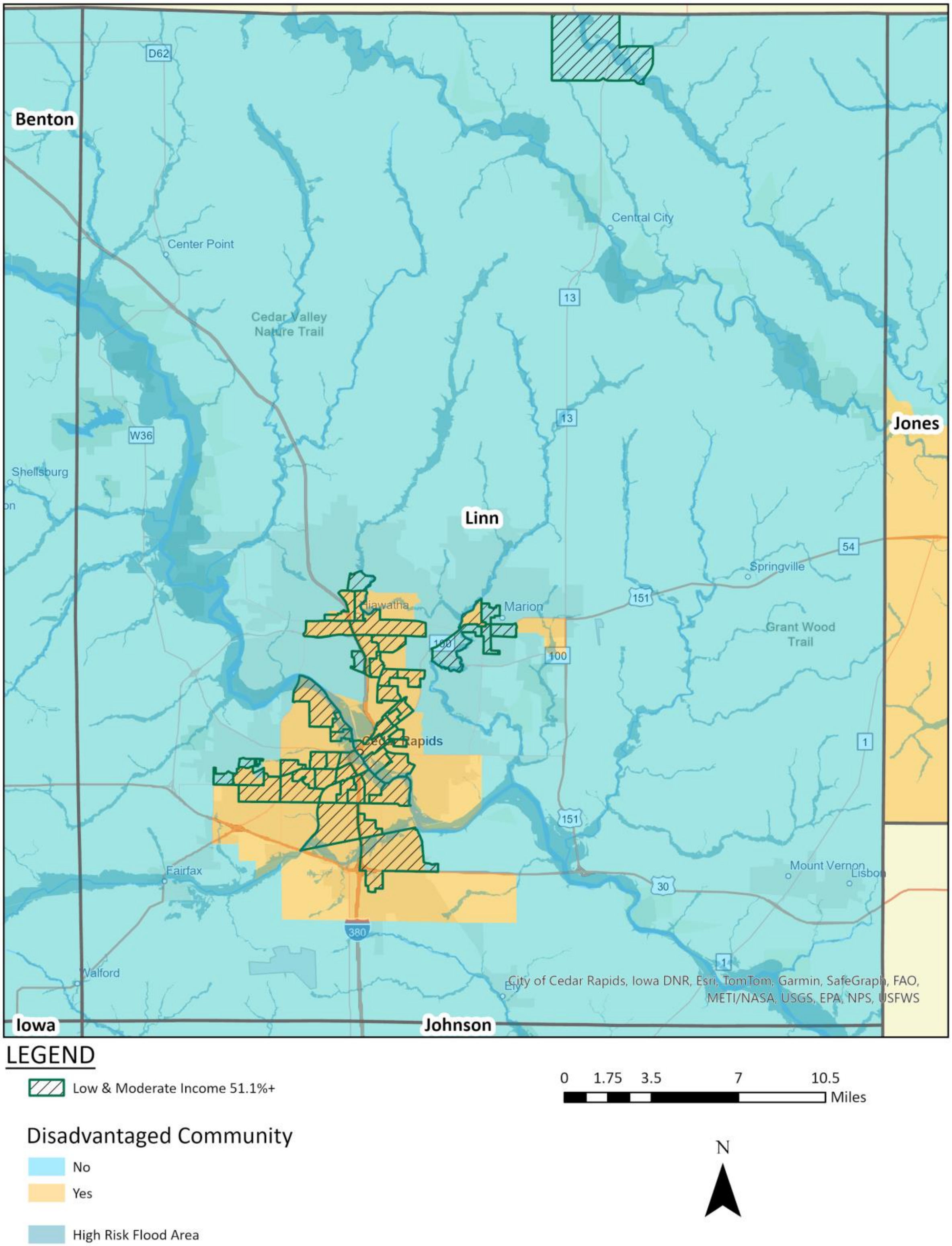
Map 11. Anamosa Area LIDAC and LMI Areas



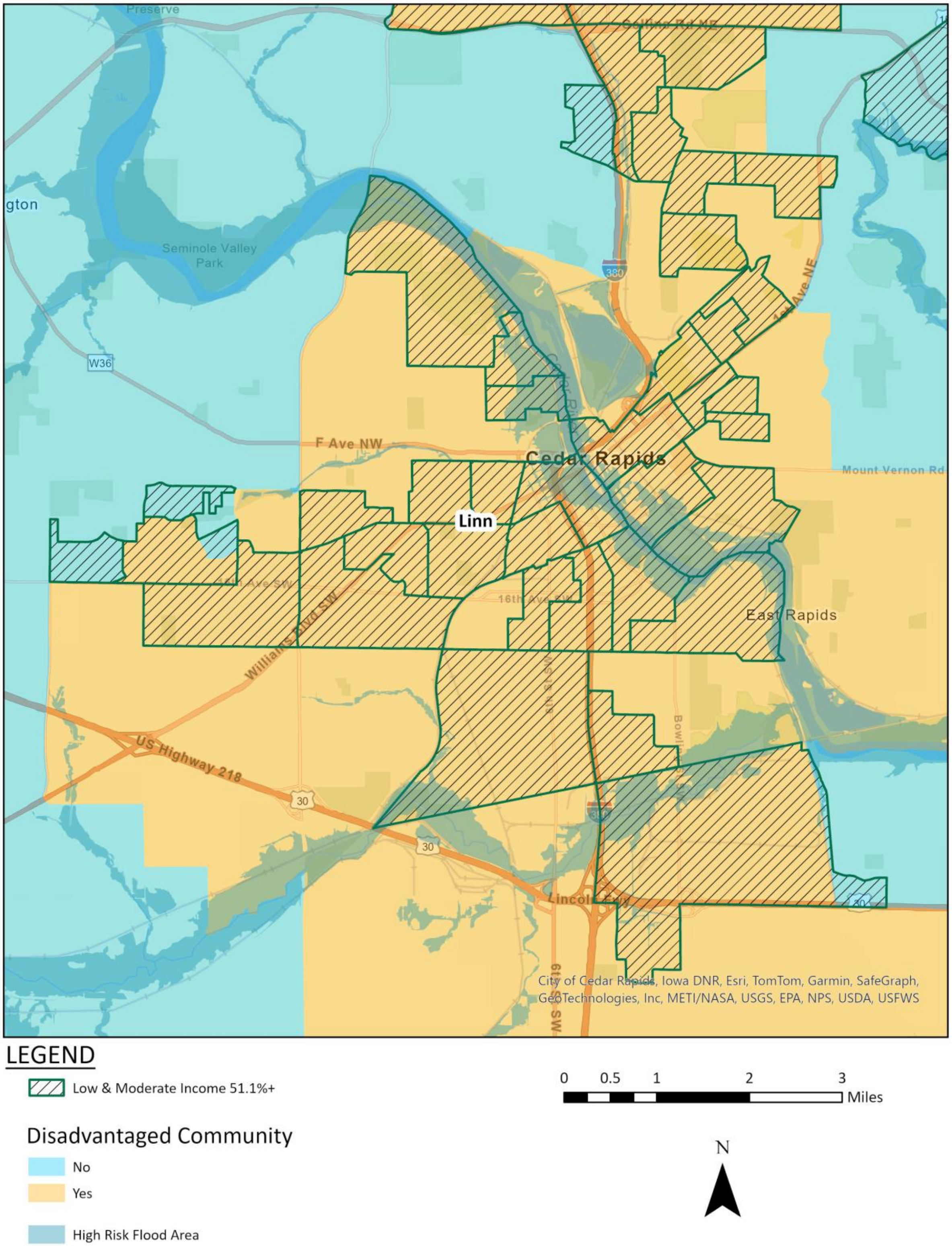
Map 12. Monticello Area LIDAC and LMI Areas



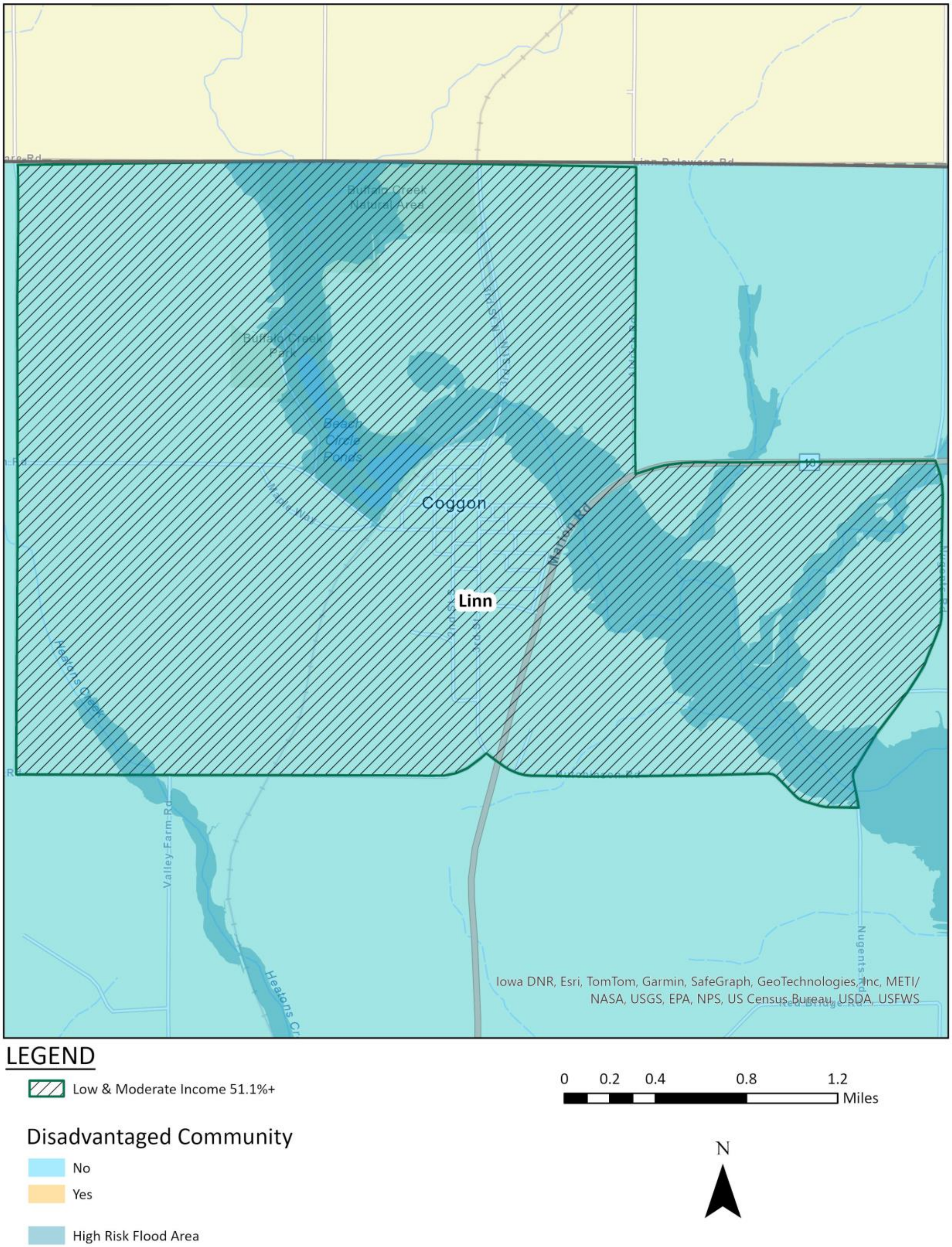
Map 13. Linn County LIDAC and LMI Areas



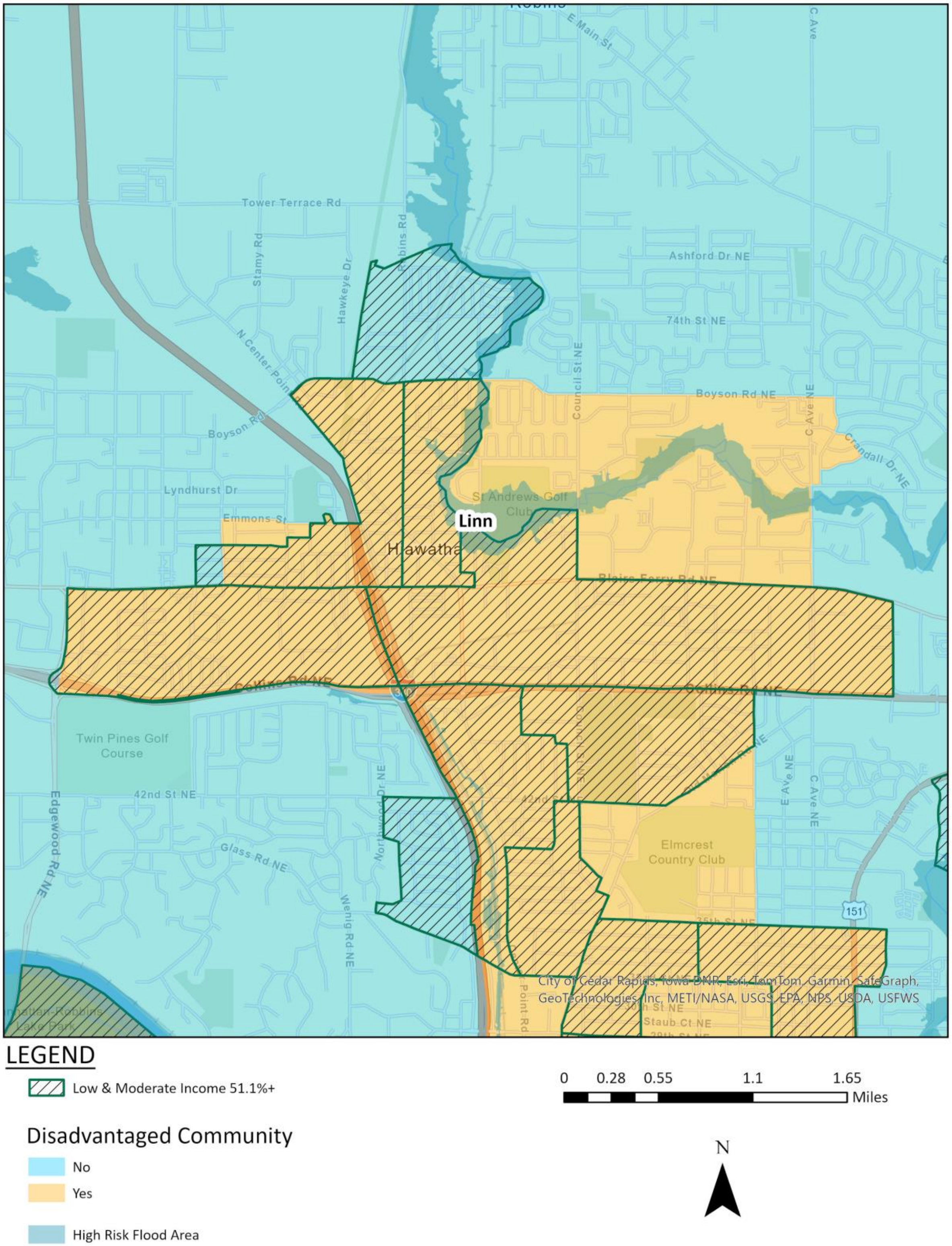
Map 14. Cedar Rapids LIDAC and LMI Areas



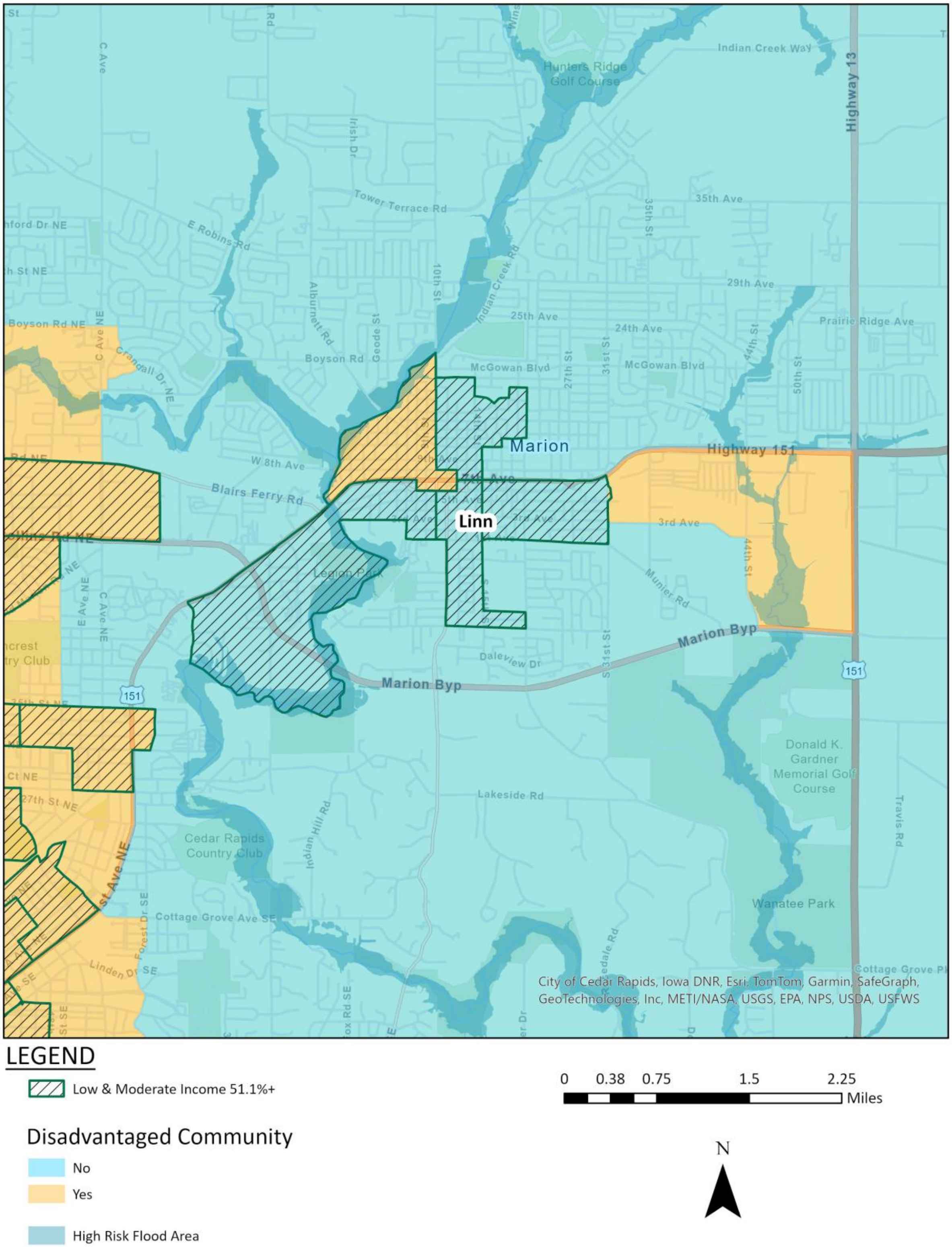
Map 15. Coggon LIDAC and LMI Areas



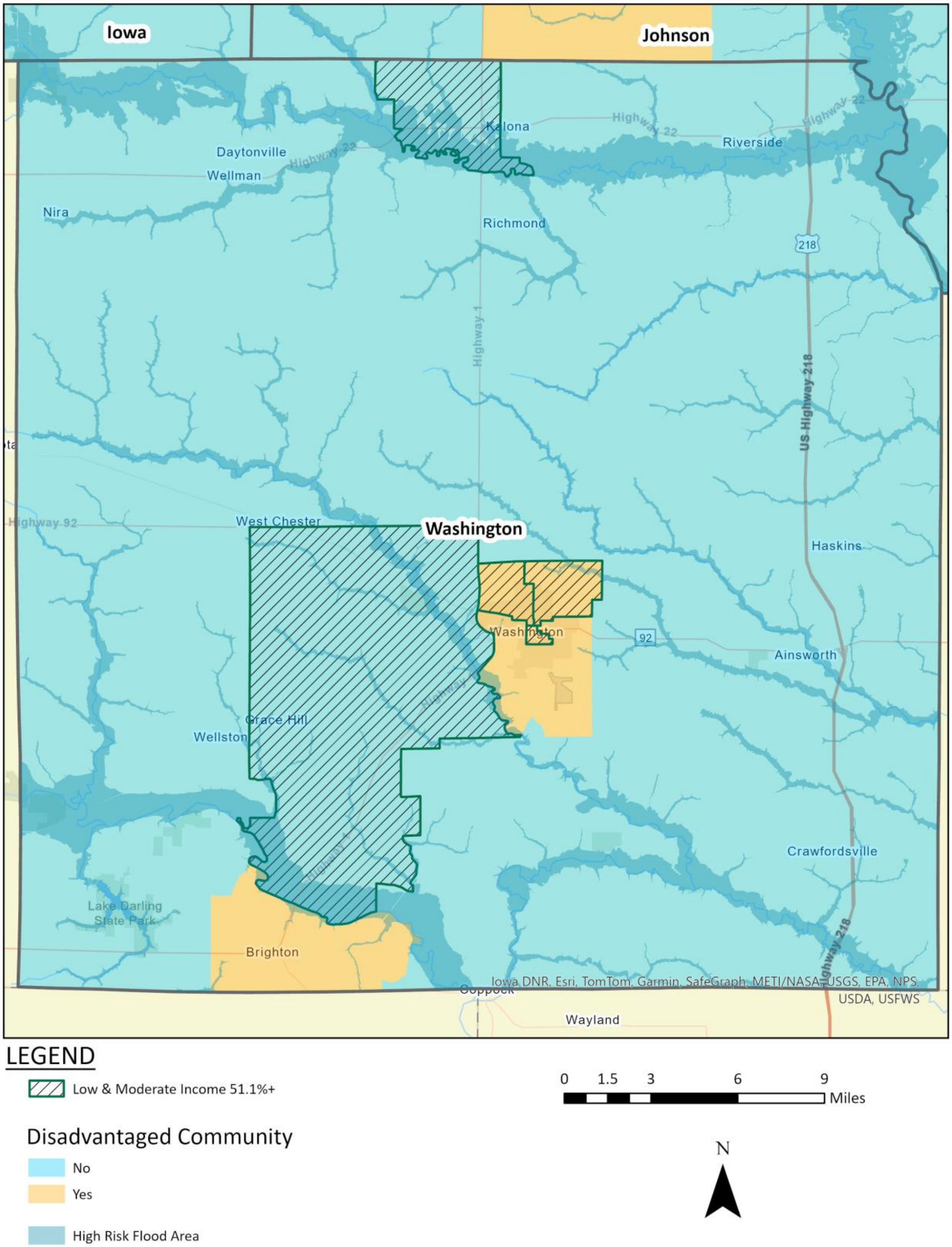
Map 16. Hiawatha LIDAC and LMI Areas



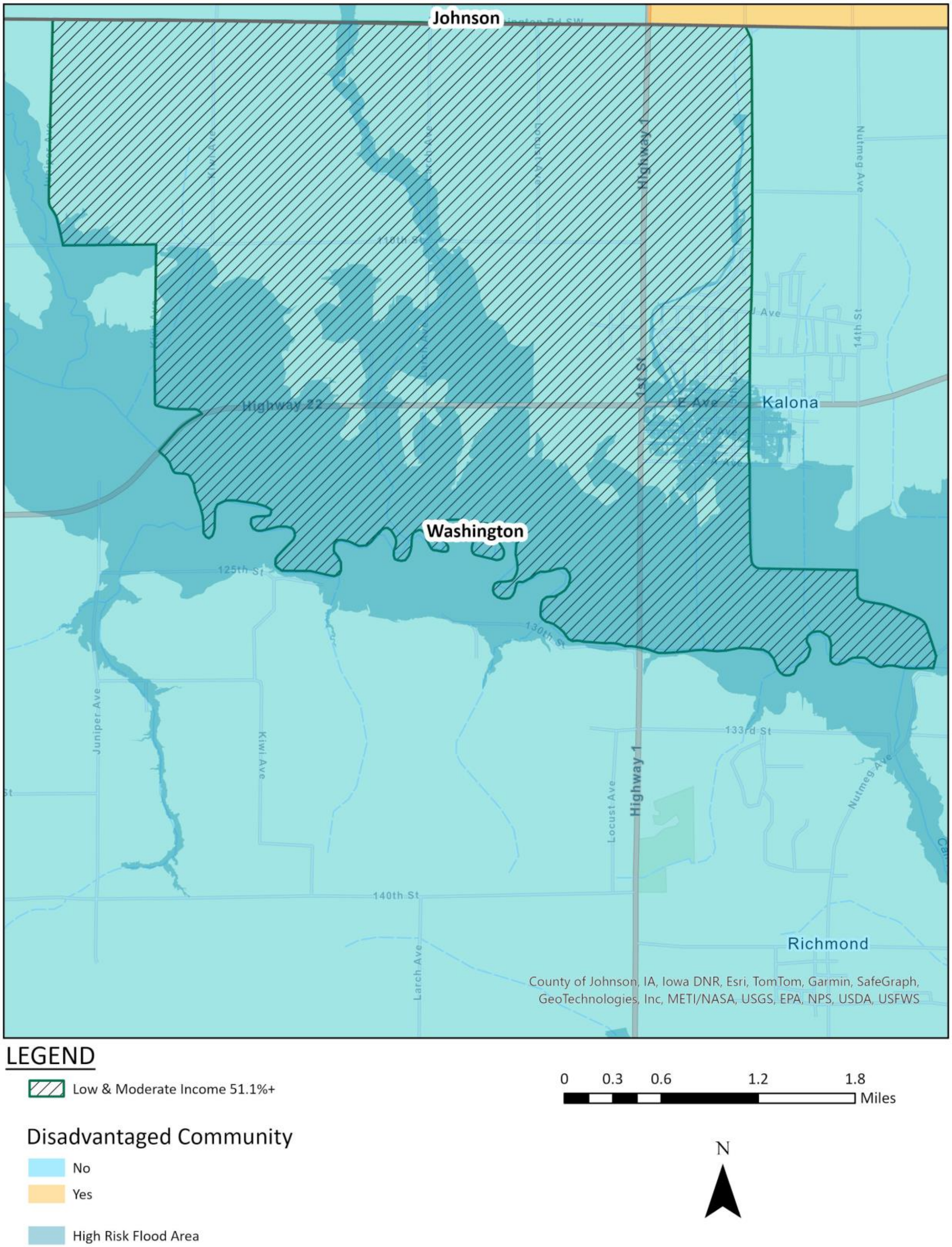
Map 17. Marion LIDAC and LMI Areas



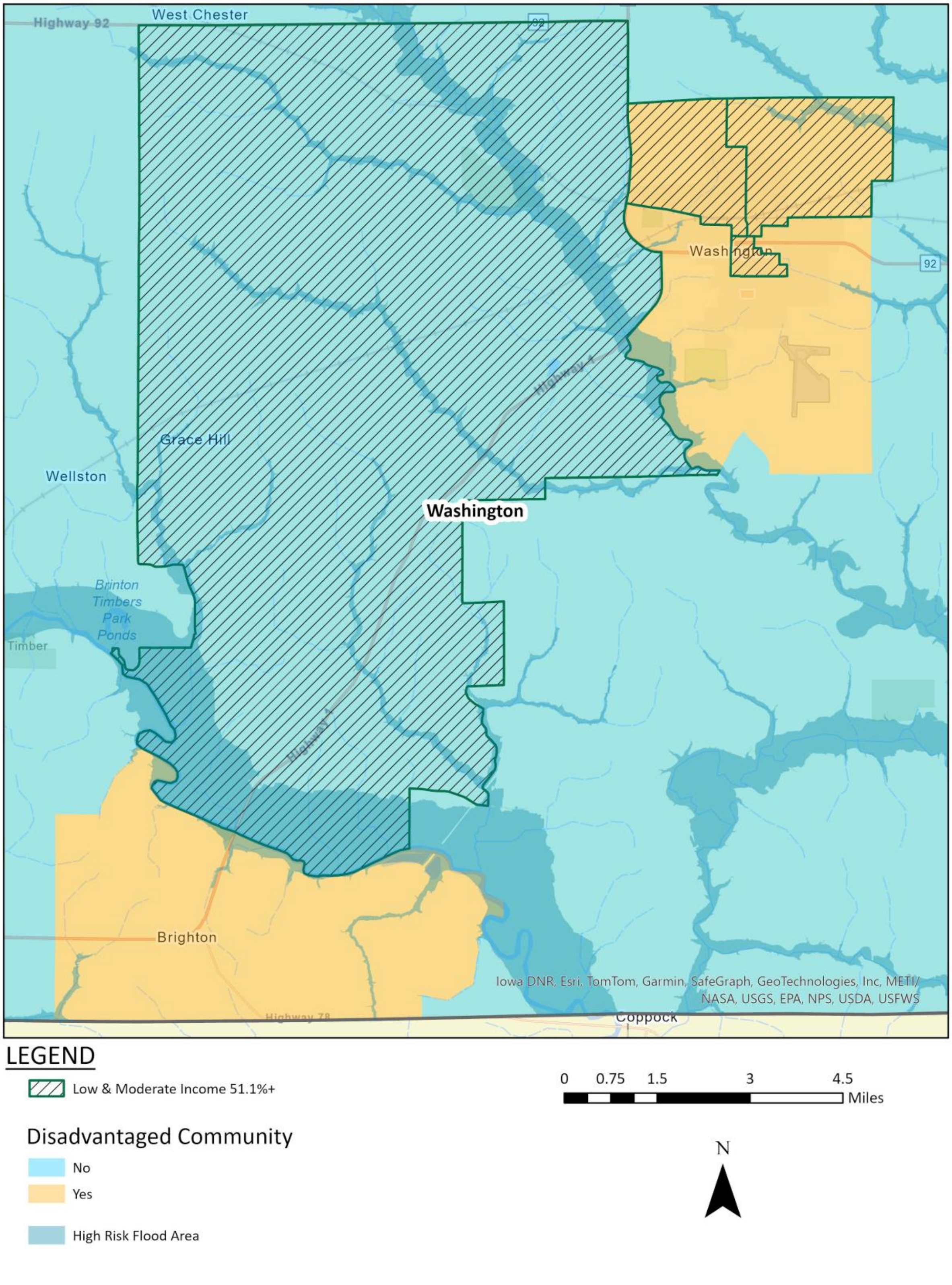
Map 18. Washington County LIDAC and LMI Areas



Map 19. Kalona Area LIDAC and LMI Areas



Map 20. Washington Area LIDAC and LMI Areas



Impact of Priority Measure Implementation on LIDACs

Table 6 lists the LIDACs anticipated to be affected by implementing each priority measure included in this PCAP. Refer to Appendix I for specific census blocks groups.

Table 6. LIDACS Affected by Priority Measures

Priority Measure	Affected LIDAC Census Block Groups
Residential Building Energy Efficiency Improvements	All identified in the region
Public Building Energy Efficiency Improvements	All identified in the region
Multi-family Electric Vehicle Charger Installation	All identified in the region
Wastewater Treatment Facility Improvements	All identified in Cedar Rapids and Iowa City

Table 7 lists the anticipated benefits associated with the implementation of priority measures in this PCAP. No disbenefits have been identified for priority measures.

Table 7. Anticipated Benefits to LIDACS Affected by Priority Measures

Priority Measure	Direct Benefits	Indirect Benefits
Residential Building Energy Efficiency Improvement	Decreased energy costs Improved indoor air quality Improved housing quality, comfort, and safety, particularly during extreme temperature events.	Supports local jobs in residential building energy efficiency Reduces strain on the electrical grid particularly during extreme temperature events
Public Building Energy Efficiency Improvement	No direct benefits to LIDACs are identified for this priority measure.	Decreased local government operational costs. Supports local jobs in commercial and public building energy efficiency. Reduces strain on the electrical grid, particularly during extreme temperature events
Multi-Family Electric Vehicle Charger Installation	Increased access to electric vehicles for residents in multi-family housing Improved air quality Reduced noise pollution	Supports local jobs in electric vehicle infrastructure installation and maintenance
Wastewater Methane Capture Improvement	Maintain affordability of local utility rates	Improved air quality Supports local energy security Decreased local government operational costs

Next Steps

This PCAP is the first major deliverable under the CPRG planning grants awarded to ECICOG for regional climate action planning in East Central Iowa. This plan can be used by eligible entities to apply to EPA's CPRG Implementation General Competition to implement the priority GHG reduction measures included in this plan.

In 2025, ECICOG will publish a comprehensive climate action plan (CCAP) that establishes GHG reduction targets and strategies that reduce GHG emissions across all sectors. The CCAP will include the following:

- GHG inventory,
- GHG emissions projections,
- GHG reduction targets
- GHG reduction measures
- Benefits analysis for the region,
- Low-income and disadvantaged communities benefit analysis,
- Review of authority to implement GHG reduction measures,
- Funding availability, and
- Workforce planning analysis.

During the CCAP development process, ECICOG will conduct public outreach and engagement with stakeholders in low-income and disadvantaged communities, community-based organizations, local governments, and GHG emitting sectors in East Central Iowa. To design an equitable outreach and engagement strategy for the CCAP, ECICOG is partnering with the Social Impact Community at the University of Iowa (UI) through a subaward to develop an equitable engagement toolkit.

To complete outreach and engagement, ECICOG will provide a subaward to the City of Cedar Rapids, City of Iowa City, Linn County, and Johnson County. In partnership with ECICOG, sustainability and climate action staff will use the equitable engagement toolkit to conduct outreach and engagement in their city or county. Outreach and engagement for other cities and counties in the region will be completed by ECICOG. Regional outreach and engagement will be coordinated with the CPRG Technical Advisory Committee and relevant stakeholders.

After the CCAP is complete, ECICOG will focus on providing technical assistance within the region to implement GHG reduction measures. In 2027, ECICOG will publish a status report that details implementation progress for measures included in the PCAP and CCAP.

Appendix A – Coordination and Outreach

This appendix includes a list of the stakeholders identified for PCAP coordination and outreach. Table 8 includes the contact information used to distribute information to each city and county in the region.

Table 8. Local Government Contacts

City/County	Contact	Position	Email
Atkins	Amber Bell	City Clerk	cityclerk@cityofatkins.org
Belle Plaine	Steve Beck	City Administrator	steve.beck@belleplaineiowa.gov
Blairstown	Brian McNulty	City Clerk	bcity@netins.net
Garrison	Angela Dague	City Clerk	gtownclerk@outlook.com
Keystone	Angie Hagen	City Clerk	keyclerk@netins.net
Luzerne	Janice Kendall	City Clerk	jkendall@netins.net
Mount Auburn	Craig Mahood	City Clerk	mtamc@lpctel.net
Newhall	Keri Touro	City Clerk	newhall@southslope.net
Norway	Wendy Erger	City Clerk	norwaych@southslope.net
Shellsburg	Barb Tracey	City Clerk	cityofshellsburg@shellsburg.com
Urbana	Jennifer Burkhart	City Administrator	jburkhart@urbanaiowa.com
Van Horne	Linda Klopping	City Clerk	vhclerk@netins.net
Vinton	Chris Ward	City Administrator	cward@vintoniowa.net
Walford	Janet Gann	City Clerk	clerk@cityofwalfordiowa.com
Benton County	Grace Schmidt	Public Health Director	gschmidt@bentoncountyia.gov
Benton County	Shelby Williams	Conservation Director	swilliams@bentoncountyparks.com
Benton County	Hayley Rippel	Auditor	hrippel@bentoncountyia.gov
Anamosa	Jeremiah Hoyt	City Administrator	jeremiah.hoyt@anamosa-ia.org
Martelle	Judey Hannam	City Clerk	martelle.master@gmail.com
Monticello	Russ Farnam	City Administrator	rfarnum@ci.monticello.ia.us
Morley	Stephanie Von Behren	City Clerk	cityofmorley@netins.net
Olin	Jean McPherson	City Clerk	cityolin@netins.net
Onslow	Ginger Thomas	City Clerk	gingerthomas1970@gmail.com
Oxford Junction	Stacia Hansen	City Clerk	ojctyhal@netins.net
Wyoming	Sheri Tjaden	City Clerk	wyocity@netins.net
Jones County	Whitney Hein	Auditor	auditor@jonescountyiowa.gov
Jones County	Brad Knudson	Public Health	brad.knudson@jonescountyiowa.gov
Jones County	Brad Mormann	Conservation	brad.mormann@jonescountyiowa.gov
Alburnett	Chris Shelby	City Clerk	cityclerk@alburnettia.org
Bertram	Raven Kuehl	City Clerk	bertramclerk1@gmail.com
Cedar Rapids	Sara Maples	Sustainability Manager	s.maples@cedar-rapids.org
Center Point	Joe Taylor	City Administrator	cityadministrator@centerpointia.com

City/County	Contact	Position	Email
Central City	Shelley Annis	City Administrator	administrator@centralcityia.gov
Coggon	Brenda Quandt	City Clerk	cityclerk@coggonia.org
Ely	Eldy Miller	City Administrator	cityadmin@elyiowa.com
Fairfax	Cynthia Stimson	City Clerk	cstimson@cityoffairfax.org
Fairfax	Jo Ann Beer	Mayor	mayor@cityoffairfax.org
Hiawatha	Dennis Marks	City Manager	dmarks@hiawatha-iowa.com
Lisbon	Brandon Siggins	City Administrator	lisboncityadmin@cityoflisbon-ia.gov
Marion	Ryan Waller	City Manager	rwaller@cityofmarion.org
Marion	Kim Downs	Deputy City Manager	kdowns@cityofmarion.org
Mount Vernon	Chris Nosbisch	City Administrator	cnosbisch@cityofmtvernon-ia.gov
Palo	Lenna Goodale	City Clerk	lennagoodale@cityofpalo.com
Prairieburg	Shelia Power	City Clerk	prairie@netins.net
Robins	Lori Pickart	City Clerk	lori@cityofrobins.org
Springville	Dee Wagaman	City Clerk	dwagaman@cityofspringville.us
Walker	Connie Helms	City Clerk	cityclerk@cityofwalkeria.org
Linn County	Tamara Marcus	Sustainability Director	tamara.marcus@linncountyiowa.gov
Ladora		City Clerk	ladora@netins.net
Marengo	Karla Marck	City Administrator	kmarck@marengoiowa.com
Millersburg		City Clerk	millersburgiowa@outlook.com
North English		City Clerk	cityofne@yahoo.com
Parnell		City Clerk	cityofparnell@gmail.com
Victor	Fred Stiefel	City Clerk	stiefellaw@netins.net
Williamsburg	Aaron Sandersfeld	City Administrator	asandersfeld@williamsburgiowa.org
Iowa County	Auditor	Brandy Enochson	benochson@iowacounty.iowa.gov
Iowa County	Public Health	Lorinda Sheeler	lsheeler@iowacounty.iowa.gov
Iowa County	Conservation	Chris Anderson	canderson@iowacounty.iowa.gov
Coralville	Kelly Hayworth	City Administrator	khayworth@coralville.org
Coralville	Amy Foster	Stormwater Coordinator	afoster@coralville.org
Coralville	Mike Knudson	City Council Member	c-knudson@uiowa.edu
Hills	Kelley Schlitz	City Administrator	cityhills@sharontc.net
Iowa City	Sarah Gardner	Climate Action Coordinator	sgardner@iowa-city.org
Lone Tree	Steph Dautremont	City Clerk	lonetreecity@windstream.net
North Liberty	Ryan Heiar	City Administrator	rheiar@northlibertyiowa.org
North Liberty	Angie McConville	Special Projects Coordinator	amcconville@northlibertyiowa.org
Oxford	Adriane Sedlacek	City Clerk	oxfordcityhall@southslope.net
Shueyville	Leah Kolar	City Clerk	shueyville@southslope.net
Solon	Cami Rasmussen	City Administrator	cami.rasmussen@solon-iowa.com
Swisher	Tawnia Kakacek	City Clerk	swisher2@southslope.net
Tiffin	Doug Boldt	City Administrator	dboldt@tiffin-iowa.org
University Heights	Mike Haverkammp	City Clerk	city-clerk@university-heights.org

City/County	Contact	Position	Email
Johnson County	Becky Soglin	Sustainability Coordinator	bsoglin@johnsoncountyiowa.gov
Ainsworth	Cheryl Smith	City Clerk	ainsworth@iowatelecom.net
Brighton	Michelle Tally	City Clerk	brightonclerk@brightoniowa.com
Crawfordsville	Carolyn Love	City Clerk	cityofcrawfordsville@farmtel.net
Kalona	Ryan Schlabaugh	City Administrator	rschlabaugh@cityofkalona.org
Riverside	Cole Smith	City Administrator	cityadmin@riversideiowa.gov
Washington	Deanna McCusker	City Administrator	dmccusker@washingtoniowa.gov
Wellman	Kelly Litwiller	City Administrator	cityadministrator@cityofwellman.com
West Chester	Sue Janacek	City Clerk	sjanecek@iowatelecom.net
Washington County	Dan Widmer	Auditor	auditor@co.washington.ia.us
Washington County	Emily Tokheim	Public Health Administrator	contact@washph.com
Washington County	Zach Rozmus	Conservation	zachwccb9279@gmail.com
Washington County		Conservation	wscountyconservation@gmail.com

Table 9 includes the contact information used to distribute information to community-based, planning, or other organizations in the region.

Table 9. Community-Based, Planning, and Other Organization Contacts

Organization	Contact	Position	Email
United Way of East Central Iowa	Kary Chase	Vice President of Community Impact	karey.chase@uweci.org
United Way of Johnson & Washington Counties	Emily Meister	Director of Community Impact & Engagement	emily.meister@unitedwayjwc.org
Willis Dady Homeless Services	Alicia Faust	Director	alicia@willisdady.org
Matthew 25	Clint Twedt Ball	Director	clint@hub25.org
Hawkeye Area Community Action Program	Jane Drapeaux	CEO	jdrapeaux@hacap.org
Hawkeye Area Community Action Program	Dan Rauser	Energy Programs Director	drauser@hacap.org
Hawkeye Area Community Action Program	Heather Harney	Housing Director	hharney@hacap.org
Jones County Economic Development	Derek Lumsden	Director	director@jonescountydevelopment.com
Washington County Economic Development	Mary Audia	Director	wedg@washingtoniowa.org
Iowa County Community Development	Laura Sauser	Director	laura@iccdia.com
Benton County Development Group	Kate Robertson	Executive Director	kate@bdgia.com
Greater Iowa City, Inc.	Nancy Bird	President & CEO	nancy@greateriowacity.com
Greater Iowa City, Inc.	Sarah Thompson	Director of Rural Development	sarah@greateriowacity.com

Organization	Contact	Position	Email
Neighborhood Finance	Stephanie Murphy	Executive Director	smurphy@neighborhoodfinance.org
East Central Iowa Housing Trust Fund	Tracey Achenbach	Director	tracey.achenbach@ecicog.org
Housing Trust Fund for Linn County	Tracey Achenbach	Director	tracey.achenbach@ecicog.org
Housing Trust Fund of Johnson County	Ellen McCabe	Director	emccabe@htfjc.org
University of Iowa Labor Center and Iowa BlueGreen Alliance	Robin Clark-Bennett	Director	robin-clark-bennett@uiowa.edu
University of Iowa Office of Sustainability and Environment	Stratis Giannakouros	Director	stratis-giannakouros@uiowa.edu
University of Iowa Office of Sustainability and Environment	Beth Mackenzie	Sustainability Program Coordinator	elizabeth-k-mackenzie@uiowa.edu
Corridor MPO	Elizabeth Burke	Director	e.burke@cedar-rapids.org
Metropolitan Planning Organization of Johnson County	Kent Ralston	Director	KRalston@iowa-city.org
Better Together	Cady Gerlach	Executive Director	cady@bt2030.org
Benton County Landfill	Eric Werner	Director	bentonlandfill@netins.net
Cedar Rapids/Linn County Solid Waste Agency	Karmin McShane	Director	kmcshane@solidwasteagency.org
Iowa County Landfill	Diane Yoder	Director	reicialandfill@southslope.net
Iowa County Landfill	John Gahring	Commission Chair	johnleogahring@gmail.com
Jones County Transfer Station	Karl Taylor	Director	landfill@jonescountyiowa.gov
Jones County Transfer Station	Russ Benke	Commission Chair	rabenke@netins.net
East Central Iowa Workforce Development Board	Liz Rodriguez	Executive Director	elizabeth.rodriguez@eciwdb.org
IowaWORKS/Kirkwood	Carla Andorf	Dean of Workforce Services	carla.andorf@kirkwood.edu

Table 10 is log of the coordination, outreach, and communication activities that occurred during the PCAP development process.

Table 10. Coordination, Outreach, and Communication Log

Date	Topic	Organizations Involved	Coordination/ Outreach Method	Location	Notes
9/27/2023	CPRG Technical Advisory Committee Kick-Off	East Central Iowa CPRG Technical Advisory Committee	Meeting held via Zoom.	Virtual	
9/29/2023	CPRG Planning Grant Implementation	East Central Iowa CPRG Technical Advisory Committee	Meeting held via Zoom.	Virtual	
10/9/2023	CPRG Planning Grant Implementation	East Central Iowa CPRG Technical Advisory Committee	Meeting held via Zoom.	Virtual	
10/30/2023	CPRG Planning Grant Implementation	East Central Iowa CPRG Technical Advisory Committee	Meeting held via Zoom.	Virtual	
11/17/2023	Iowa BlueGreen Alliance	Iowa BlueGreen Alliance members	Meeting held via Zoom.	Virtual	Link to organization website here.
11/21/2023	CPRG Equitable Engagement Toolkit	East Central Iowa CPRG Technical Advisory Committee and Amy Colbert with the Social Impact Community at the University of Iowa	Meeting held via Zoom.	Virtual	Link to Social Impact Community website here.
11/28/2023	CPRG Webinar	Cities, counties, and local organizations	Webinar open to the public held via Zoom. All cities, counties, and select local organizations were directly invited through by email. The webinar was included in the November 2023 edition of the ECICOG newsletter.	Virtual	Link to webinar recording here.
11/30/2023	CPRG Webinar	Cities, counties, and local organizations			
12/5/2023	CPRG Planning Grant Implementation	East Central Iowa CPRG Technical Advisory Committee	Meeting held via Zoom.	Virtual	
12/11/2023	CPRG Planning Grant Implementation	East Central Iowa CPRG Technical Advisory Committee and Polk County CPRG	Meeting held via Zoom.	Virtual	

Date	Topic	Organizations Involved	Coordination/ Outreach Method	Location	Notes
		Planning Grant Manager			
12/12/2023	PCAP Survey Launch	All identified stakeholders	Survey conducted through project webpage. Information and direct survey link distributed via email.	Online	Link to survey here.
12/15/2023	CPRG Overview	Goodwill of the Heartland	Meeting held via Zoom.	Virtual	
12/15/2023	Iowa BlueGreen Alliance			Virtual	Provided overview of PCAP development process
1/5/2024	CPRG Overview	Neighborhood Finance Corp of Cedar Rapids	Meeting held via Zoom.	Virtual	
1/5/2024	PCAP GHG Reduction Measures	Iowa BlueGreen Alliance & University of Iowa Labor Center	Meeting held via Zoom.	Virtual	Discussed PCAP GHG Reduction Measures
1/10/2024	PCAP Survey Deadline	18 respondents	Survey conducted through project webpage. Information and direct survey link distributed via email.	Online	
1/17/2024	PCAP GHG Reduction Measures	Goodwill of the Heartland	Meeting held via Zoom.	Email	Discussed proposed PCAP GHG Reduction Measure
1/17/2024	CPRG Planning Grant Implementation	East Central Iowa CPRG Technical Advisory Committee	Meeting held via Zoom.	Virtual	
1/18/2024	PCAP GHG Reduction Measures	Goodwill of the Heartland		Email & Phone	Discussed proposed PCAP GHG Reduction Measure
1/18/2024	GHG Reduction Projects Discussion	Jones County Economic Development	Meeting held via Zoom.	Virtual	Discussed proposed PCAP GHG Reduction Measure
1/22/2024	GHG Reduction Projects Discussion	Goodwill of the Heartland		Email & Phone	Discussed proposed PCAP GHG

Date	Topic	Organizations Involved	Coordination/ Outreach Method	Location	Notes
					Reduction Measure
1/23/2024	GHG Reduction Projects Discussion	Jones County Economic Development		Email	Discussed proposed PCAP GHG Reduction Measure
1/25/2024	CPRG Overview & PCAP GHG Reduction Measures	ECICOG Board of Directors	Presentation to ECICOG Board Directors	Virtual and In-person	
1/29/2024	PCAP GHG Reduction Measures	City of North Liberty	Meeting held via Zoom.	Virtual	Discussed proposed PCAP GHG Reduction Measure
1/30/2024	PCAP GHG Reduction Measures	City of Marion	Meeting held via Zoom.	Virtual	Discussed proposed PCAP GHG Reduction Measures
1/31/2024	PCAP GHG Reduction Measures	City of Coralville	Meeting held via Zoom.	Virtual	Discussed proposed PCAP GHG Reduction Measure
2/2/2024	CPRG Planning Grant Implementation	East Central Iowa CPRG Technical Advisory Committee	Meeting held via Zoom.	Virtual	
2/8/2024	CPRG Planning Grant Implementation	East Central Iowa CPRG Technical Advisory Committee	Meeting held via Zoom.	Virtual	
2/15/2024	CPRG Planning Grant Implementation	East Central Iowa CPRG Technical Advisory Committee	Meeting held via Zoom.	Virtual	
2/21/2024	CPRG Planning Grant Implementation	East Central Iowa CPRG Technical Advisory Committee	Meeting held via Zoom.	Virtual	
2/26/2024	CPRG Equitable Engagement Toolkit	East Central Iowa CPRG Technical Advisory Committee and Amy Colbert with the Social Impact Community at the University of Iowa	Meeting held via Teams.	Virtual	
2/29/2024	CPRG Planning Grant Implementation	East Central Iowa CPRG Technical Advisory Committee	Meeting held via Zoom.	Virtual	

Appendix B – Cedar Rapids MSA GHG Inventory

This appendix explains the methodology and assumptions used for developing the GHG emissions inventory for the Cedar Rapids MSA, which includes Benton, Jones, and Linn counties.

Introduction

ECICOG developed a simplified GHG inventory for East Central Iowa. The baseline year, 2019, was chosen due to the availability of GHG emissions data. This GHG inventory includes direct and indirect emissions of CO_2, CH_4, and N_2O. Fluorinated greenhouse gases are generally not reported at significant levels in East Central Iowa and are not included in this inventory due to insufficient data. All GHG emissions are reported in $MTCO_2e$. Each sector is described in this report, along with calculation methods, data sources, assumptions, and results.

Several GHG inventories have been published in East Central Iowa. Linn County, Iowa completed a Baseline Inventory of Community (i.e. countywide) GHG Emissions for 2010 in 2021. In 2023, Linn County published a GHG Inventory for 2019 along with an update to the baseline GHG Inventory of 2010.[14] Johnson County, Iowa completed a Community (countywide) GHG Emissions Inventory accounting for the years 2010 (baseline) and 2020 in 2022 (released in March 2023).[15] Iowa City published an Iowa City Municipal GHG Emissions Inventory Update in August 2017.[16] These previously published GHG inventories were not adopted in their entirety, but certain data sets are incorporated into the GHG inventory for this PCAP.

This GHG Inventory was developed in accordance with a quality assurance project plan (QAPP) for the Cedar Rapids MSA, approved by the EPA on November 9, 2023. The QAPP provides guidelines on how to collect, manage, and analyze data while compiling a GHG inventory. Quality Assurance (QA) procedures included determining if data were appropriate for intended use, originated from a credible source, and were properly documented. In addition, QA checks were made to ensure that units of measure were converted to a consistent basis prior to making comparisons of datasets, and that calculation methods and

[14] www.linncountyiowa.gov/DocumentCenter/View/22636/FINAL-2019-Greenhouse-Gas-Inventory?bidId=

[15] https://www.johnsoncountyiowa.gov/sites/default/files/2023-05/Johnson%20County%20IA%20Community%20GHG%20Inventories%202010%20and%202020%20pdf%20with%2005%2003%20clarifications.pdf

[16] https://www.iowa-city.org/weblink/0/edoc/1753565/ICMunicipalGreenhouseGasUpdate-2017.pdf

assumptions were clearly documented. QA checks were made independently by both the quality assurance manager and the task leader, following the QAPP protocol.

Table 11 details the global warming potential (GWP) values used to convert metric tons of each GHG to $MTCO_2e$, based on the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5).[17]

Table 11. 100-Year Global Warming Potentials

GHG	MT CO_2 Equivalent
1 MT CO_2	1 $MTCO_2e$
1 MT C_H4	28 $MTCO_2e$
1 MT N_2O	265 $MTCO_2e$

GHG emissions were calculated for the following sectors in East Central Iowa:

- Transportation
- Commercial and Residential Buildings
- Industry and Electricity Generation
- Agriculture
- Waste and Materials Management
- Wastewater
- Natural and Working Lands

[17] https://www.ipcc.ch/report/ar5/syr/

Cedar Rapids MSA Overall Results

Linn County is the most populated county in the Cedar Rapids MSA and contributed 7,536,492 $MTCO_2e$ of GHG emissions in 2019. Benton and Jones counties produced 548,763 $MTCO_2e$ and 414,055 $MTCO_2e$ of GHG emissions, respectively.

Figure 2 details the estimated GHG emissions in $MTCO_2e$ by county in the Cedar Rapids MSA in 2019.

Figure 2. Total Estimated GHG Emissions by County

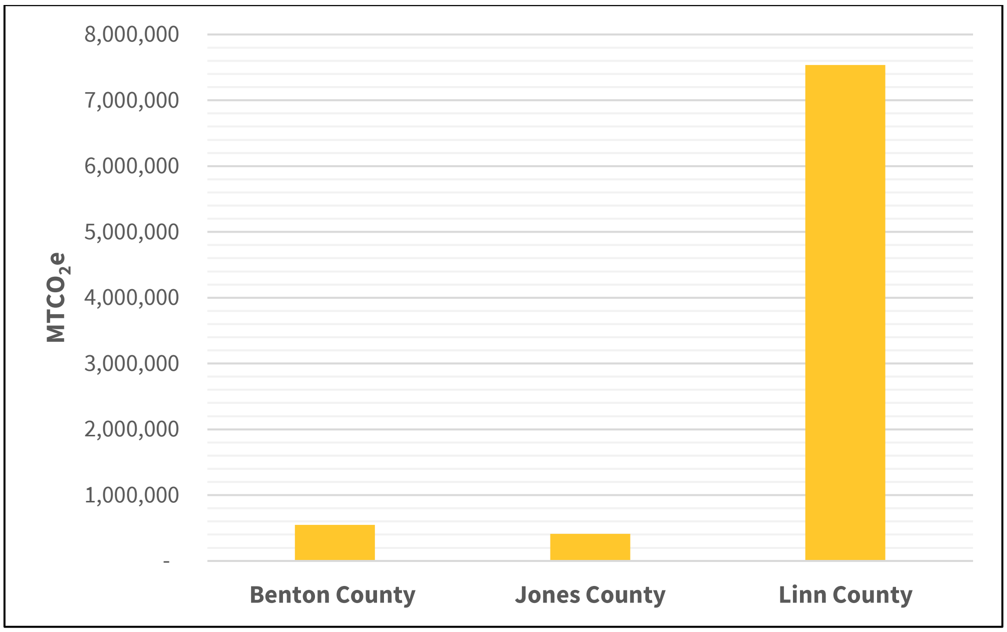


Table 12 details the estimated total GHG emissions in $MTCO_2e$ across all sectors by county in the Cedar Rapids MSA in 2019.

Table 12. Estimated GHG Emissions by Sector and County

Sector	Benton	Jones	Linn
Transportation	219,741	140,817	1,105,234
Commercial and Residential Buildings	148,214	132,984	1,460,374
Industry and Electricity Generation	39,012	39,220	4,793,193
Agriculture	131,565	97,929	97,463
Waste and Materials Management	9,375	3,340	127,335
Wastewater	5,560	4,644	8,518
Natural and Working Lands	-4,705	-4,879	-55,625
Total	**548,763**	**414,055**	**7,536,492**

Transportation Sector

The transportation sector, which includes on-road and non-road mobile sources, is a major contributor of GHG emissions. These emissions are predominantly generated from the combustion of fossil fuels in vehicles.

Greenhouse Gas Inventory Calculation Method

On-road emissions were calculated using the EPA Local GHG Inventory Tool (LGGIT) Community Module, Version 2023.3.[18] Non-road transportation emission data from the National Emissions Inventory (NEI)[19] was compiled and converted to $MTCO_2e$. NEI data includes GHG emissions from non-road mobile sources such as agricultural equipment, construction and industrial equipment, locomotives, and aircraft. The NEI GHG data was downloaded for each county in the Cedar Rapids MSA. NEI data is reported in short tons by GHG. The data was converted from short tons to metric tons and then to $MTCO_2e$ by multiplying each GHG by its 100-year GWP.

Data Sources

- Iowa Department of Transportation (DOT) provided vehicle miles traveled (VMT) data in each county in Iowa in 2019.[20]
- Fuel economy in miles per gallon by vehicle class was provided in LGGIT "Mobile-Entry" sheet.
- Non-road transportation emissions were gathered from the EPA NEI (2020 values).

Assumptions

The Iowa Department of Natural Resources (DNR) 2019 Iowa Statewide Greenhouse Gas Emissions Inventory Report Technical Support Document[21] utilized the national distribution percentages of vehicle types obtained from the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021 to calculate the proportion of vehicles in each class in Iowa.[22] ECICOG used the same assumption to calculate the number of vehicles in each class by county in the Cedar Rapids MSA.

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[18] https://www.epa.gov/statelocalenergy/download-local-greenhouse-gas-inventory-tool
[19] https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data
[20] https://iowadot.gov/maps/Data/Vehicle-miles-traveled
[21] https://www.iowadnr.gov/Portals/idnr/uploads/air/ghgemissions/2019_GHG_TSD.pdf
[22] https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021

Table 13 details the vehicle classification percentages for the year 2019, published in Annex 3 of the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021.

Table 13. 2019 Vehicle Classification Percentages

Vehicle Class	Percentage
Heavy Duty Diesel Vehicle	8.34
Light Duty Diesel Truck	1.82
Light Duty Diesel Vehicle	0.26
Heavy Duty Gas Vehicle	0.91
Light Duty Gas Truck	50.22
Light Duty Gas Vehicle	37.80
Motorcycle	0.64
Total	100.00

Non-road mobile GHG emissions data were obtained from the EPA NEI for each county in the Cedar Rapids MSA. NEI data is released every three years, and 2020 data was used as proxy for 2019.

Results

In East Central Iowa, GHG emissions from mobile sources accounted for approximately 24% of the total GHG emissions in the region. Table 14 displays results for the Cedar Rapids MSA counties in $MTCO_2e$.

Table 14. Transportation Sector Emissions by GHG and County ($MTCO_2e$)

GHG	Benton	Jones	Linn
CO_2	219,374	140,684	1,103,785
CH_4	200	133	1,273
N_20	167	-	175
Total	**219,741**	**140,817**	**1,105,234**

Commercial and Residential Building Sector

The commercial and residential building sector is a significant contributor to GHG emissions. These emissions primarily come from electricity usage and the burning of natural gas and propane.

Greenhouse Gas Inventory Calculation Method

Linn County utility-specific data was used along with U.S. Department of Energy (DOE) State and Local Planning for Energy (SLOPE) platform data to calculate GHG emissions in the LGGIT community module for the Cedar Rapids MSA.[23] Residential propane usage was calculated using data from the U.S. Energy Information Administration (EIA), which provided the total number of propane barrels used in Iowa for residential heating.[24] The U.S. Census American Community Survey (ACS) provided information about the number of households that used propane as a heating fuel in 2019.[25] The amount of propane for each county was scaled from the EIA total number of propane barrels used in 2019 by comparing the number of households using propane in each county to the total in the state of Iowa.

Data Sources

- The U.S. DOE SLOPE Platform was utilized to acquire 2019 electricity and natural gas usage in Iowa and Washington Counties.
- Linn County, Iowa obtained electricity and natural gas usage data for the year 2019 for use in the Linn County Greenhouse Gas Inventory for 2019 along with an update to the baseline Greenhouse Gas Inventory of 2010. Data from Linn County was obtained via access to their account in the ICLEI ClearPath database.
- Propane usage information for residential buildings was estimated based on the U.S. EIA and the U.S. Census ACS.

Assumptions

Data obtained by Linn County was deemed acceptable for use in this GHG inventory. The natural gas usage data in millions of British thermal units (MMBtu) and electricity data in kilowatt-hour (kWh) was available and broken into two categories: residential and commercial/industrial. The SLOPE platform was used to estimate Linn County's specific commercial-to-industrial energy consumption ratio, which was then utilized to estimate the sector-specific energy usage in Linn County.

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[23] https://maps.nrel.gov/slope
[24] https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_use/res/use_res_IA.html&sid=IA
[25] https://data.census.gov/table?q=DP04&g=040XX00US19&y=2019

Results

In East Central Iowa, energy usage in residential and commercial buildings produced approximately 24% of the total GHG emissions in the region. Table 15 displays results for the Cedar Rapids MSA counties in $MTCO_2e$.

Table 15. Commercial and Residential Building Sector Emissions by GHG and County ($MTCO_2e$)

GHG	Benton	Jones	Linn
CO_2	147,421	132,277	1,452,444
CH_4	386	337	4,032
N_20	407	370	3,898
Total	**147,214**	**132,984**	**1,460,374**

Industry and Electricity Generation

The industry sector includes GHG emissions from the industrial use of electricity and natural gas, along with energy generation.

Greenhouse Gas Inventory Calculation Method

Linn County utility-specific data was used along with SLOPE data to calculate GHG emissions in the LGGIT community module for the Cedar Rapids MSA. GHG emissions data for Archer Daniels Midland (ADM), Prairie Creek generating station, and Interstate Power & Light were obtained from the EPA Facility Level Information on Greenhouse Gases tool (FLIGHT).[26]

Data Sources

- The U.S. DOE SLOPE platform was used to acquire 2019 electricity and natural gas usage in Iowa and Washington Counties.
- Linn County, Iowa obtained electricity and natural gas usage data for the year 2019 as part of their Baseline Greenhouse Gas Inventory in 2010 and an Update to the Baseline Greenhouse Gas Inventory in 2019. Data from Linn County was obtained via access to their account in the ICLEI ClearPath database.
- GHG emissions from energy generation at the ADM power plant and Prairie Creek generating station in Cedar Rapids, and fugitive natural gas GHG emissions from Interstate Power & Light distribution system were accessed via EPA FLIGHT.

[26] https://ghgdata.epa.gov/ghgp/main.do

Assumptions

Data obtained by Linn County was deemed acceptable for use in this GHG inventory. The natural gas usage data in MMBtu and electricity data in kWh was available and broken into two categories: residential and commercial/industrial. The SLOPE platform was used to estimate Linn County's specific commercial-to-industrial energy consumption ratio, which was then utilized to estimate the sector-specific energy usage in Linn County.

Results

In East Central Iowa, industrial energy usage and generation produced approximately 45% of the total GHG emissions in the region. Table 16 displays results for the Cedar Rapids MSA counties in $MTCO_2e$.

Table 16. Industry and Electricity Generation Sector Emissions by GHG and County ($MTCO_2e$)

GHG	Benton	Jones	Linn
CO_2	38,744	38,956	4,743,635
CH_4	166	116	32,814
N_20	151	148	16,745
Total	**39,012**	**39,220**	**4,793,193**

Agriculture

The agriculture sector includes GHG emissions from fertilizer usage on planted crops. A future comprehensive GHG inventory will include emissions from other agricultural sources, including livestock, crops, and soil management. Synthetic fertilizers play a significant role in N_2O emissions. Over a 100-year period, N_2O is approximately 265 times more effective at trapping heat in the atmosphere as compared to CO_2.

Greenhouse Gas Inventory Calculation Method

GHG emissions were calculated using the EPA LGGIT Community Module. The total amount of fertilizer used in the state of Iowa and the percentage of fertilizer by type was obtained using the EPA's State Greenhouse Gas Inventory and Projection Tool (SIT) Agriculture Module, Version 2023.2.[27] This data was then scaled based on the acres of planted crops in each county in the Cedar Rapids MSA.

[27] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool

Data Sources

- The National Agricultural Statistics Service (NASS) Quick Stats tool provided the acres of planted crops in each county in the Cedar Rapids MSA.[28]
- The EPA SIT Agriculture Module provided the total amount of fertilizer used in the state of Iowa and the percentage of fertilizer by type in the year 2019.

Table 17 displays fertilizer usage by type and the total acres of planted crops by county in the Cedar Rapids MSA.

Table 17. Fertilizer Usage and Acres of Planted Crops by County

County	Acres of Planted Crops	% of State	Synthetic Fertilizer (tons)	Organic Fertilizer (tons)	Manure (tons)
Benton	384,167	1.4	18,330	15	2
Jones	285,948	1.08	13,643	11	1
Linn	284,575	1.07	13,578	11	1

Assumptions

The 2017 crop acreage data from the NASS Quickstats database served as proxy for 2019 figures.

Results

In East Central Iowa, fertilizer usage on planted crops produced approximately 5% of the total GHG emissions in the region. Table 18 displays results for the Cedar Rapids MSA counties in $MTCO_2e$.

Table 18. Agriculture Sector Emissions by GHG and County ($MTCO_2e$)

GHG	Benton	Jones	Linn
N_20	131,565	97,929	97,463
Total	**131,565**	**97,929**	**97,463**

[28] https://www.nass.usda.gov/Quick_Stats/

Waste and Materials Management

The waste and materials management sector includes GHG emissions from waste management, including landfills, composting, anaerobic digestion, waste incineration, and wastewater treatment. Wastewater treatment is discussed in the wastewater sector section, below. In this GHG inventory, the category of waste and materials management specifically includes emissions from landfills. The decomposition of organic materials in landfills results in the creation of landfill gas, which contains approximately 50% methane. Methane, or CH_4, is a potent GHG that is 28 times more effective than CO_2 at trapping heat in the atmosphere over a 100-year period.

Greenhouse Gas Inventory Calculation Method

The Cedar Rapids/Linn County Solid Waste Agency submits yearly GHG emissions data to the EPA Greenhouse Gas Reporting System (GHGRP) for one operating landfill and one closed landfill. This data was accessed via the EPA FLIGHT tool. The Benton County Sanitary Landfill does not report emissions data to the GHGRP. Instead, they engage an engineering firm to calculate their annual GHG emissions. The Jones County Sanitary Landfill closed in 2008 and GHG emissions were calculated using the California Air Resources Board (CARB) Landfill Gas Tool.[29]

Data Sources

- GHG emissions from the Cedar Rapids/Linn County Solid Waste Agency, Sites 1 and 2 in 2019 were obtained via EPA FLIGHT.
- Benton County Sanitary Landfill data was obtained from a 2019 greenhouse gas report produced by HLW Engineering Group.
- Yearly tonnage data for the closed Jones County Sanitary Landfill was obtained from Iowa DNR.

Assumptions

It was assumed that GHG emissions data submitted to the EPA as part of the GHGRP was acceptable for use in this inventory. Additionally, the GHG emissions from Benton County Sanitary Landfill, calculated by the HLW Engineering Group, were also accepted in place of separate calculations. Since the Jones County Sanitary Landfill ceased operations in 2008, waste from Jones County is now transported to a landfill located in Milan, Illinois. Scope 3, indirect, solid waste disposal GHG emissions were not included in this inventory. Indirect emissions will be accounted for in a future, comprehensive GHG inventory.

[29] https://ww2.arb.ca.gov/resources/documents/carbs-landfill-gas-tool

Results

In East Central Iowa, GHG emissions from landfills accounted for approximately 1.5% of the total GHG emissions in the region. Table 19 displays results for the Cedar Rapids MSA counties in $MTCO_2e$.

Table 19. Waste and Materials Management Sector Emissions by GHG and County ($MTCO_2e$)

GHG	Benton	Jones	Linn
CH_4	9,375	3,340	127,335
Total	**9,375**	**3,340**	**127,335**

Wastewater

The wastewater sector includes GHG emissions from industrial and domestic treatment of wastewater. Wastewater treatment processes produce CH_4 and N_2O, both of which are potent greenhouse gases. Anaerobic decomposition of organic matter generates CH_4 as a byproduct and N_2O is primarily associated with nitrification and denitrification processes in wastewater treatment.

Greenhouse Gas Inventory Calculation Method

Emissions were calculated using the EPA LGGIT Community Module and SIT Wastewater Module. The estimated population with septic tanks was determined for Iowa and Washington Counties and entered in the LGGIT community module to calculate GHG emissions. The GHG emissions for the population served by WWTPs were calculated using the SIT wastewater module. In Linn County, Iowa, data was collected for the Cedar Rapids WWTP. This data was entered into the LGGIT Community Module to calculate GHG emissions for Linn County.

Data Sources

- U.S. Geological Survey (USGS) water use data from 2015.[30]
- Site-Specific data from the Cedar Rapids WWTP was obtained via access to Linn County's account in the ICLEI ClearPath database.
- U.S. Census 2020 population data.[31]

[30] https://waterdata.usgs.gov/ia/nwis/water_use/
[31] https://www.census.gov/quickfacts/fact/table/US/PST045222

- Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021 available protein in 2019: 45.4 kg/person-yr.
- GHG emissions from industrial wastewater treatment at ADM were obtained from EPA FLIGHT.

Assumptions

The percentage of the population in each county without septic tanks was calculated using USGS water use data from 2015. This was the most recent available data set and was deemed acceptable for use in this 2019 GHG Inventory. The water use data provides the population of each county connected to public water supply. This population was assumed to be the number of persons also served by WWTPs. Population was scaled using the 2020 U.S. Census as proxy for 2019. This method to determine the fraction of the population without septic systems was deemed more representative of each county in the MSA than using the SIT Iowa default of 83%. Other SIT default emission factors and assumptions for Iowa were used to calculate CH_4 and N_2O emissions except that N_2O was calculated using the 2019 protein value from the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021.

Results

In East Central Iowa, GHG emissions from wastewater treatment accounted for less than 1% of the total GHG emissions in the region. Table 20 displays results for the Cedar Rapids MSA counties in $MTCO_2e$.

Table 20. Wastewater Sector Emissions by GHG and County ($MTCO_2e$)

GHG	Benton	Jones	Linn
CH_4	4,189	3,537	8,043
N_20	1,371	1,107	476
Total	**5,560**	**4,644**	**8,518**

Natural and Working Lands

The natural and working lands sector includes greenhouse gas emissions and sinks from land use, including forestry. This GHG inventory includes urban forestry sinks within this sector, while agricultural land use is accounted for in the agriculture sector. Urban forests play a vital role in reducing atmospheric GHG levels by capturing and storing CO_2.

Greenhouse Gas Inventory Calculation Method

GHG emissions were calculated using the EPA LGGIT Community Module. The land covered by trees in urban areas of the Cedar Rapids MSA was obtained from the Iowa DNR Canopy Cover report, published in 2010.[32] The report provides the number of forested acres in most incorporated towns in Iowa. The forested area was compared to the total incorporated area of each town in Benton, Jones, and Linn Counties. An average percentage of forested land was then calculated for each county in the Cedar Rapids MSA and the land area was converted from acres to square kilometers (km^2).

Data Sources

- Iowa DNR Canopy Cover report, published in 2010.
- Iowa State University – Incorporated Cities by County.[33]

Table 21 displays the urban area of each county in the Cedar Rapids MSA in km^2 and the percentage of each county that is urban forested.

Table 21. Urban Forested Area by County

County	Urban Area of County (km^2)	% Urban Forested
Benton	42	14
Jones	32	19
Linn	304	22

Assumptions

The tree canopy report data from 2010 was deemed acceptable for use as proxy for 2019 data in the absence of a more recent report. In a future, comprehensive GHG inventory, the inclusion of more recent data will be prioritized. Additionally, this inventory will consider the impact of the 2020 derecho, a powerful group of thunderstorms with intense winds, that caused extensive damage to the urban tree canopy in East Central Iowa.

[32] https://www.iowadnr.gov/Portals/idnr/uploads/forestry/urban/canopycover.pdf
[33] https://www.icip.iastate.edu/maps/refmaps/places

Results

In East Central Iowa, urban forestry accounts for a nearly 1% reduction in GHG emissions in the region. Table 22 displays results for the Cedar Rapids MSA counties in $MTCO_2e$.

Table 22. Natural and Working Lands Sector Sinks by GHG and County ($MTCO_2e$)

GHG	Benton	Jones	Linn
CO_2	-4,705	-4,879	-55,625
Total	**-4,705**	**-4,879**	**-55,625**

Appendix C – Iowa City MSA GHG Inventory

This appendix explains the methodology and assumptions used for developing the GHG emissions inventory for the Iowa City MSA, which includes Johnson and Washington counties, plus Iowa County.

Introduction

ECICOG developed a simplified GHG inventory for East Central Iowa. The baseline year, 2019, was chosen due to the availability of GHG emissions data. This GHG Inventory includes direct and indirect emissions for CO_2, CH_4, and N_2O. Fluorinated greenhouse gases are generally not reported at significant levels in East Central Iowa and are not included in this inventory due to insufficient data. All GHG emissions are reported in $MTCO_2e$. Each sector is described in this report, along with calculation methods, data sources, assumptions, and results.

Several GHG inventories have been published in East Central Iowa. Linn County, Iowa completed a Baseline Inventory of Community (i.e. countywide) GHG Emissions for 2010 in 2021. In 2023, Linn County published a GHG Inventory for 2019 along with an update to the baseline GHG Inventory of 2010. Johnson County, Iowa completed a Community (countywide) GHG Emissions Inventory accounting for the years 2010 (baseline) and 2020 in 2022 (released in March 2023). Iowa City published an Iowa City Municipal GHG Emissions Inventory Update in August 2017. These previously published GHG inventories were not adopted in their entirety, but certain data sets are incorporated into the GHG inventory for this PCAP.

The GHG Inventory was developed in accordance with a QAPP for the Iowa City MSA, approved by the EPA on November 15, 2023. The QAPP provides guidelines on how to collect, manage, and analyze data while compiling a GHG inventory. QA procedures included determining if data were appropriate for intended use, originated from a credible source, and were properly documented. In addition, QA checks were made to ensure that units of measure were converted to a consistent basis prior to making comparisons of datasets, and that calculation methods and assumptions were clearly documented. QA checks were made independently by both the quality assurance manager and the task leader, following the QAPP protocol.

Table 23 details the GWP values used to convert metric tons of each GHG to $MTCO_2e$, based on the IPCC AR5.

Table 23. 100-Year Global Warming Potentials

GHG	MT CO_2 Equivalent
1 MT CO_2	1 $MTCO_2e$
1 MT C_H4	28 $MTCO_2e$
1 MT N_2O	265 $MTCO_2e$

GHG emissions were calculated for the following sectors in East Central Iowa:

- Transportation
- Commercial and Residential Buildings
- Industry and Electricity Generation
- Agriculture
- Waste and Materials Management
- Wastewater
- Natural and Working Lands.

Iowa City MSA Overall Results

Johnson County is the most populated county in the Iowa City MSA and contributed 1,826,810 $MTCO_2e$ of GHG emissions in 2019. In the same year, Iowa and Washington counties produced 562,262 MTCO2e and 484,892 $MTCO_2e$ of GHG emissions, respectively.

Figure 3 details estimated total GHG emissions in $MTCO_2e$ by county in the Iowa City MSA in 2019.

Figure 3. Iowa City MSA Total Estimated GHG Emissions by County

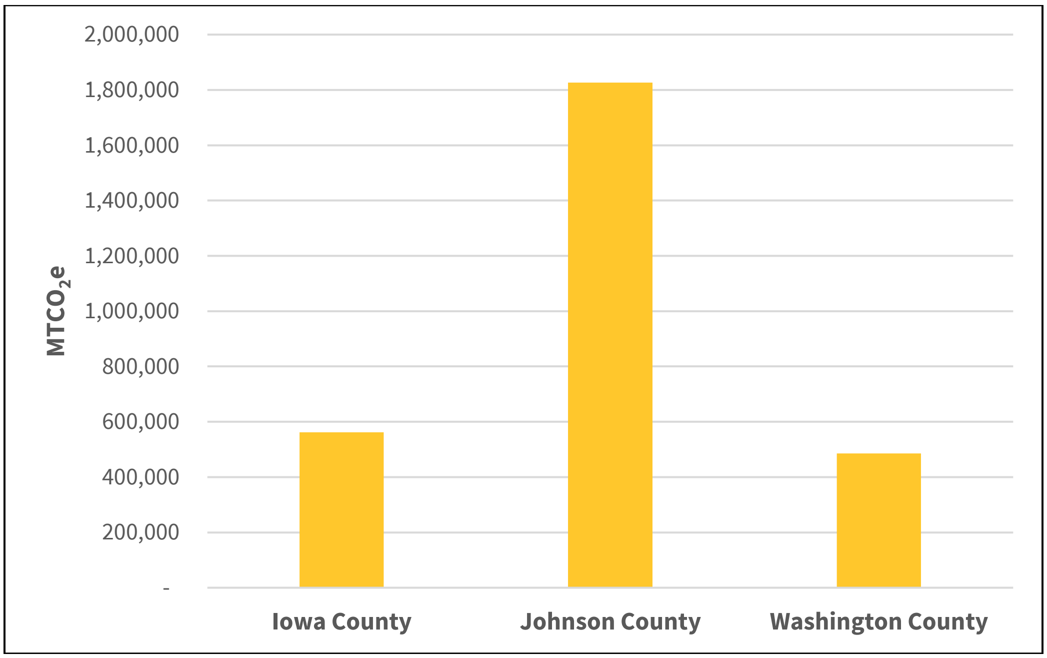

Table 24 details estimated total GHG emissions in $MTCO_2e$ across all sectors by county in the Iowa City MSA in 2019.

Table 24. Iowa City MSA Estimated GHG Emissions by Sector and County

Sector	Iowa	Johnson	Washington
Transportation	242,154	815,340	195,416
Commercial and Residential Buildings	120,237	770,495	134,833
Industry and Electricity Generation	91,278	153,334	66,021
Agriculture	97,068	90,708	90,313
Waste and Materials Management	9,643	18,790	0
Wastewater	3,412	6,598	3,539
Natural and Working Lands	-1,531	-28,455	-4,230
Total	**562,262**	**1,826,810**	**485,892**

Transportation Sector

The transportation sector, which includes on-road and non-road mobile sources, is a major contributor of GHG emissions. These emissions are predominantly generated from the combustion of fossil fuels by vehicles.

Greenhouse Gas Inventory Calculation Method

On-road emissions were calculated using the EPA LGGIT Community Module, Version 2023.3. Non-road transportation emission data from the NEI was compiled and converted to $MTCO_2e$. NEI data includes GHG emissions from non-road mobile sources such as agricultural equipment, construction and industrial equipment, locomotives, and aircraft. The NEI GHG data was downloaded for each county in the Iowa City MSA. NEI data is reported in short tons by GHG. The data was converted from short tons to metric tons and then to CO_2e by multiplying each GHG by its 100-year GWP.

Data Sources

- Iowa DOT provided VMT data in each county in Iowa in 2019.
- Fuel economy in miles per gallon by vehicle class was provided in LGGIT “Mobile-Entry” sheet.
- Non-road transportation emissions were gathered from the EPA NEI (2020 values).

Assumptions

The Iowa DNR 2019 Iowa Statewide Greenhouse Gas Emissions Inventory Report Technical Support Document utilized the national distribution percentages of vehicle types obtained from the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021 to calculate the proportion of vehicles in each class in Iowa. ECICOG used the same assumption to calculate the number of vehicles in each class for each county in the Iowa City MSA.

Table 25 details the vehicle classification percentages for the year 2019, published in Annex 3 of the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021.

Table 25. 2019 Vehicle Classification Percentages

Vehicle Class	Percentage
Heavy Duty Diesel Vehicle	8.34
Light Duty Diesel Truck	1.82
Light Duty Diesel Vehicle	0.26
Heavy Duty Gas Vehicle	0.91
Light Duty Gas Truck	50.22
Light Duty Gas Vehicle	37.80

Vehicle Class	Percentage
Motorcycle	0.64
Total	100.00

Non-road mobile GHG emissions data were obtained from the EPA NEI for each county in the Iowa City MSA. NEI data is released every three years, and 2020 data was used as proxy for 2019.

Results

In East Central Iowa, GHG emissions from mobile sources accounted for approximately 24% of the total GHG emissions in the region. Table 26 displays the results for the Iowa City MSA counties in $MTCO_2e$.

Table 26. Transportation Sector Emissions by GHG and County ($MTCO_2e$)

GHG	Iowa	Johnson	Washington
CO_2	241,990	814,733	195,247
CH_4	155	591	155
N_20	10	17	14
Total	**242,154**	**815,340**	**195,416**

Commercial and Residential Building Sector

The commercial and residential building sector is a significant contributor to GHG emissions. These emissions primarily come from electricity usage and the burning of natural gas and propane.

Greenhouse Gas Inventory Calculation Method

Johnson County utility-specific data was used along with U.S. DOE SLOPE platform data to calculate GHG emissions in the LGGIT community module for the Iowa City MSA. Residential propane usage was calculated using data from the U.S. EIA, which provided the total number of propane barrels used in Iowa for residential heating. The U.S. Census ACS provided information about the number of households that used propane as a heating fuel in 2019. The amount of propane for each county was scaled from the EIA total number of propane barrels used in 2019 by comparing the number of households using propane in each county to the total in the state of Iowa.

Data Sources

- The DOE SLOPE platform was utilized to acquire 2019 electricity and natural gas usage in Iowa and Washington Counties.
- Johnson County, Iowa obtained electricity and natural gas usage data for the year 2020 in 2022-23 as part of the Johnson County Iowa Community (countywide) Greenhouse Gas Emissions Inventory accounting for the years 2010 (baseline) and 2020. Data from Johnson County was obtained via access to their account in the ICLEI ClearPath database.
- Propane usage information for residential buildings was estimated based on the U.S. EIA and the U.S. Census ACS.

Assumptions

Johnson County 2020 data was deemed acceptable for use in this 2019 GHG inventory. The natural gas usage data in therms and electricity data in kWh was available and broken into two categories: residential and commercial/industrial. The SLOPE platform was used to estimate Johnson County's specific commercial-to-industrial energy consumption ratio, which was then utilized to estimate the sector-specific energy usage in Johnson County.

Results

In East Central Iowa, energy usage in residential and commercial buildings produced approximately 24% of the total GHG emissions in the region. Table 27 displays the results for the Iowa City MSA counties in $MTCO_2e$.

Table 27. Commercial and Residential Building Sector Emissions by GHG and County ($MTCO_2e$)

GHG	Iowa	Johnson	Washington
CO_2	119,582	769,261	134,117
CH_4	317	921	349
N_20	339	313	367
Total	**120,237**	**770,495**	**134,833**

Industry and Electricity Generation

The industry sector includes GHG emissions from the industrial use of electricity and natural gas, along with energy generation.

Greenhouse Gas Inventory Calculation Method

Johnson County utility-specific data was used along with SLOPE data to calculate GHG emissions in the LGGIT community module for the Iowa City MSA. GHG emissions data for the University of Iowa Power Plant was obtained from EPA FLIGHT.

Data Sources

- The DOE SLOPE platform was used to acquire 2019 electricity and natural gas usage in Iowa and Washington Counties.
- Johnson County, Iowa obtained electricity and natural gas usage data in 2022-23 as part of the Johnson County Iowa Community (Countywide) Greenhouse Gas Emissions Inventories: 2010 Baseline and 2020. Data from Johnson County was obtained via access to their account in the ICLEI ClearPath database.
- GHG emissions from energy generation at the University of Iowa Power Plant in 2019 were accessed via EPA FLIGHT.

Assumptions

2020 data obtained by Johnson County was deemed acceptable for use in this 2019 GHG inventory. The natural gas usage data in therms and electricity data in kWh was available and broken into two categories: residential and commercial/industrial. The SLOPE platform was used to estimate Johnson County's specific commercial-to-industrial energy consumption ratio, which was then utilized to estimate the sector-specific energy usage in Johnson County.

Results

In East Central Iowa, industrial energy use and generation produced approximately 45% of the total GHG emissions in the region. Table 28 displays the results for the Iowa City MSA counties in $MTCO_2e$.

Table 28. Industry and Electricity Generation Sector Emissions by GHG and County ($MTCO_2e$)

GHG	Iowa	Johnson	Washington
CO_2	90,686	152,757	65,581
CH_4	268	233	195
N_20	324	344	245
Total	**91,278**	**153,334**	**66,021**

Agriculture

The agriculture sector includes GHG emissions from fertilizer usage on planted crops. A future comprehensive GHG inventory will include emissions from other agricultural sources, including livestock, crops, and soil management. Synthetic fertilizers play a significant role in N_2O emissions. Over a 100-year period, N_2O is approximately 265 times more effective at trapping heat in the atmosphere as compared to CO_2.

Greenhouse Gas Inventory Calculation Method

Emissions were calculated using the EPA LGGIT Community Module. The total amount of fertilizer used in the state of Iowa and the percentage of fertilizer by type was obtained using the EPA's SIT Agriculture Module, Version 2023.2. This data was then scaled based on the acres of planted crops in each county in the Iowa City MSA.

Data Sources

- The NASS Quick Stats tool provided the acres of planted crops in each county in the Iowa City MSA.
- The EPA SIT Agriculture Module provided the total amount of fertilizer used in the state of Iowa and the percentage of fertilizer by type in the year 2019.

Table 29 displays fertilizer usage by type and the total acres of planted crops by county in the Iowa City MSA.

Table 29. Fertilizer Usage and Acres of Planted Crops by County

County	Acres of Planted Crops	% of State	Synthetic Fertilizer (tons)	Organic Fertilizer (tons)	Manure (tons)
Iowa	283,425	1.07	13,523	11	1
Johnson	264,857	0.99	12,637	10	1
Washington	263,705	0.99	12,582	10	1

Assumptions

The 2017 crop acreage data from the NASS Quickstats database served as proxy for 2019 figures.

Results

In East Central Iowa, fertilizer usage on planted crops produced approximately 5% of the total GHG emissions in the region. Table 30 displays the results for the Iowa City MSA counties in $MTCO_2e$.

Table 30. Industry and Electricity Generation Sector Emissions by GHG and County ($MTCO_2e$)

GHG	Iowa	Johnson	Washington
N_20	97,068	90,708	90,313
Total	**97,068**	**90,708**	**90,313**

Waste and Materials Management

The waste and materials management sector includes GHG emissions from waste management, including landfills, composting, anaerobic digestion, waste incineration, and wastewater treatment. Wastewater treatment is discussed in the wastewater sector section, below. In this GHG inventory, the category of waste and materials management specifically includes emissions from landfills. The decomposition of organic materials in landfills results in the creation of landfill gas, which contains approximately 50% CH_4, a potent GHG that is 28 times more effective than CO_2 at trapping heat in the atmosphere over a 100-year period.

Greenhouse Gas Inventory Calculation Method

The Iowa City Sanitary Landfill submits yearly GHG emissions data to the EPA GHGRP. This data was accessed via the EPA FLIGHT tool. The Iowa County Sanitary Landfill does not report emissions data to the GHGRP. Instead, they engage an engineering firm to calculate their annual GHG emissions.

Data Sources

- 2019 GHG emissions from the Iowa City Sanitary Landfill were obtained via EPA FLIGHT.
- Iowa County Sanitary Landfill data was obtained from a 2019 greenhouse gas report produced by HLW Engineering Group.

Assumptions

It was assumed that GHG emission data submitted to the EPA as part of the GHGRP was acceptable for use in this inventory. Additionally, the GHG emissions from the Iowa County Sanitary Landfill, calculated by the HLW Engineering Group, were also accepted in place of separate calculations. Washington County disposes of waste in the SEMCO landfill in Keokuk County, Iowa. Scope 3, indirect, solid waste disposal GHG emissions were not included in this inventory. Indirect emissions will be accounted for in a future, comprehensive GHG inventory.

Results

In East Central Iowa, GHG emissions from landfills accounted for approximately 1.5% of the total GHG emissions in the region. Table 31 displays the results for the Iowa City MSA counties in $MTCO_2e$.

Table 31. Waste and Materials Management Sector Emissions by GHG and County ($MTCO_2e$)

GHG	Iowa	Johnson	Washington
CH_4	9,643	18,790	-
Total	**9,643**	**18,790**	**-**

Wastewater

The wastewater sector includes GHG emissions from industrial and domestic treatment of wastewater. Wastewater treatment processes produce CH_4 and N_2O, both of which are potent greenhouse gases. Anaerobic decomposition of organic matter generates CH_4 as a byproduct and N_2O is primarily associated with nitrification and denitrification processes in wastewater treatment.

Greenhouse Gas Inventory Calculation Method

Emissions were calculated using the EPA LGGIT Community Module and SIT Wastewater Module. The estimated population with septic tanks was determined for Iowa and Washington Counties and entered in the LGGIT community module to calculate GHG emissions. The GHG emissions for the population served by WWTPs were calculated using the SIT wastewater module. In Johnson County, Iowa, WWTP-specific data was obtained from Iowa City, Coralville, and North Liberty. This data was entered into the LGGIT Community Module to calculate GHG emissions for part of Johnson County.

The population of the remainder of Johnson County was treated in the same manner as Iowa and Washington counties, calculating the emissions from septic tanks using LGGIT and emissions from municipal WWTPs using the SIT wastewater module.

Data Sources

- USGS water use data from 2015.
- Site-Specific data received directly from the cities of Coralville, Iowa City, and North Liberty.
- U.S. Census 2020 population data.
- Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021 available protein in 2019: 45.4 kg/person-yr.

Assumptions

The percentage of the population in each county without septic tanks was calculated using USGS water use data from 2015. This was the most recent available data set and was deemed acceptable for use in this 2019 GHG Inventory. The water use data provides the population of each county connected to public water supply. This population was assumed to be the number of persons also served by WWTPs. Population was scaled using the 2020 U.S. Census as proxy for 2019. This method to determine the fraction of the population without septic systems was deemed more representative of each county in the MSA than using the SIT Iowa default of 83%. Other SIT default emission factors and assumptions for Iowa were used to calculate CH_4 and N_2O emissions except that N_2O was calculated using the 2019 protein value from the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021.

Results

In East Central Iowa, GHG emissions from wastewater treatment accounted for less than 1% of the total GHG emissions in the region. Table 32 displays the results for the Iowa City MSA counties in $MTCO_2e$.

Table 32. Wastewater Sector Emissions by GHG and County ($MTCO_2e$)

GHG	Iowa	Johnson	Washington
CH_4	2,518	3,610	2,324
N_20	894	2,988	1,215
Total	**3,412**	**6,598**	**3,539**

Natural and Working Lands

The natural and working lands sector includes greenhouse gas emissions and sinks from land use, including forestry. This GHG inventory includes urban forestry sinks within this sector, while agricultural land use is accounted for in the agriculture sector. Urban forests play a vital role in reducing atmospheric GHG levels by capturing and storing CO_2.

Greenhouse Gas Inventory Calculation Method

Emissions were calculated using the EPA LGGIT Community Module. The land covered by trees in urban areas of the Iowa City MSA was obtained from the Iowa DNR Canopy Cover report, published in 2010. The report provides the number of forested acres in most incorporated towns in Iowa. The forested area was compared to the total incorporated area of each town in Iowa, Johnson, and Washington Counties. An average percentage of forested land was then calculated for each county in the Iowa City MSA and the land area was converted from acres to km^2.

Data Sources

- Iowa DNR Canopy Cover report, published in 2010.
- Iowa State University – Incorporated Cities by County.

Table 33 displays the urban area of each county in the Iowa City MSA in km^2 and the percentage of each county that is urban forested.

Table 33. Urban Forested Area by County

County	Urban Area of County (km^2)	% Urban Forested
Iowa	18	10
Johnson	145	24
Washington	30	17

Assumptions

The tree canopy report data from 2010 was deemed acceptable for use as proxy for 2019 data in the absence of a more recent report. In a future comprehensive GHG Inventory, the inclusion of more recent data will be prioritized. Additionally, this inventory will consider the impact of the 2020 derecho, a powerful group of thunderstorms with intense winds that caused extensive damage to the urban tree canopy in East Central Iowa.

Results

In East Central Iowa, urban forestry accounts for a nearly 1% reduction in GHG emissions in the region. Table 34 displays the results for the Iowa City MSA counties in $MTCO_2e$.

Table 34. Urban Forestry Sector Sinks by GHG and County ($MTCO_2e$)

GHG	Iowa	Johnson	Washington
CO_2	-1,531	-28,455	-4,230
Total	**-1,531**	**-28,455**	**-4,230**

Appendix D – Residential Building Energy Improvements

This appendix explains the methodology and assumptions used for developing the estimated GHG and co-pollutant emissions reduced for the Residential Building Energy Efficiency Improvements priority measure included in the East Central Iowa PCAP.

Methods and Assumptions

Emission Reductions Estimate Method

GHG emission reductions and energy savings were calculated using the National Renewable Energy Laboratory (NREL) ResStock Energy Efficiency and Electrification Dashboard.[34] The NREL ResStock analysis tool identifies energy-saving home improvements and provides estimates of savings, using data from the U.S. DOE.

Reductions in criteria air pollutants (CAPs), including sulfur dioxide (SO_2), nitrogen oxides (NOx), and particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), and hazardous air pollutants (HAPs), including volatile organic compounds (VOCs), and ammonia (NH_3), were calculated using U.S. EPA Avoided Emissions and Generation Tool (AVERT) 2022 emission rates.[35]

Models/Tools Used

- NREL ResStock analysis tool (updated Feb 9, 2024).
- AVERT main module and web edition, version 4.2.

Measure Implementation Assumptions

The following key assumptions about measure implementation were used to quantify emission reductions for this measure:

- The geographic scope includes Benton, Iowa, Johnson, Jones, Linn, and Washington counties.
- Energy efficiency upgrades will be applied to 130 total housing units per year for 5 years. Johnson and Linn counties, the most populous in East Central Iowa, are expected to upgrade 50 housing units each. The remaining counties will make energy

[34] https://public.tableau.com/app/profile/nrel.buildingstock/viz/StateLevelResidentialBuildingStockandEnergyEfficiencyElectrificationPackagesAnalysis/Introduction
[35] https://www.epa.gov/avert

efficiency upgrades in 30 more housing units. The distribution of these upgrades (130 total housing units/year) is as follows:
    - 55% of the upgrades will apply to single-family detached homes;
    - 25% of the upgrades will apply to mobile homes; and
    - The remaining 20% will upgrade multi-family housing units.
- Energy efficiency upgrades include the following package from the NREL Building Stock Analysis:
    - Basic enclosure upgrade: Attic insulation to 2021 International Energy Conservation Code levels, reduce infiltration by 30%, seal ducts to 10% leakage with R-8 insulation, drill and fill wall insulation to R-13 for uninsulated wood stud walls only;
    - Heat pump water heater: 50-gallon, 66-gallon, or 80-gallon 3.45 uniform efficiency factor heat pump water heater dependent on house size; and
    - High efficiency (cold weather) heat pump with electric heat backup: Air source heat pump or mini-split heat pump depending on duct presence with Seasonal Energy Efficiency Ratio 24 and 13.0 Heating Seasonal Performance Factor ratings, electric resistance backup heat.
- Additional energy efficiency upgrades include electric cooking (electric range) or induction cooking (induction range and electric oven).
- The abovementioned energy efficiency measures have varying lifespans. Enclosure upgrades can endure for multiple decades, heat pump water heaters may last 13-15 years[36], and high efficiency heat pumps have a lifespan of 15-20 years.[37] Electric or induction ranges and ovens usually last at least 10 years before requiring replacement.[38]
- It is assumed that the upgrades for each unit will cost no more than $25,000. Over the course of 5 years, the projected cost for implementing this priority measure is approximately $17,300,000 including improvements and program delivery.
- Operation and maintenance costs will be minimal, including routine maintenance comparable to existing home or unit upkeep.

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[36] https://www.energystar.gov/products/ask-the-experts/what-goes-into-the-cost-of-installing-a-heat-pump-waterheater#:~:text=In%20contrast%2C%20heat%20pump%20water,replace%20your%20existing%20water%20heater

[37] https://www.nachi.org/life-expectancy.htm

[38] https://reviewed.usatoday.com/ovens/features/how-long-do-kitchen-appliances-last

Emission Reduction Estimate Assumptions

The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- GHG emission savings were estimated using the NREL ResStock tool using Iowa as the state and Climate Zone 5A.
- It was assumed that 72 single family homes, 32 mobile homes, and 26 multifamily homes (2-4 units) would be upgraded per year for 5 years in East Central Iowa.
- Induction cooking (induction range with electric oven) values were utilized for calculations. The GHG emissions savings from electric cooking (electric range) are comparable.
- The EPA AVERT tool evaluates how energy efficiency measures lead to changes in emissions of several air pollutants on a regional basis. The total energy savings per year in gigawatt-hours (GWh), calculated with the ResStock tool, was used to calculate co-pollutant reductions. AVERT provides the average fossil emission rates in pounds (lb.)/megawatt-hour (MWh) in the Midwest region. These rates were utilized to calculate cumulative reductions in co-pollutants. The AVERT excel and web modules were used to estimate yearly emission reductions as part of a quality check.

Reference Case Scenario

The methods used to calculate GHG emissions by the ResStock tool compared energy efficiency upgrades to a business-as-usual scenario.

Measure-Specific Activity Data and Implementation Tracking Metrics

This priority measure proposes to implement energy efficiency improvements in 130 housing units per year for five years. The number and specific types of housing unit upgrades will be tracked and documented. Depending on the completed upgrades, the NREL ResStock tool or a different, reputable method will be utilized to estimate GHG emission reductions.

GHG and Co-Pollutant Calculations

GHG Emission Reductions (Year 1)

$GHG\ emission\ savings\ in\ MTCO_2e\ (NREL\ ResStock\ package +\ induction\ cooking)\ per\ unit\ (by\ unit\ type)\ x\ number\ of\ units\ upgraded\ (by\ type)$

$Single\ family\ detached\ homes: 7.23\ MTCO_2e\ x\ 72\ homes = 521\ MTCO_2e$
$Multifamily\ (2-4\ units): 2.69\ MTCO_2e\ x\ 26\ units = 70\ MTCO_2e$
$Mobile\ homes: 5.04\ MTCO_2e\ x\ 32\ units = 161\ MTCO_2e$

$521\ MTCO_2e + 70\ MTCO_2e + 161\ MTCO_2e = \mathbf{752\ MTCO_2e}$

Cumulative GHG emission reductions from 2025-2030:

$$\sum_{i=1}^{5} i\ \ x\ Year\ 1\ reductions$$

$$\sum_{i=1}^{5} i\ x\ 752\ MTCO_2e = \mathbf{11,279\ MTCO_2e}$$

Cumulative GHG Emission Reductions 2025-2050

$Cumulative\ GHG\ reductions\ from\ 2025-2030 + (Year\ 5\ reductions\ x\ 20\ years)$

$Year\ 5\ reductions = Year\ 1\ reductions\ x\ 5$

$11{,}279\ MTCO_2e + (752\ MTCO_2e\ x\ 5\ x\ 20) = \mathbf{86,472\ MTCO_2e}$

Co-Pollutant Reductions (Year 1)

$Energy\ savings\ in\ GWh\ (NREL\ package\ induction\ cooking)\ per\ unit\ (by\ unit\ type)\ x\ number\ of\ units\ upgraded\ (by\ type)$

$Single\ family\ detached\ homes: 101\ MMBtu\ x\ 0.000293 \frac{GWh}{MMBtu} x\ 72\ homes = 2.13\ GWh$
$Multifamily\ (2-4\ units): 43\ MMBtu\ x\ 0.000293 \frac{GWh}{MMBtu} x\ 26\ units = 0.33\ GWh$
$Mobile\ homes: 71\ MMBtu\ x\ 0.000293 \frac{GWh}{MMBtu} x\ 32\ homes = 0.67\ GWh$

$2.13\ GWh + 0.33\ GWh + 0.67\ GWh = \mathbf{3.12\ GWh}$

Cumulative Reduction of Co-Pollutants 2025-2030

$$\sum_{i=1}^{5} i\ x\ (Year\ 1\ energy\ savings\ in\ MWh) x\ (AVERT\ emission\ rate\ by\ co-pollutant\ in\ lb/MWh)$$

$$\sum_{i=1}^{5} i\ x\ \left(3.12\ GWh\ x\ 1{,}000 \frac{MWh}{GWh}\right) x\ 1.292\ lb \frac{SO_2}{MWh} = \mathbf{60,543\ lb\ SO_2}$$

$$\sum_{i=1}^{5} i\ x\ \left(3.12\ GWh\ x\ 1{,}000 \frac{MWh}{GWh}\right) x\ 0.931\ lb \frac{NOx}{MWh} = \mathbf{43,627\ lb\ NOx}$$

$$\sum_{i=1}^{5} i\ x\ \left(3.12\ GWh\ x\ 1{,}000 \frac{MWh}{GWh}\right) x\ 0.089\ lb \frac{PM_{2.5}}{MWh} = \mathbf{4,171\ lb\ PM_{2.5}}$$

$$\sum_{i=1}^{5} i\ x\ \left(3.12\ GWh\ x\ 1{,}000 \frac{MWh}{GWh}\right) x\ 0.028\ lb \frac{VOCs}{MWh} = \mathbf{1,312\ lb\ VOCs}$$

$$\sum_{i=1}^{5} i\ x\ \left(3.12\ GWh\ x\ 1{,}000 \frac{MWh}{GWh}\right) x\ 0.021\ lb \frac{NH_3}{MWh} = \mathbf{984\ lb\ NH_3}$$

Cumulative Reduction of Co-Pollutants 2025-2050

$$Cumulative\ co-pollutant\ reductions\ from\ 2025-2030 + (Year\ 5\ reductions\ x\ 20\ years)$$

$$Year\ 5\ reductions = Year\ 1\ reductions\ x\ 5$$

$$3.12\ GWh\ x\ 1{,}000 \frac{MWh}{GWh}\ x\ 1.292\ lb \frac{SO_2}{MWh}\ x\ 5\ x\ 20 + 60{,}543\ lb\ SO_2 = \mathbf{464,164\ lb\ SO_2}$$

$$3.12\ GWh\ x\ 1{,}000 \frac{MWh}{GWh}\ x\ 0.931\ lb \frac{NOx}{MWh}\ x\ 5\ x\ 20 + 43{,}627\ lb\ NOx = \mathbf{334,471\ lb\ NOx}$$

$$3.12\ GWh\ x\ 1{,}000 \frac{MWh}{GWh}\ x\ 0.089\ lb \frac{PM_{2.5}}{MWh}\ x\ 5\ x\ 20 + 4{,}171\ lb\ PM_{2.5} = \mathbf{31,974\ lb\ PM_{2.5}}$$

$$3.12\ GWh\ x\ 1{,}000 \frac{MWh}{GWh}\ x\ 0.028\ lb \frac{VOCs}{MWh}\ x\ 5\ x\ 20 + 1{,}312\ lb\ VOCs = \mathbf{10,059\ lb\ VOCs}$$

$$3.12\ GWh\ x\ 1{,}000 \frac{MWh}{GWh}\ x\ 0.021\ lb \frac{NH_3}{MWh}\ x\ 5\ x\ 20 + 984\ lb\ NH_3 = \mathbf{7,544\ lb\ NH_3}$$

GHG and Co-Pollutant Emissions Reduced

Implementation of this measure is anticipated to reduce **752** $MTCO_2e$ in the first year with **11,279** cumulative $MTCO_2e$ for the period between 2025 – 2030 and **86,472** cumulative $MTCO_2e$ for the period between 2025 – 2050.

This measure will also provide benefits in reduction of co-pollutants. The following reductions of co-pollutants in lb. were calculated using the EPA AVERT average fossil emission rates.

Table 35. Reductions of Co-Pollutants in lb.

CAP/HAP	Cumulative Reduction	
	2025-2030	**2025-2050**
Sulfur Dioxide (SO_2)	60,543	464,164
Nitrogen Oxides (NO_x)	43,627	334,471
Particulate Matter $PM_{2.5}$	4,171	31,974
Volatile Organic Compounds (VOCs)	1,312	10,059
Ammonia (NH_3)	984	7,544

Appendix E – Public Building Energy Efficiency Improvements

This appendix explains the methodology and assumptions used for developing the estimated GHG emissions and co-pollutant emissions reduced for the Public Building Energy Efficiency Improvements priority measure included in the East Central Iowa PCAP.

Methods and Assumptions

Emission Reductions Estimate Method

Energy savings were calculated using the NREL ComStock analysis tool. The NREL ComStock analysis tool identifies energy-saving commercial building improvements and provides an estimate of savings, using data from the U.S. Department of Energy.

Reductions in CAPs, including SO_2, NOx, and $PM_{2.5}$, and HAPs, including VOCs and NH_3, were calculated using EPA AVERT 2022 emission rates.

Models/Tools Used

- NREL ComStock analysis tool (EUSS ComStock National 2018 Release 2 2023).[39]
- AVERT main module and web edition, version 4.2.

Measure Implementation Assumptions

The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- The geographic scope includes Benton, Iowa, Johnson, Jones, Linn, and Washington Counties.
- Energy efficiency upgrades will be applied to 12 buildings per year for 5 years.
- Energy efficiency upgrades include package 1, "High-Efficiency Envelope", from the NREL ComStock analysis tool and includes window replacement, exterior wall insulation, and roof insulation.[40]
- Additional energy efficiency upgrade to replace interior lighting with Generation 5 light-emitting diode (LED) lighting[41] was evaluated using NREL ComStock analysis tool.

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[39] https://comstock.nrel.gov/dataviewer/?datasetName=vizstock_comstock_amy2018_r2_2023_by_state_vu

[40] https://nrel.github.io/ComStock.github.io/docs/upgrade_measures/package_1.html

[41] https://www.nrel.gov/docs/fy24osti/86100.pdf

- Generation 5 LED lighting is estimated to last 10 years. The Package 1 upgrades were estimated by NREL to have an effective useful life of at least 20 years.[42]
- It is estimated that each building will cost $50,000 to upgrade. Over the course of 5 years, the projected cost for implementing this priority measure is approximately $3,370,000 including improvements and program delivery.
- Operation and maintenance costs will be minimal, including routine maintenance of public buildings comparable to existing upkeep.

Emission Reduction Estimate Assumptions

The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- Energy savings were estimated using the NREL ComStock analysis tool using Iowa as the state and a building size of 3,000 square feet (ft^2). It was further assumed that 12 buildings would be upgraded per year over the course of 5 years.
- Energy savings were converted to GHG emission reductions in $MTCO_2e$ by using the 2022 eGrid MROW regional emission factor.[43]
- The EPA AVERT tool evaluates how energy efficiency measures lead to changes in emissions of several air pollutants on a regional basis. The total energy savings per year in kWh, calculated with the ComStock analysis tool, was used to calculate co-pollutant reductions. AVERT provides the average fossil emission rates in lb./megawatt-hour (MWh) in the Midwest region. These rates were utilized to calculate cumulative reductions in co-pollutants. The AVERT Excel and web modules were used to estimate yearly emission reductions as part of a quality check.

Reference Case Scenario

The methods used to calculate energy savings by the ComStock anaylsis tool compared energy efficiency upgrades to a business-as-usual scenario.

Measure-Specific Activity Data and Implementation Tracking Metrics

This priority measure proposes to implement energy efficiency improvements in 12 public buildings per year for five years. The number and size of buildings upgraded will be tracked and documented. Depending on the completed upgrades, the NREL ComStock tool or a different, reputable method will be utilized to estimate energy savings and to calculate GHG emission reductions.

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[42] https://www.nrel.gov/docs/fy22osti/80889.pdf
[43] https://www.epa.gov/egrid/data-explorer

GHG and Co-Pollutant Calculations

Energy Savings (Year 1)

$Energy\ savings\ in\ \frac{MWh}{ft^2}\ (NREL\ ComStock\ package\ 1 + LED\ upgrade)\ per\ unit\ x\ 3{,}000\ ft^2$

$Package\ 1: 5.28\ \frac{kWh}{ft^2}\ x\ 3{,}000\ ft^2\ = 15{,}829\ KWh$

$LED\ lighting\ upgrade: 0.85\ \frac{kWh}{ft^2}\ x\ 3{,}000\ ft^2 = 2{,}541\ kWh$

$Total\ energy\ savings\ per\ 3{,}000\ ft^2\ building: 15{,}829\ kWh + 2{,}541\ kWh = 18{,}371\ kWh$

GHG Reductions (Year 1)

$Energy\ savings\ x\ eGRID\ 2022\ MROW\ Emission\ Factor\ (EF)\ x\ 0.001\ \frac{MWh}{kWh}\ x\ 0.000454\ \frac{MT}{lb}\ x\ GWP$

$2022\ eGRID\ MROW\ EF = 936.49\ lb\ \frac{CO_2}{MWh}$

$GWP = 1$

$18{,}371\ kWh\ x\ 936.49\ lb\ \frac{CO_2}{MWh}\ x\ 0.001\ \frac{MWh}{kWh}\ x\ 0.000454\ \frac{MT}{lb}\ x\ 1 = 7.81\ MTCO_2$

$7.81\ MTCO_2e\ x\ 12\ buildings = \mathbf{94\ MTCO_2e}$

Cumulative GHG emission reductions from 2025-2030:

$$\sum_{i=1}^{5} i\ \ x\ Year\ 1\ reductions$$

$$\sum_{i=1}^{5} i\ x\ 94\ MTCO_2e = \mathbf{1{,}406\ MTCO_2e}$$

Cumulative GHG Emission Reductions 2025-2050

$Cumulative\ GHG\ reductions\ from\ 2025 - 2030 + (Year\ 5\ reductions\ x\ 20\ years)$

$Year\ 5\ reductions = Year\ 1\ reductions\ x\ 5$

$1406\ MTCO_2e + (94\ MTCO_2e\ x\ 5)\ x\ 20 = \mathbf{10{,}779\ MTCO_2e}$

Co-Pollutant Reductions from Energy Savings (Year 1)

$$Energy\ savings\ in\ kWh\ x\ \frac{MWh}{1{,}000\ kWh}\ x\ number\ of\ buildings\ upgraded$$

$$18{,}371\ kWh\ x\ \frac{MWh}{1{,}000\ kWh}\ x\ 12\ buildings = 220.5\ MWh$$

$$\sum_{i=1}^{5} i\ x\ Year\ 1\ energy\ savings\ in\ MWh\ x\ AVERT\ emission\ rate\ by\ co-pollutant\ in\ \frac{lb}{MWh}$$

$$\sum_{i=1}^{5} i\ x\ (220.5\ MWh) x\ 1.292\ lb\ \frac{SO_2}{MWh} = \boldsymbol{4{,}272\ lb\ SO_2}$$

$$\sum_{i=1}^{5} i\ x\ (220.5\ MWh\ ) x\ 0.931\ lb\ \frac{NOx}{MWh} = \boldsymbol{3{,}079\ lb\ NOx}$$

$$\sum_{i=1}^{5} i\ x\ (220.5\ MWh) x\ 0.089\ lb\ \frac{PM_{2.5}}{MWh} = \boldsymbol{294\ lb\ PM_{2.5}}$$

$$\sum_{i=1}^{5} i\ x\ (220.5\ MWh) x\ 0.028\ lb\ \frac{VOCs}{MWh} = \boldsymbol{93\ lb\ VOCs}$$

$$\sum_{i=1}^{5} i\ x\ (220.5\ MWh) x\ 0.021\ lb\ \frac{NH_3}{MWh} = \boldsymbol{69\ lb\ NH_3}$$

Cumulative Reduction of Co-Pollutants 2025-2050

$$Cumulative\ co-pollutant\ reductions\ from\ 2025-2030 + (Year\ 5\ reductions\ x\ 20\ years)$$

$$Year\ 5\ reductions = Year\ 1\ reductions\ x\ 5$$

$$220.5\ MWh\ x\ 1.292\ lb\ \frac{SO_2}{MWh}\ x\ 5\ x\ 20 + 4{,}272\ lb\ SO_2 = \boldsymbol{32{,}754\ lb\ SO_2}$$

$$220.5\ MWh\ x\ 0.931\ lb\ \frac{NOx}{MWh}\ x\ 5\ x\ 20 + 3{,}079\ lb\ NOx = \boldsymbol{23{,}602\ lb\ NOx}$$

$$220.5\ MWh\ x\ 0.089\ lb\ \frac{PM_{2.5}}{MWh}\ x\ 5\ x\ 20 + 294\ lb\ PM_{2.5} = \boldsymbol{2{,}256\ lb\ PM_{2.5}}$$

$$220.5\ MWh\ x\ 0.028\ lb\frac{VOCs}{MWh}\ x\ 5\ x\ 20 + 93\ lb\ VOCs = \mathbf{710\ lb\ VOCs}$$

$$220.5\ MWh\ x\ 0.021\ lb\frac{NH_3}{MWh}\ x\ 5\ x\ 20 + 69\ lb\ NH_3 = \mathbf{532\ lb\ NH_3}$$

GHG and Co-Pollutant Emissions Reduced

Implementation of this measure is anticipated to reduce **94** $MTCO_2e$ in the first year with **1,406** cumulative $MTCO_2e$ for the period between 2025 – 2030 and **10,779** cumulative $MTCO_2e$ for the period between 2025 – 2050.

This measure will also provide benefits in reduction of co-pollutants. The following reductions of co-pollutants in lb. were calculated using the EPA AVERT average fossil emission rates.

Table 36. Reduction of Co-Pollutants in lb.

CAP/HAP	Cumulative Reduction	
	2025-2030	2025-2050
Sulfur Dioxide (SO_2)	4,272	32,754
Nitrogen Oxides (NO_x)	3,079	23,602
Particulate matter $PM_{2.5}$	294	2,256
Volatile Organic Compounds (VOCs)	93	710
Ammonia (NH_3)	69	532

Appendix F – Multi-Family Housing Electric Vehicle Charger Installation

This appendix explains the methodology and assumptions used for developing the estimated GHG emissions and co-pollutant emissions reduced for the Multi-Family Housing Electric Vehicle (EV) Charger Installation priority measure included in the East Central Iowa PCAP.

Methods and Assumptions

Emission Reductions Estimate Method

GHG and co-pollutant emissions savings were calculated using the Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Charging and Fueling Infrastructure (CFI) Emissions Tool[44] developed by the Argonne National Laboratory for the U.S. DOE. In addition to GHG emission reductions in tons, AFLEET calculates reductions in lb. for several air pollutants. These pollutants include the following CAPs: carbon monoxide (CO), NO_x, particulate matter less than 10 micrometers (PM_{10}), $PM_{2.5}$, and sulfur oxides (SO_x). AFLEET also accounted for reductions in VOCs.

Models/Tools Used

AFLEET CFI Emissions Tool version 1.1, released April 3, 2023.

Measure Implementation Assumptions

The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- The geographic scope includes Benton, Iowa, Johnson, Jones, Linn, and Washington Counties.
- 12 new Level 2 EV chargers will be installed at multi-family residential buildings per year for 5 years (60 total).
- The EV chargers will have a moderate usage level during years 1-4 and a high usage level in year 5 and beyond.
- Level 2 EV chargers are currently projected to have a lifespan of approximately 10 years.[45]

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[44] https://afleet.es.anl.gov/home/
[45] https://sites.energycenter.org/sites/default/files/docs/nav/transportation/plug-in_sd/Plug-In_SD-EV_Charging_for_Multi-Unit_Dwellings.pdf

- Each Level 2 EV charger is estimated to cost $15,000. Over the course of 5 years, the projected cost for implementing this priority measure is approximately $1,300,000 including improvements and program delivery.
- The U.S. DOE estimates an average maintenance cost of $400 annually per Level 2 EV charger. [46] This cost is in addition to electricity usage charges.

Emission Reduction Estimate Assumptions

The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- Iowa was input as the state of reference in the AFLEET CFI Emissions Tool, which selects the Midwest Reliability Organization (MRO) as the source of electricity.
- According to the AFLEET CFI Emissions Tool, a level 2 EV charger is estimated to provide 60 kWh of electricity per light-duty EV charge using a Level 2 Electric Vehicle Supply Equipment (EVSE) charger.
- Moderate usage of a Level 2 EVSE charger is estimated to include 100 EV charges per year, while high usage is estimated to yield 167 EV charges per year.

Reference Case Scenario

The AFLEET CFI Emissions Tool calculated GHG and co-pollutant emission reductions for each newly installed EV charger. This assessment inherently involves comparing the results to a reference scenario where no new EV chargers are added.

Measure-Specific Activity Data and Implementation Tracking Metrics

This priority measure proposes installing 12 new Level 2 EVSE chargers per year for five years. The chargers are anticipated to see moderate usage in the first four years and then high usage in year five and beyond. The number, type, and utilization of the new chargers will be tracked and documented. Updated GHG and co-pollutant emissions will be calculated using the AFLEET CFI Emissions Tool or another reputable method.

[46] https://afdc.energy.gov/fuels/electricity_infrastructure_maintenance_and_operation.html

GHG and Co-Pollutant Calculations

The AFLEET tool calculated the following reduction in GHG emissions per Level 2 EVSE charger:

Moderate Usage: -3.9 tons CO_2e (3.5 $MTCO_2e$)
High Usage: -6.5 tons CO_2e (5.9 $MTCO_2e$)

GHG emission reductions (Year 1)

$$GHG\ emission\ reductions\ in\ MTCO_2e\ x\ number\ of\ level\ 2\ EVSE\ chargers\ (moderate\ usage)$$

$$3.9\ tons\ CO_2e\ x\ 0.907185\frac{MT}{ton}\ x\ 12\ chargers = \mathbf{42\ MTCO_2e}$$

GHG emission reductions (Years 1-4):

$$\sum_{i=1}^{4} i\ x\ Year\ 1\ GHG\ reductions$$

$$\sum_{i=1}^{4} i\ x\ 42.5\ MTCO_2e = 424.6\ MTCO_2e$$

GHG emission reductions (Year 5)

$$GHG\ emission\ reductions\ in\ MTCO_2e\ x\ number\ of\ level\ 2\ EVSE\ chargers\ (high\ usage)$$

$$6.5\ tons\ x\ 0.907185\frac{MT}{ton} x\ 5\ years\ x\ 12\frac{chargers}{year} = 353.8\ MTCO_2e$$

Cumulative GHG Emission Reductions 2025-2030

$$Years\ 1-4\ reductions + Year\ 5\ reductions$$

$$424.6\ MTCO_2e + 353.8\ MTCO_2e = \mathbf{778\ MTCO_2e}$$

Cumulative GHG Emission Reductions 2025-2050

$$Cumulative\ GHG\ reductions\ from\ 2025-2030 + (Year\ 5\ reductions\ x\ 20\ years)$$

$$778\ MTCO_2e + (353.8\ MTCO_2e\ x\ 20) = \mathbf{7,854\ MTCO_2e}$$

Table 37 displays the annual emission reductions of co-pollutants in lb. per Level 2 EVSE charger, calculated by the AFLEET tool.

Table 37. Reduction of Co-Pollutants per Level 2 EV Charger in lb.

Co-Pollutant	Moderate Usage	High Usage
Carbon Monoxide (CO)	50.6	84.3
Nitrogen Oxides (NO_x)	1.4	2.4
Particulate Matter (PM_{10})	0.18	0.29
Particulate Matter ($PM_{2.5}$)	0.1	0.19
Volatile Organic Compounds (VOCs)	4.6	7.7
Sulfur Oxides (SO_x)	0.02	0.03

Co-Pollutant Reductions (Year 1)

$$Co - pollutant\ reductions\ in\ lb\ x\ number\ of\ level\ 2\ EVSE\ chargers\ (moderate\ usage)$$

Co-Pollutant Reductions (Years 1-4)

$$\sum_{i=1}^{4} i\ x\ Year\ 1\ copollutant\ reductions$$

$$\sum_{i=1}^{4} i\ x\ \ (50.6\ lb\ CO\ x\ 12\ chargers) = 6{,}070\ lb\ CO$$

$$\sum_{i=1}^{4} i\ x\ \ (1.4\ lb\ NOx\ x\ 12\ chargers) = 170.5\ lb\ NOx$$

$$\sum_{i=1}^{4} i\ x\ \ (0.18\ lb\ PM_{10}\ x\ 12\ chargers) = 21.1\ lb\ PM_{10}$$

$$\sum_{i=1}^{4} i\ x\ \ (0.1\ lb\ PM_{2.5}\ x\ 12\ chargers) = 13.6\ lb\ PM_{2.5}$$

$$\sum_{i=1}^{4} i\ x\ \ (4.6\ lb\ VOCs\ x\ 12\ chargers) = 555.3\ lb\ VOCs$$

$$\sum_{i=1}^{4} i\ x\ \ (0.021\ lb\ SOx\ x\ 12\ chargers) = 2.5\ lb\ SOx$$

Cumulative Co-Pollutant Reductions 2025-2030

$$Years\ 1-4\ co-pollutant\ reductions + Year\ 5\ co-pollutant\ reductions$$

$$Year\ 5\ reductions = Co-pollutant\ reductions\ in\ lb\ x\ number\ of\ level\ 2\ EVSE\ chargers\ (high\ usage)$$

$$6{,}070\ lb\ CO + \left(84.3\ lb\ CO\ x\ 5\ years\ x\ 12\frac{chargers}{year}\right) = \mathbf{11,129\ lb\ CO}$$

$$170.5\ lb\ NOx + \left(2.37\ lb\ NOx\ x\ 5\ years\ x\ 12\frac{chargers}{year}\right) = \mathbf{313\ lb\ NOx}$$

$$21.1\ lb\ PM10 + \left(0.29\ lb\ PM_{10}\ x\ 5\ years\ x\ 12\frac{chargers}{year}\right) = \mathbf{39\ lb\ PM_{10}}$$

$$13.6\ lb\ PM2.5 + \left(0.19\ lb\ PM_{2.5}\ x\ 5\ years\ x\ 12\frac{chargers}{year}\right) = \mathbf{25\ lb\ PM_{2.5}}$$

$$555.3\ lb\ VOCs + \left(7.7\ lb\ VOCs\ x\ 5\ years\ x\ 12\frac{chargers}{year}\right) = \mathbf{1,018\ lb\ VOCs}$$

$$2.5\ lb\ SOx + \left(0.03\ lb\ SOx\ x\ 5\ years\ x\ 12\frac{chargers}{year}\right) = \mathbf{4.5\ lb\ SOx}$$

Cumulative Co-Pollutant Emission Reductions 2025-2050

$$Cumulative\ co-pollutant\ reductions\ from\ 2025-2030 + (Year\ 5\ reductions\ x\ 20\ years)$$

$$11{,}129\ lb\ CO + \left(84.3\ lb\ CO\ x\ 5\ years\ x\ 12\frac{chargers}{year}\right) x\ 20 = \mathbf{112,299\ lb\ CO}$$

$$313\ lb\ NOx + \left(2.37\ lb\ NOx\ x\ 5\ years\ x\ 12\frac{chargers}{year}\right) x\ 20 = \mathbf{3,155\ lb\ NOx}$$

$$39\ lb\ PM_{10} + \left(0.29\ lb\ PM_{10}\ x\ 5\ years\ x\ 12\frac{chargers}{year}\right) x\ 20 = \mathbf{391\ lb\ PM_{10}}$$

$$25\ lb\ PM_{2.5} + \left(0.19\ lb\ PM_{2.5}\ x\ 5\ years\ x\ 12\frac{chargers}{year}\right) x\ 20 = \mathbf{251\ lb\ PM_{2.5}}$$

$$1{,}018\ lb\ VOCs + \left(7.7\ lb\ VOCs\ x\ 5\ years\ x\ 12\frac{chargers}{year}\right) x\ 20 = \mathbf{10,273\ lb\ VOCs}$$

$$4.5\ lb\ SOx + \left(0.03\ lb\ SOx\ x\ 5\ years\ x\ 12\frac{chargers}{year}\right) x\ 20 = \mathbf{46\ lb\ SOx}$$

GHG and Co-Pollutant Emissions Reduced

Implementation of this measure is anticipated to reduce **42** $MTCO_2e$ in the first year with **778** cumulative $MTCO_2e$ for the period between 2025 – 2030 and **7,854** cumulative $MTCO_2e$ for the period between 2025-2050.

This measure will also provide benefits in reduction of co-pollutants. The following reductions of co-pollutants in lb. were calculated using the AFLEET CFI Emissions Tool.

Table 38. Reduction of Co-Pollutants (lb.)

CAP/HAP	Cumulative Reduction	
	2025-2030	2025-2050
Carbon Monoxide (CO)	11,129	112,299
Nitrogen Oxides (NO_x)	313	3,155
Particulate Matter PM_{10}	39	391
Particulate Matter $PM_{2.5}$	25	252
Volatile Organic Compounds (VOCs)	1,018	10,273
Sulfur Oxides (SO_x)	4.5	46

Appendix G – Wastewater Treatment Facility Improvements

This appendix explains the methodology and assumptions used for developing the estimated GHG emissions reduced for the wastewater treatment improvements priority measure included in the East Central Iowa PCAP.

The largest cities in the region, including Cedar Rapids and Iowa City, have prioritized improvements to their wastewater treatment facilities. These cities are home to large wastewater treatment plants and are planning to integrate biodigester systems to capture methane, clean it, and inject it into the natural gas grid as renewable natural gas (RNG). These proposed improvements will reduce GHG emissions by capturing more methane from biogas production. More hauled waste will be transported to these systems in order to produce more biogas and this will offset the emissions that would otherwise occur during waste transportation to other locations (such as landfills) or when waste is left in uncovered lagoons.

Methods and Assumptions

Emission Reductions Estimate Method

Iowa City-Specific:
Biogas quantities and quality were developed from existing plant data, including digester gas production data, sludge loading data and mass balances, and estimates of additional digester gas production in the future as a result of codigestion of hauled in industrial wastes. RNG production was developed based on the RNG manufacturer's estimates related to methane capture and uptime of the biogas conditioning equipment.

Biogas amounts are projected to increase over time, both as a result of community growth and as a result of hauled waste additions to the digestion facilities for additional gas production. The gas flow estimates are provided below:

Near Term (through 2030): 52,100 million British thermal units (MMBtu)/year
Long-Term (2030-2050): 54,600 MMBtu/year

Annual emission reduction estimates were then developed using the life cycle approach and an assumed carbon intensity (CI) score for the RNG produced. The assumed CI scores are based on related EPA documents and engineering experience. Below is the description of the approach and calculations. No co-pollutant benefits were included.

Cedar Rapids-Specific:

Biogas quantities and quality were developed from plant mass balance, process models and bench scale pilot information. RNG production was developed based on methane capture and uptime of the biogas conditioning equipment. Below is a summary of the biogas production estimates for Phase 1 and Phase 2.

For Phase 1: 427 standard cubic feet per minute (scfm) * 580 BTU/scf * 1440 min/day * 365 day/year * 97% methane capture * 95% uptime = 120,000 MMBTU/year
For Phase 2: 780 scfm * 580 BTU/scf * 1440 min/day * 365 day/year * 97% methane capture * 95% uptime = 219,000 MMBTU/year

Annual emission reduction estimates were then developed using the life cycle approach and an assumed carbon intensity score for the RNG produced. Below is the description of the approach and calculations. No co-pollutant benefits were included.

Lifecycle Calculations

A lifecycle accounting methodology utilizes the RNG's carbon intensity (i.e., GHG emissions per unit of energy) which varies substantially between feedstocks and production methods. Carbon intensities include methane emission offsets, which reflect the reduced emissions due to a change in production practice or elimination of emission sources like landfill emissions or uncovered farm lagoons. Carbon intensities can also vary by location of production and how the fuel is transported and distributed. For this analysis, the carbon intensity (CI) score for the RNG is assumed to be 30 grams (g) carbon dioxide equivalent (CO_2e)/megajoule (MJ) to compare to the reference CI score of 94.71 g CO_2e/MJ. The calculations are shown below:

$$GHG = GF * (CI_{ref} - CI_{fs}) * E_c * M_c$$

Where,

- GHG: Greenhouse gas emission reduction (metric tons (MT) CO_2e/year)
- GF: Gas flow per year (MMbtu/year)
- CI_{ref}: Reference carbon intensity score = 94.7 *gCO_2e/MJ*
- CI_{fs}: Carbon intensity estimate for RNG feedstock
- E_c: Energy conversion = 1,055 MJ per MMBtu
- M_c: Mass conversion = 1 metric ton per 1,000,000 grams

Therefore, the following GHG emission reductions are projected based on this method.

Iowa City-Specific:

2028 - 2030: 52,100 * (94.7 – 30) * 1055 / 1,000,000 **= 3,667 $MTCO_2e$/year**
= 11,000 $MTCO_2e$

2031-2050: 54,600 * (94.7 – 30) * 1055 / 1,000,000 **= 3,700 $MTCO_2e$/year**
= 74,000 $MTCO_2e$

Cedar Rapids-Specific:

Phase 1: 120,000 * (94.7 – 30) * 1055 * 1 /1,000,000 = **8,191 $MTCO_2e$/year**
Phase 2: 219,000 * (94.7 – 30) * 1055 *1/1,000,000 = **14,948 $MTCO_2e$/year**

Models/Tools Used

Iowa City-Specific:

The estimated biogas production was developed using the existing Iowa City biogas production data, as well as future digestion loading projections and future hauled waste volumes and loadings. This spreadsheet-based model was developed by Strand Associates, Inc.

Cedar Rapids-Specific:

The estimated biogas production was developed using a plant mass balance model. This spreadsheet-based model was developed by HDR Engineering.

Measure Implementation Assumptions

The following key assumptions about measure implementation were used to quantify emissions reductions for this measure.

Iowa City-Specific:

- Geographic Scope: Biogas production, conditioning, and pipeline injection at the Iowa City South Wastewater Treatment Facility.
- Implementation Measure Uptake: The measure will capture 99% of the methane produced in the anaerobic digestion process. The biogas conditioning equipment is anticipated to have an uptime of 95%.
- Implementation Measure Milestones: The RNG and hauled waste acceptance facilities are projected to be on-line by January 1, 2028.
- Measure Lifetime: 2025 to 2050.
- Capital Cost Assumptions: Capital cost opinions were developed as part of conceptual design project for the RNG facilities during the summer of 2023. Manufacturer proposals were solicited to inform the equipment costs, and the local gas utility was consulted for connection locations and utility charges for the project. The overall capital costs are based on +/- 30% estimating value. Approximately 30 million dollars.
- Operational and Maintenance Cost Assumptions: To be determined.

Cedar Rapids-Specific:

- Geographic Scope: Biogas production, conditioning, and pipeline injection at the Cedar Rapids Water Pollution Control Facility.
- Implementation measure uptake: The measure will capture 97% of the methane produced in the anaerobic digestion process. The biogas conditioning equipment is also anticipated to have an uptime of 95%.
- Implementation measure milestones: Phase 1 is scheduled to be completed in late 2026 and Phase 2 will be completed in 2031.
- Measure lifetime: 2025 to 2050.
- Capital Cost Assumptions: Approximately 60 million dollars.
- Operational and maintenance cost assumptions: To be determined.

Emission Reduction Estimate Assumptions

The following key assumptions about emission reductions were used to quantify emission reductions for this measure.

Iowa City-Specific:

1. Biogas Quantities: Anticipated biogas production was developed from the plant's historical gas production data, as well as from estimates of future growth and experience with codigestion operations elsewhere.
2. Biogas Quality: Anticipated biogas quality, including a heating value of 600 BTU/cubic foot, was estimated based on gas sampling and comparable projects.
3. Implementation Costs: Costs were developed from conceptual design layouts, vendor quotations, and discussions with the local gas utility. design drawings and vendor quotes. Operation and maintenance costs were developed from energy costs of electricity, labor costs, and material costs from the vendor provided information and similar projects.
4. RNG Production: RNG production was estimated using an assumed methane capture of 99% and an equipment uptime of 95%, which are the values provided by the biogas conditioning equipment vendor.
5. RNG Carbon Intensity: For the emissions reduction estimates, a CI of the RNG was assumed to be +30gCO_2e/MJ, which is typical for RNG produced from biogas generated at municipal wastewater treatment plants.

Cedar Rapids-Specific:

1. Biogas Quantities: Anticipated biogas production was developed from a plant mass balance and digestion process model. This model assisted with determining the average annual biogas production, in standard cubic feet per minute (scfm), for the Phase 1 project including digestion and biogas conditioning as well as the Phase 2 improvements when the thermal hydrolysis process (THP) is added to improve digester performance.

2. Biogas Quality: Anticipated biogas quality, including a heating value of 580 BTU/cubic foot, was estimated from the anaerobic digestion and THP piloting performed during the study phase of the project.
3. Implementation Costs: Costs were developed from 90% design drawings and vendor quotes. Operation and maintenance costs were developed from energy costs of electricity, labor costs, and material costs from the vendor provided information and similar projects.
4. RNG production: RNG production was estimated using an assumed methane capture of 97% and an equipment uptime of 95% which are the values provided by the biogas conditioning equipment vendor.
5. RNG Carbon Intensity: For the emissions reduction estimates, the CI of the RNG was assumed to be +30gCO_2e/MJ, which is typical for RNG produced from biogas generated at municipal wastewater treatment plant.

Reference Case Scenario

The reference case scenario of not implementing this measure includes the combustion of the biogas through an on-site waste gas flare which results in a reduction of 0.0 MTCO_2e.

Measure-Specific Activity Data and Implementation Tracking Metrics

Metrics tracked for estimated emissions reductions for this measure include measuring and monitoring of RNG injected into the MidAmerican Energy (MEC) Pipeline and sold as vehicle fuel in compliance with the EPA Renewable Fuel Standard program. Monitoring of RNG quantities will be performed with EPA approved gas flow meters and RNG quality and BTU content will be measured with an EPA and MEC approved gas chromatograph. Additional metrics could include calculation and verification of the RNG carbon intensity CI score produced by the facility, which is estimated to be +30gCO_2e/MJ for this application.

GHG Emissions Reduced

Iowa City-Specific:

2028 – 2030:	52,100 * (94.7 – 30) * 1055 / 1,000,000	= 3,667 MTCO_2e/year
		= 11,000 MTCO_2e
2031 – 2050:	54,600 * (94.7 – 30) * 1055 / 1,000,000	= 3,700 MTCO_2e/year
		= 74,000 MTCO_2e
2025 – 2050:	11,000 + 74,000 = **85,000 MTCO_2e**	

Cedar Rapids-Specific:

Implementation of this measure is anticipated to reduce 8,191 $MTCO_2e$ per year from the Phase 1 improvements and 14,948 $MTCO_2e$ from the Phase 2 improvements with 24,573 cumulative $MTCO_2e$ for the period between 2025 – 2030 and 323,533 cumulative $MTCO_2e$ for the period between 2025 – 2050.

2027 – 2029: 8,191 * 3 = **24,573 $MTCO_2e$**
2030 – 2050: 14,948* 20 = 298,960 $MTCO_2e$
2025 – 2050: 24,573 + 298,960 = **323,533 $MTCO_2e$**

Appendix H - Additional GHG Measures Considered for Inclusion

In the stakeholder outreach and engagement process, GHG reduction measures were proposed by local governments and organizations in the region. The following measures were proposed but did not meet the criteria for inclusion in this PCAP.

City/County/Organization	GHG Reduction Measure(s)	Justification
Marion	Electric vehicle charging stations Convert traffic signals from battery to solar Train employees for energy audits	Electric vehicle charging stations project is not implementation ready. Funds from the Energy Efficiency Community Block Grant Program may be used for converting traffic signals to solar. Other resources may be available for training employees for energy audits.
Coralville	Additional public vehicle charging stations	The proposed project is in the Iowa River Landing and may be eligible for Iowa's National Electric Vehicle Infrastructure (NEVI) funds.
North Liberty	Solar installation at city hall and police station	The project is not implementation-ready, and the city is planning to explore financing options for the solar installation similar to other city buildings.
Goodwill of the Heartland	Recycled polyethylene terephthalate (rPET) plant	The organization is not directly eligible to apply for CPRG General Competition Implementation funding, so an eligible entity would need to apply on their behalf. The total project cost does not meet the minimum funding requirement.
Jones County Economic Development	Recycle waste materials into energy products	Proposed project is not implementation ready.

Appendix I - LIDAC Census Block Groups

This appendix explains how low-income and disadvantaged communities (LIDAC) are defined and lists the specific census block groups that meet LIDAC requirements.

Low-income and disadvantaged communities (LIDAC) are defined by the EPA using the Environmental Justice Screening and Mapping Tool (EJScreen), and additional low-income areas are defined using the low- and moderate-income (LMI) criteria for the Community Development Block Grant Program (CDBG) administered by the US Department of Housing and Urban Development (HUD).

To be designated a LIDAC, a census block group must meet the following criteria in EJScreen:

- Located in a census tract that is included as disadvantaged in the Climate & Economic Justice Screening Tool (CEJST),
- Any census block group at or above the 90th percentile for any of EJScreen's Supplemental Indexes when compared to the nation or state, and/or
- Any geographic area within Tribal lands.

To be designated as disadvantaged in the Climate & Economic Justice Screening Tool, a census tract must meet the threshold for at least one of the tool's categories of burden or be within Tribal lands. Categories of burden include:

- Climate change,
- Energy,
- Health,
- Housing,
- Legacy pollution,
- Transportation,
- Water and wastewater, and
- Workforce development.

Table 39. Total LIDAC Census Block Groups by County

County	Total LIDAC Census Block Groups
Benton	0
Iowa	0
Johnson	35
Jones	6
Linn	75
Washington	8

Table 40. East Central Iowa LIDAC Census Block Groups

Block Group	County	CEJST Disadvantaged Criterion	National Supplemental Index Criterion	State Supplemental Index Criterion
191030002001	Johnson	No	No	Yes
191030002003	Johnson	No	Yes	Yes
191030003041	Johnson	No	No	Yes
191030003071	Johnson	No	No	Yes
191030003072	Johnson	No	Yes	Yes
191030003073	Johnson	No	Yes	Yes
191030003074	Johnson	No	No	Yes
191030004011	Johnson	No	Yes	Yes
191030004012	Johnson	No	No	Yes
191030004022	Johnson	No	Yes	Yes
191030005011	Johnson	No	No	Yes
191030005013	Johnson	No	No	Yes
191030005022	Johnson	No	No	Yes
191030006001	Johnson	No	Yes	Yes
191030006002	Johnson	No	No	Yes
191030006003	Johnson	No	Yes	Yes
191030011001	Johnson	No	No	Yes
191030011002	Johnson	No	Yes	Yes
191030011003	Johnson	No	Yes	Yes
191030016011	Johnson	Yes	Yes	Yes
191030016012	Johnson	Yes	Yes	Yes
191030016013	Johnson	Yes	Yes	Yes
191030016021	Johnson	Yes	Yes	Yes
191030016022	Johnson	Yes	No	Yes
191030018011	Johnson	No	Yes	Yes
191030018012	Johnson	No	No	Yes
191030018021	Johnson	Yes	No	Yes
191030018022	Johnson	Yes	No	Yes
191030021001	Johnson	No	Yes	Yes
191030023001	Johnson	No	No	Yes
191030023002	Johnson	No	No	Yes
191030104011	Johnson	No	Yes	Yes
191030104012	Johnson	No	No	Yes
191030104021	Johnson	No	No	Yes
191030105011	Johnson	No	Yes	Yes
191050703022	Jones	No	No	Yes
191050703023	Jones	No	No	Yes
191050704011	Jones	Yes	No	No
191050704012	Jones	Yes	No	No
191050704021	Jones	Yes	No	No
191050704022	Jones	Yes	No	No

Block Group	County	CEJST Disadvantaged Criterion	National Supplemental Index Criterion	State Supplemental Index Criterion
191130001031	Linn	No	Yes	Yes
191130002012	Linn	No	Yes	Yes
191130002013	Linn	No	Yes	Yes
191130002121	Linn	Yes	No	Yes
191130002122	Linn	Yes	No	No
191130002131	Linn	Yes	No	No
191130002132	Linn	Yes	Yes	Yes
191130003001	Linn	No	No	Yes
191130008001	Linn	No	Yes	Yes
191130008002	Linn	No	No	Yes
191130008003	Linn	No	No	Yes
191130008004	Linn	No	No	Yes
191130009011	Linn	No	No	Yes
191130010042	Linn	No	No	Yes
191130010043	Linn	No	Yes	Yes
191130010051	Linn	No	No	Yes
191130010052	Linn	No	Yes	Yes
191130011011	Linn	No	No	Yes
191130011012	Linn	No	No	Yes
191130011013	Linn	No	No	Yes
191130011021	Linn	No	No	Yes
191130011022	Linn	No	No	Yes
191130012001	Linn	Yes	No	Yes
191130012002	Linn	Yes	No	Yes
191130013001	Linn	No	No	Yes
191130013002	Linn	No	No	Yes
191130013003	Linn	No	No	Yes
191130014001	Linn	Yes	Yes	Yes
191130014002	Linn	Yes	No	Yes
191130014003	Linn	Yes	No	Yes
191130017001	Linn	No	No	Yes
191130017002	Linn	No	No	Yes
191130017003	Linn	No	No	Yes
191130017004	Linn	No	No	Yes
191130017005	Linn	No	Yes	Yes
191130018001	Linn	Yes	No	Yes
191130018002	Linn	Yes	No	Yes
191130018003	Linn	Yes	Yes	Yes
191130019001	Linn	Yes	Yes	Yes
191130019002	Linn	Yes	Yes	Yes
191130019003	Linn	Yes	Yes	Yes
191130022001	Linn	Yes	Yes	Yes

Block Group	County	CEJST Disadvantaged Criterion	National Supplemental Index Criterion	State Supplemental Index Criterion
191130022002	Linn	Yes	Yes	Yes
191130023001	Linn	No	No	Yes
191130023002	Linn	No	No	Yes
191130023003	Linn	No	No	Yes
191130023004	Linn	No	No	Yes
191130024001	Linn	No	No	Yes
191130024002	Linn	No	Yes	Yes
191130024003	Linn	No	Yes	Yes
191130025001	Linn	Yes	Yes	Yes
191130025002	Linn	Yes	Yes	Yes
191130025003	Linn	Yes	No	Yes
191130026001	Linn	Yes	Yes	Yes
191130026002	Linn	Yes	No	Yes
191130027001	Linn	Yes	Yes	Yes
191130027002	Linn	Yes	Yes	Yes
191130028001	Linn	No	No	Yes
191130028002	Linn	No	No	Yes
191130028003	Linn	No	No	Yes
191130029001	Linn	No	No	Yes
191130029002	Linn	No	No	Yes
191130029003	Linn	No	Yes	Yes
191130029004	Linn	No	Yes	Yes
191130030031	Linn	No	No	Yes
191130030032	Linn	No	No	Yes
191130030041	Linn	No	Yes	Yes
191130030042	Linn	No	No	Yes
191130030043	Linn	No	Yes	Yes
191130030051	Linn	No	No	Yes
191130030052	Linn	No	No	Yes
191130030053	Linn	No	No	Yes
191130030054	Linn	No	No	Yes
191130030062	Linn	No	No	Yes
191130030063	Linn	No	No	Yes
191839602005	Washington	No	No	Yes
191839603001	Washington	Yes	No	No
191839603002	Washington	Yes	No	No
191839603003	Washington	Yes	No	No
191839604001	Washington	Yes	No	No
191839604002	Washington	Yes	No	No
191839604003	Washington	Yes	No	Yes
191839604004	Washington	Yes	No	No

Using criteria for the Community Development Block Grant Program (CDBG), low- to moderate-income (LMI) census blocks have at least 51 percent of residents who are considered a low- and moderate-income person based on data from the American Community Survey (ACS) or a local income survey. Widely available ACS data was used in this LIDAC analysis, so additional census blocks in the region may be designated LMI with a local income survey. These areas should also be considered when identifying communities to focus projects for the CPRG Implementation Grants General Competition.

Table 41. Total Low- to Moderate-Income Census Block Groups per County

County	Total LMI Census Block Groups
Benton	4
Iowa	2
Johnson	29
Jones	3
Linn	49
Washington	5

Table 42. Low- to Moderate-Income Census Block Groups

County	Block Group	LMI Percent
Benton	190119607002	63.43%
Benton	190119607003	67.17%
Benton	190119603003	72.00%
Benton	190119603002	88.64%
Iowa	190959602004	51.25%
Iowa	190959602003	51.71%
Johnson	191030012002	52.51%
Johnson	191030018021	53.35%
Johnson	191030104004	54.17%
Johnson	191030017001	55.15%
Johnson	191030005002	56.33%
Johnson	191030002002	56.83%
Johnson	191030017002	57.72%
Johnson	191030001002	58.97%
Johnson	191030002001	65.08%
Johnson	191030023001	65.35%
Johnson	191030003023	66.13%
Johnson	191030018012	67.01%
Johnson	191030004002	67.70%
Johnson	191030003021	68.71%
Johnson	191030003024	74.44%
Johnson	191030018022	75.54%

County	Block Group	LMI Percent
Johnson	191030006002	77.00%
Johnson	191030017003	77.21%
Johnson	191030018011	77.33%
Johnson	191030016001	78.15%
Johnson	191030016004	80.16%
Johnson	191030002003	86.71%
Johnson	191030006001	87.07%
Johnson	191030011001	87.71%
Johnson	191030011002	91.35%
Johnson	191030021001	92.43%
Johnson	191030016003	94.00%
Johnson	191030003025	95.36%
Johnson	191030016002	96.84%
Jones	191050703001	53.21%
Jones	191050706002	53.21%
Jones	191050704001	53.68%
Linn	191130010023	51.75%
Linn	191130003001	52.36%
Linn	191130101003	52.53%
Linn	191130025001	52.80%
Linn	191130004004	53.05%
Linn	191130009013	53.54%
Linn	191130024003	53.83%
Linn	191130011021	54.40%
Linn	191130005001	54.47%
Linn	191130002013	55.61%
Linn	191130008004	55.68%
Linn	191130024001	56.73%
Linn	191130024002	56.81%
Linn	191130005002	57.14%
Linn	191130002012	57.24%
Linn	191130014001	57.95%
Linn	191130023004	58.54%
Linn	191130006001	58.72%
Linn	191130008002	58.77%
Linn	191130012001	60.00%
Linn	191130012002	60.47%
Linn	191130008001	60.59%
Linn	191130023002	61.58%
Linn	191130002073	62.04%
Linn	191130026001	63.99%
Linn	191130017003	64.10%

County	Block Group	LMI Percent
Linn	191130023001	65.12%
Linn	191130010031	65.80%
Linn	191130018003	67.09%
Linn	191130025002	67.12%
Linn	191130013002	67.42%
Linn	191130018002	67.61%
Linn	191130009011	68.51%
Linn	191130022001	69.42%
Linn	191130014002	69.86%
Linn	191130027002	71.61%
Linn	191130010033	72.87%
Linn	191130002011	73.91%
Linn	191130029003	76.13%
Linn	191130030022	77.10%
Linn	191130026002	77.44%
Linn	191130017005	80.09%
Linn	191130027001	83.03%
Linn	191130022002	83.12%
Linn	191130010034	86.84%
Linn	191130019001	88.79%
Linn	191130019003	90.48%
Linn	191130019002	93.18%
Linn	191130029004	94.98%
Washington	191839601003	51.10%
Washington	191839603001	51.81%
Washington	191839602004	52.81%
Washington	191839603002	64.02%
Washington	191839604002	68.83%

Table 42. LIDAC Census Block Groups in Cedar Rapids and Iowa City Areas

Cedar Rapids	Iowa City
191130002132	191030004011
191130008001	191030004012
191130008002	191030004022
191130008003	191030005013
191130008004	191030005022
191130009011	191030006001
191130010042	191030006002
191130010043	191030006003
191130010051	191030011001
191130010052	191030011002
191130011013	191030011003

Cedar Rapids	Iowa City
191130011021	191030016011
191130011022	191030016012
191130013001	191030016013
191130013002	191030016021
191130013003	191030016022
191130014002	191030018011
191130017001	191030018012
191130017002	191030021001
191130017003	191030023001
191130017004	191030023002
191130017005	191030104011
191130018002	191030105011
191130018003	
191130019001	
191130019003	
191130022001	
191130022002	
191130023003	
191130024001	
191130024002	
191130024003	
191130025002	
191130026001	
191130026002	
191130027001	
191130027002	
191130028001	
191130028002	
191130028003	
191130029001	
191130029002	
191130029003	
191130029004	
191130030031	
191130030032	
191130030041	
191130030042	
191130030043	
191130030051	
191130030052	
191130030054	
191130030062	
191130030063	
191130001031	

Cedar Rapids	Iowa City
191130003001	
191130002132	
191130002122	
191130002131	
191130002012	
191130002013	
191130009011	
191130002013	