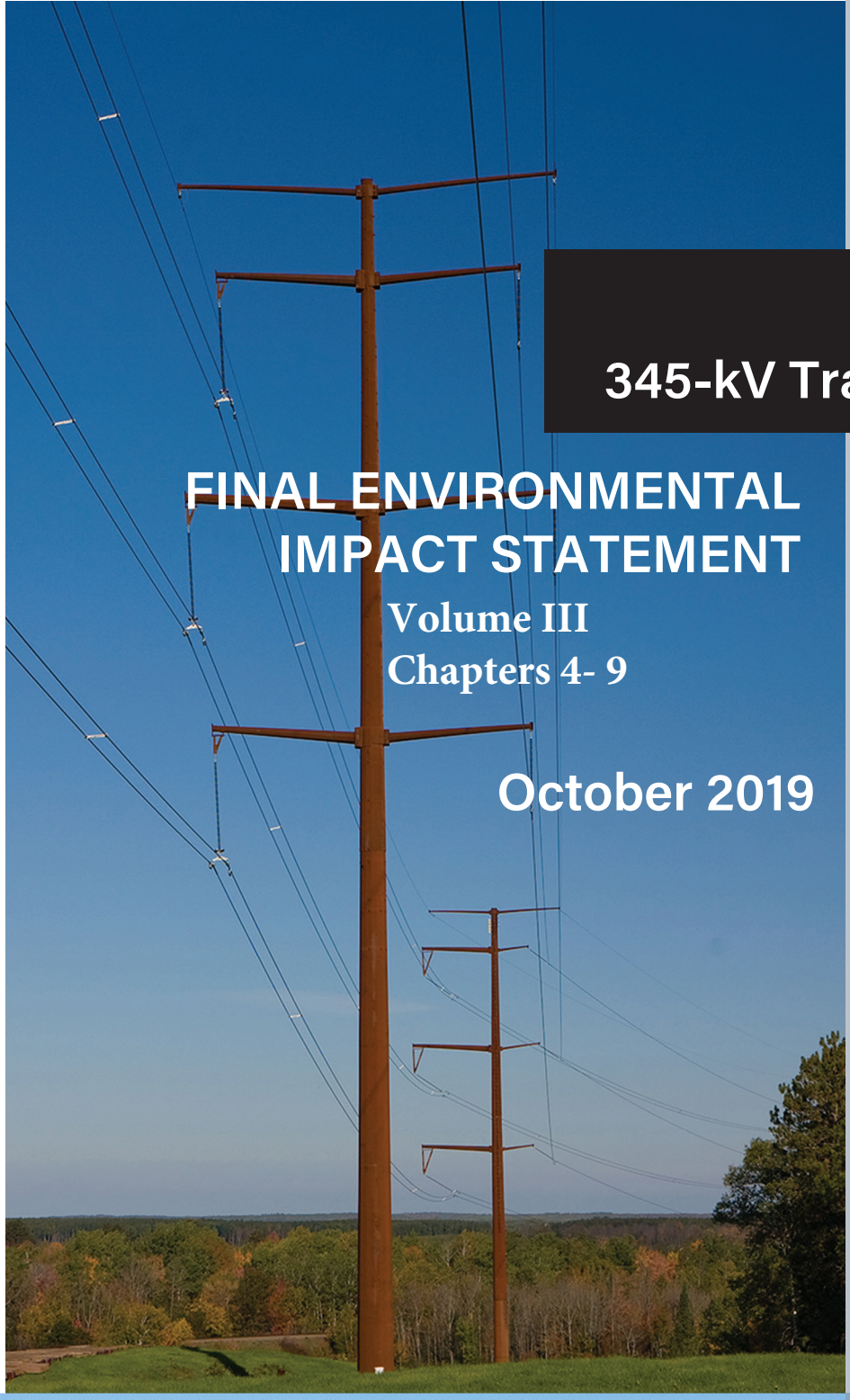

Cardinal-Hickory Creek 345-kV Transmission Line Project

FINAL ENVIRONMENTAL IMPACT STATEMENT

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Chapters 4- 9

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U.S. Department of Agriculture,
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Cooperating Agencies:

U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency

USDA

US Army Corps of Engineers

U.S. FISH & WILDLIFE SERVICE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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CHAPTER 4. CUMULATIVE IMPACTS AND OTHER REQUIRED CONSIDERATIONS

4.1 INTRODUCTION

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertake such other actions" (40 CFR 1508.7). CEQ interprets this regulation as referring only to the cumulative impact of the direct and indirect effects of a proposed action and its alternatives when added to the aggregate effects of past, present, and reasonably foreseeable future actions (CEQ 2005). CEQ regulations implementing NEPA require the assessment of cumulative impacts be taken into consideration in the decision-making process for Federal projects, plans, and programs. Cumulative impacts need to be analyzed in a meaningful manner that considers the specific resource, ecosystem, and human community being affected by the alternatives and should be considered for all alternatives, including the No Action Alternative (CEQ 1997).

4.2 CUMULATIVE IMPACTS METHODOLOGY

The cumulative impacts analysis done for this FEIS is consistent with CEQ regulations and considers the environmental impacts of the alternatives when added to impacts of past, present, and reasonably foreseeable future actions for each resource for which direct and indirect impacts were identified in Chapter 3. These steps were followed to analyze cumulative impacts in this FEIS:

1. Identify resources affected and summarize the types of direct and indirect impacts to each resource from the C-HC Project, as described in Chapter 3.
2. Establish resource-specific spatial and temporal boundaries for analyzing cumulative impacts. Spatial boundaries delineate the area where past, present, and reasonably foreseeable future actions have taken place, are taking place, or could take place and result in cumulative impacts on the affected resource when combined with the impacts of the alternatives being considered. Table 4.2-1 provides an overview of the spatial boundary for each resource area. The temporal boundary describes how far into the past and forward into the future actions should be considered in the impact analysis. The temporal boundary for resources analyzed in the EIS is the estimated duration of impacts, which for most resources is the life of the C-HC Project (estimated to be 60 years). A few resources that would only result in direct or indirect impacts during the construction period of the C-HC Project have shorter temporal boundaries for cumulative impacts analysis.
3. Identify the cumulative action scenario (presented in Section 4.3), which includes looking at the present and reasonably foreseeable future actions to be included in the impact analysis for each specific resource identified. The cumulative effects of past actions are accounted for in the description of the affected environment presented for each resource in Chapter 3; therefore, no past projects are included in the cumulative action scenario.
4. Identify the types of cumulative impacts (direct/indirect from the C-HC Project + incremental impacts from the projects listed in the cumulative action scenario) that could result for each resource impacted by the C-HC Project. For many projects in the cumulative scenario, it was not possible to assess the context and intensity of each incremental impact due to lack of project-specific details available. Therefore, RUS estimated the acreages of projects listed in the cumulative action scenario that overlap with each spatial boundary. For example, there are

approximately 467,146 acres of present and reasonably foreseeable future projects within the geology and soils cumulative action analysis area. The 467,146 acres is the sum of all estimated project areas that overlap the cumulative impact spatial boundary for soils and geology. This approach provides context for the types and level of cumulative impacts likely to occur for each resource.

Table 4.2-1. Cumulative Impact Spatial Boundaries by Resource Area

Affected Resource	Cumulative Impact Spatial Boundary
Geology and Soils	The spatial boundary is the seven HUC-8 watersheds crossed by the C-HC Project alternatives. **Rationale:** The direct and indirect impacts to geology and soils would occur within and immediately adjacent to the proposed C-HC Project ROW. These short-term, moderate and long-term, minor impacts could contribute to adverse cumulative watershed impacts through movement of water over the land surface and geologic features. Section 4.4.1 analyzes these potential cumulative impacts.
Vegetation, including Wetlands and Special Status Plants	The spatial boundary is the Savanna and Coulee Sections of the Driftless Area Ecoregion bounded to the north by where the Turkey and Wisconsin Rivers join the Mississippi River. **Rationale:** The direct and indirect impacts to vegetation would occur within and immediately adjacent to the proposed C-HC Project ROW. These moderate (short- and long-term) impacts could contribute to adverse cumulative vegetation and wetland impacts within these ecoregions. Section 4.4.2 analyzes these potential cumulative impacts.
Wildlife, including Special Status Species	The spatial boundary is the Savanna and Coulee Sections of the Driftless Area Ecoregion bounded to the north by where the Turkey and Wisconsin Rivers join the Mississippi River. **Rationale:** The direct and indirect impacts to wildlife would occur within and immediately adjacent to the proposed C-HC Project ROW. These short-term, minor and long-term, moderate impacts could contribute to adverse cumulative wildlife impacts within these ecoregions. Section 4.4.3 analyzes these potential cumulative impacts.
Water Resources and Quality	The spatial boundary is the seven HUC-8 watersheds crossed by the C-HC Project alternatives. **Rationale:** The direct and indirect impacts to water resources would occur within and immediately adjacent to the proposed C-HC Project ROW. These minor short-term impacts could contribute to adverse cumulative watershed impacts. Section 4.4.4 analyzes these potential cumulative impacts.
Air Quality and Climate Change	The spatial boundary for air quality is a 5-mile area surrounding the Proposed Action alternatives. The spatial boundary for climate change is the United States, to allow for comparison to the U.S. greenhouse gas emissions estimates. **Rationale:** The minor, short-term direct and indirect adverse impacts to air quality would not extend beyond the 5-mile analysis area. Therefore, it is appropriate to analyze cumulative impacts within the same spatial boundary as direct and indirect impacts for the C-HC Project. Section 4.4.5 analyzes these potential cumulative impacts.
Noise	The spatial boundary is a 2-mile analysis area that encompasses the proposed ROW along each alternative. **Rationale:** The minor, short-term adverse direct and indirect noise impacts would not extend beyond the 2-mile analysis area. Therefore, it is appropriate to analyze cumulative impacts within the same spatial boundary as direct and indirect impacts for the C-HC Project. Section 4.4.6 analyzes these potential cumulative impacts.
Transportation	The spatial boundary is a 5-mile area surrounding the Proposed Action alternatives. **Rationale:** The minor, short-term and moderate, long-term direct and indirect adverse impacts to transportation would not extend beyond the 5-mile analysis area described in Section 3.8. Therefore, it is appropriate to analyze cumulative impacts within the same spatial boundary as direct and indirect impacts for the C-HC Project. Section 4.4.7 analyzes these potential cumulative impacts.

Affected Resource	Cumulative Impact Spatial Boundary
Cultural and Historic Resources	The spatial boundary is a 2,000-foot analysis area that encompasses the proposed ROW along each alternative. **Rationale:** The potential for direct and indirect adverse impacts to cultural resources would not extend beyond the 2,000-foot analysis area. Therefore, it is appropriate to analyze cumulative impacts within the same spatial boundary as direct and indirect impacts for the C-HC Project. Section 4.4.8 analyzes these potential cumulative impacts.
Land Use, including Agriculture and Recreation	The spatial boundary is Dane, Iowa, Lafayette, and Grant Counties in Wisconsin, and Clayton and Dubuque Counties in Iowa. **Rationale:** The short-term, moderate and long-term, major adverse impacts to land use would not occur outside of the six-county analysis area for the C-HC Project. Therefore, it is appropriate to analyze cumulative impacts within the same spatial boundary as direct and indirect impacts for the C-HC Project. Section 4.4.9 analyzes these potential cumulative impacts.
Visual Quality and Aesthetics	The spatial boundary is a 2-mile area surrounding the Proposed Action alternatives. **Rationale:** The minor to major long-term direct and indirect adverse impacts to visual resources would not extend beyond the 2-mile analysis area described in Section 3.11. Therefore, it is appropriate to analyze cumulative impacts within the same spatial boundary as direct and indirect impacts for the C-HC Project. Section 4.4.10 analyzes these potential cumulative impacts.
Socioeconomics and Environmental Justice	The spatial is Dane, Iowa, Lafayette, and Grant Counties in Wisconsin, and Clayton and Dubuque Counties in Iowa. **Rationale:** The short-term, moderate and long-term, minor adverse impacts to socioeconomic conditions would not occur outside of the six-county analysis area for the C-HC Project. Therefore, it is appropriate to analyze cumulative impacts within the same spatial boundary as direct and indirect impacts for the C-HC Project. Section 4.4.11 analyzes these potential cumulative impacts.
Public Health and Safety	The spatial boundary is a 300-foot analysis area that encompasses the proposed ROW and substations along each alternative. **Rationale:** The minor, long-term adverse direct and indirect impacts to public health and safety would not extend beyond the 300-foot analysis area, as described in Section 3.13. Therefore, it is appropriate to analyze cumulative impacts within the same spatial boundary as direct and indirect impacts for the C-HC Project. Section 4.4.12 analyzes these potential cumulative impacts.
Upper Mississippi River National Wildlife and Fish Refuge	The spatial boundary is Pool 11 of the Refuge, which is between Lock and Dam 10 (upstream) and Lock and Dam 11 (downstream) on the Mississippi River. **Rationale:** The direct and indirect impacts to the Refuge would occur within and immediately adjacent to the proposed C-HC Project ROW. These impacts could contribute to adverse cumulative impacts with Pool 11. Section 4.4.13 analyzes these potential cumulative impacts.

4.3 CUMULATIVE ACTION SCENARIO

The cumulative action scenario in Table 4.3-1 describes the present and reasonably foreseeable future actions that are included in the cumulative impact analysis area for each affected resource identified in Chapter 3. Thirty projects or actions have been identified that when combined with the proposed C-HC Project may result in cumulative impacts. The cumulative effects of past actions are accounted for in the description of the affected environment presented for each resource in Chapter 3; therefore, no past projects are included in the cumulative action scenario. For the purpose of this analysis, "reasonably foreseeable" actions are considered where there is an existing decision (e.g., record of decision or issued permit), a commitment of resources or funding, or a formal proposal (e.g., a permit request). Actions that are highly probable based on known opportunities or trends (e.g., residential development in urban areas) are also considered. Speculative future developments (such as those that are not formally proposed or do not have enough project details to inform analysis) are not considered.

Table 4.3-1. List of Present and Reasonably Foreseeable Future Projects Considered in the Cumulative Impact Analysis

Project Name	Estimated Project Size	Project Location	Project Description	Anticipated Project Schedule
Montfort Wind Project	2,500 acres	Eden, Iowa County, WI	Existing wind generation facilities: 30-MW wind electric generation facility comprising 20 GE 1.5-MW Model S wind turbines (PSCW 2019).	2019–2020
Red Barn Wind Project	Over 10,000 acres	Grant County, WI	Proposed wind generation facilities with generating capacity of under 100 MW and would consist of approximately 25 turbines with capacities of between 2.0 to 4.2 MW each. The proposed project would utilize equipment such as wind turbines, access roads, and underground connector lines, among others. The proposed wind turbines would be between 459 and 656 feet tall. The project would interconnect at a new substation tap located adjacent to the existing Lancaster to Eden 138-kV transmission line (PSCW 2019).	2019–2021
Sugar River Wind Project	5,870 acres	Jefferson, Green County, WI	Wind farm project with capacity of 65 MW. The number of acres expected to be taken out of agricultural production following project completion is expected to be approximately 24 acres of the 5,870-acre project area (EDF Renewables 2019).	2019–2021
Badger Hollow Solar Farm	3,500 acres of leased land within a 10,700-acre project area	Cobb, Iowa County, WI	New solar electric generating facility with capacity of 300 MW, authorized by PSCW in April 2019. Project is expected to be constructed in two 150-MW halves with the second half to be developed later. The project will utilize equipment such as solar photovoltaic (PV) panels, inverters, and underground connector lines, among others. Coincident with this project will be the development of an approximately 5-mile-long, 138-kV generator tie-line to interconnect the project with the existing electric transmission system at a new substation that will be located directly north of the project area, adjacent to the existing Eden to Spring Green 138-kV transmission line. An environmental assessment (EA) was also prepared by PSCW (PSCW 2019).	2019–2023
Dane County Regional Airport Solar Farm	41 acres	Dane County, WI	A solar energy site is currently being proposed for just north of the Dane County Regional Airport in south-central Wisconsin. The project site is 41 acres, and the project is anticipated to generate 8 MW of electricity from 20,000 solar panels. The project requires approvals from the Federal Aviation Administration and the PSCW (Renew Wisconsin 2018; *Wisconsin State Journal* 2018a).	If approved, construction is expected to begin in 2019.
J870 and J871 solar projects	Unknown	Iowa County, WI	The J870 and J871 solar projects are being developed in southwestern Wisconsin. The J870 is a 200-MW facility and the J871 is a 100-MW facility.	Both are expected to be in service by September 10, 2021.

Project Name	Estimated Project Size	Project Location	Project Description	Anticipated Project Schedule
ATC wind and solar projects: J584, J807, J818, J819, J835, J850, J855, J947; J1000; J1003; J1053; J1127; J1129; J1154; J1188; and J1171	Unknown	Dodge, Grant, Green, Iowa, Jefferson, Lafayette, and Rock Counties, WI	Proposed projects in the generation queue from ATC by county: Dodge: - J1171 100 MW of solar with a 138-kV interconnect (2020); J1003 50 MW of solar with 69-kV interconnect (2021) Grant: - J947 and J1000 50 MW each with 138-kV interconnects (2020) Green: - J584 60 MW of wind with 69-kV interconnect (2019); J825 99.9 MW of wind with 138-kV interconnect (2020); J1127 50 MW of solar with 138-kV interconnect (2021) Iowa: - J855 100 MW of wind with 138-kV interconnect (2019) Jefferson: - J818 149 MW of solar with 138-kV interconnect (2019); J1053 400 MW of solar with -149-kV interconnect (2020); kVJ1154 200 MW of solar with 138-kV interconnect (2021) Lafayette: - J807 41.4 of wind with 138-kV interconnect (2020); J819 99.9 MW of wind with 138-kV interconnect (2020) Rock: - J850 250 MW of solar with 138-kV interconnect (2021); J1129 65 MW of solar with 138-kV interconnect (2021); J1188 50 MW of solar with 69-kV interconnect (2020) (ATC 2018)	2019–2021

Project Name	Estimated Project Size	Project Location	Project Description	Anticipated Project Schedule
Existing electric transmission infrastructure	7,300 acres	Throughout the spatial boundaries shown in Table 4.2-1	High-voltage electric transmission lines, substations, and electric distribution lines include: - Existing Montfort Wind Farm, a 30-MW wind electric generation facility comprising 20 GE 1.5-MW Model S wind turbines. Each turbine has a hub height of 213 feet with a rotor diameter of 231 feet, for a total blade tip height of approximately 329 feet. - Several 138-kV and 69-kV electric transmission lines, which typically occupy a ROW of 80 to 150 feet in width or more, depending on a number of factors including operating voltage and line configuration. Structures typically range from 60 to 120 feet tall with span lengths of up to 1,000 feet, depending on terrain and other variables. - Electric substations typically include fenced-in areas containing electrical transformers for converting voltage from one level to another, electrical switching and circuit protection equipment, and buswork to electrically connect the various circuits and equipment. Substations typically occupy parcels which range in size from under 1 acre to 10 or more acres. - Electric distribution facilities typically connect substations to customer load and comprise primary- and secondary-voltage electric distribution lines. Other electric distribution equipment includes switches, capacitors, transformers, lightning protection devices, and fusing, among other less-common elements. Electric distribution lines can be constructed using either overhead or underground configurations (PSCW 2019).	Existing
Dairyland transmission projects	1,114 acres	Throughout the spatial boundaries shown in Table 4.2-1	Proposed future transmission line and associated infrastructure improvements include: - Rebuild of LN153 Sand Ridge-Lancaster 69-kV line - Partial rebuild of LN8 Decorah-Postville 69-kV line - New LN196 Platteville Tap Line (69-kV) - Rebuild of lN177 Castle Rock Tap (69-kV) - Partial rebuild of N96 Bell Center-Lancaster 69-kV line - Partial rebuild of LN6 Lancaster-Bell Center-Gays Mill 69-kV line	2019–2025

Project Name	Estimated Project Size	Project Location	Project Description	Anticipated Project Schedule
ATC transmission projects	2,238 acres	Throughout the spatial boundaries shown in Table 4.2-1, only in Wisconsin.	Proposed future transmission line and associated infrastructure improvements include: - New substation in Green County, WI - Rebuild of the Sheepskin-Stoughton 69-kV line - Rebuild of Lone Rock – Boscobel 69-kV line - Rebuild of Hillman-Darlington 138-kV line - Rebuild of X-6 Portage-Staff Substation 138-kV line - Rebuild of X-98 Staff-North Randolph Substation 138-kV line - New T-D Alliant Energy substation in Dane County (Line 13998) - Construction of Edgerton T-D substation - Partial rebuild of Portage-Trienda 138-kV line - West Riverside GIC J390 Kittyhawk substation - Badger-Coulee Transmission Line segments 1–3	2019–2025
ITC transmission projects	862 acres	Throughout the spatial boundaries shown in Table 4.2-1.	Proposed future transmission line and associated infrastructure improvements include: - Removal of Sand Springs – Hopkinton 34-kV lines - New Marion South tap lines (69-kV) - Partial rebuild/upgrade of Oak Hill-Marion 69-kV line - Partial rebuild of Hazleton-Mitchell 345-kV line - Partial rebuild of Wyoming-Wyoming REC 69-kV line - Partial rebuild of Wyoming-Dixon 69-kV line - Partial rebuild of Wyoming-Bennet 69-kV line - New North Liberty-Tharp 69-kV line - New North Liberty-Fairfax 3161kv line - New Morgan Valley-New Beverly 345/161-kV line - Rebuild of Oelwein-Fairbank 69-kV line - New Marion South substation (69-kV) - New Morgan Valley substation (345-kV) - New Beverly substation (345/161-kV)	2019–2025

Project Name	Estimated Project Size	Project Location	Project Description	Anticipated Project Schedule
Alliant Energy Center Campus Master Plan	1.7 acres	Madison, Dane County, WI	$30 million for redevelopment of the Alliant Energy Center. Approximately 500 lineal feet of reconstructed roadway with enhanced sidewalks and crosswalk improvements. Estimated costs of $77,395,000 for expansion of the 74,000-square foot exhibition hall, includes site preparation, building expansion, a new parking lot, landscaping, stormwater improvements, and a new entry drive and drop-off area. This project is part of a 30-year Master Plan (Alliant Energy Center 2018).	2019–2024 (Phase I)
Dane County / Madison local recreation projects	2,000 acres of parks	Dane County, WI	These local projects include expanded bike lanes and paths and include part of a bridge and underpass in the Capital City Trail; a 12-mile bike path in the North Mendota Trail; Ice Age Junction Path: 2 miles of bike paths along County M; and a 1-mile path along the West Towne Path from High Point Road to Grand Canyon Drive (*The Capital Times* 2016).	2018–2020
Highway M improvements	2.8 miles; All work is assumed to occur in existing Department of Transportation (DOT) ROW, so no new disturbance anticipated.	Madison and Verona, Dane County, WI	Project to improve safety and operational deficiencies of County Highway M. Project is identified in the Madison Area Transportation Planning Board 2016-2020 Transportation Improvement Program – Major Projects. The Transportation Improvement Program proposes complete reconstruction of County M from Cross Country Road to County S in four separate phases. Two phases have already been designed and constructed. The two phases are similar in length and comprise the 2.86-mile project. The south phase includes the 1.39-mile section from Cross Country Road to 2,500 feet north of County PD. The north phase includes the Midtown Road intersection in this 1.47-mile section from 2,500 feet north of County PD intersection to Prairie Hill Road. This northern section will connect to the existing roundabout and facilities located at County M/Valley View Road. The reconstruction includes earthwork, storm sewer, sanitary sewer, water main, base aggregate, concrete curb and gutter, concrete sidewalk, hot-mix asphalt pavement, bridge structures, retaining walls, street lighting, and traffic signals. An EA was done in 2016 (City of Madison 2019).	2019
Dane County restoration projects	16.5 miles of trail and 179 acres	Dane County, WI	The Capital City Trail Pavement Restoration is a 3-year project that will upgrade and improve approximately 10 miles of trail. Other restoration projects in Dane County funded by grants from the Dane County Land & Water Resources Department Grant Projects include restoration projects for the following areas: Badger Mill Creek Natural Resource Area (13 acres); Cherokee Marsh Natural Resource Area (106 acres); Patrick Marsh Natural Resource Area (25 acres); and South Waubesa Wetlands Natural Resource Area (35 acres) (Dane County Parks 2018).	2018–2020

Project Name	Estimated Project Size	Project Location	Project Description	Anticipated Project Schedule
WisDOT planning studies – U.S. Route 14 (U.S. 14) corridor	All work is assumed to occur in existing DOT ROW, so no new disturbance anticipated	WIS 78 to U.S. Route 12/14, Mazomanie to Middleton, Dane County, WI	The study states that the majority of U.S. 14 mainline is to be maintained as a two-lane facility. Within the C-HC Project limits, intersection improvements were recommended at Stagecoach Road, Cleveland Road, and Rocky Dell. Stagecoach Road intersection improvements were made recently along with centerline/shoulder rumble strips between Stagecoach Road and Twin Valley Road. An Access Management Plan is also included in the study. Within the C-HC Project limits, potential new roadway intersections, removal of driveway access, road closures, and frontage roads are recommended.	Study was completed in 2010. Implementation of the transportation project is likely to occur sometime during the C-HC Project life.
WisDOT planning studies – U.S. Route 18/151 corridor	29 miles; 479.8 acres	U.S. Route 18/151 corridor Dodgeville to Verona, Iowa and Dane Counties, WI	Conversion of 28 miles to freeway. The Proposed Action (Preferred Alternative) would add a total of four new interchanges, seven grade-separated crossings (two underpasses and five overpasses), 21 miles of new and altered local roads, and one pair auxiliary lanes approximately 0.5 mile in length. Approximately 70 at-grade crossing would be eliminated along the corridor. The two-lane county roads would have a traveled way width of 20–24 feet and shoulder width of 2–6 feet. Town roads would have a traveled way width of 20–22 feet and a shoulder width of 3–6 feet. The corridor is divided into six sections (south to north), five of which are within the limits of the C-HC Project area.	EA completed in 2013; WisDOT mapping phase interrupted by need to revisit EA due to a development near the proposed alternative in study near Barneveld. All sections can be designed and constructed independently of the others or any combination when funding becomes available.
WisDOT Improvement Program	0.9 mile	U.S. Route 18/151, Dodgeville to Verona, Iowa and Dane Counties, WI U.S. 14, Middleton to Cross Plains, Dane County, WI U.S. 61, Lancaster, Grant County, WI	U.S. Route 18/151 - A new interchange construction project on the west side of Ridgeway at U.S. Route 18/151 and County ID was completed in 2018 - Resurfacing project scheduled for 2022 from Dodgeville to Mount Horeb on U.S. Route 18/151 - Pavement replacement/bridge deck overlay in from State Trunk Highway 23 to U.S. 18 - New County Salt Storage Facility, south of the U.S. Route 151/County Trunk Highway O interchange or along the east side of U.S. 151 just north of the State Trunk Highway 23 interchange U.S. Route 18/151 - Install new cable guard on U.S. 18 between Lunde Lane and County Trunk Highway PB U.S. 14 - Mill and overlay of U.S. 14 from Cross Plains to Middleton U.S. 61 - Mill and overlay of U.S. 61 from Dickeyville to Lancaster (WisDOT 2019b)	2017–2022

Project Name	Estimated Project Size	Project Location	Project Description	Anticipated Project Schedule
Southwest Wisconsin Grassland and Stream Conservation Area	12,000 acres	Grasslands west and south of Mount Horeb extending into Iowa and Lafayette Counties, WI	The WDNR proposes to protect 12,000 acres (through fee title and easement) across the 473,900-acre project area. Acreage goals may be adjusted at a later date to according to adaptive management and strategic habitat conservation goal (WDNR 2019b).	Unknown
Rail expansion project by Pattison Sand Company	Estimated 170 acres	Clayton, IA	The Iowa DOT approved more than $1,100,000 in funding to support a rail-expansion project by Pattison Sand Company for the creation of 3,300 feet of track and 78 additional railcar spots (Iowa DOT 2017).	Anticipated 2019–2022
Proving Grounds Recreation Area	137-acre park	North Dubuque, Dubuque County, IA	Crews began working on park projects and have added a paved parking area, restrooms, and a pavilion. Upcoming work includes building a 7.5-mile mountain bike trail system and an 18-hole disc golf course. The development costs, which are expected to total about $300,000, will be covered by the county, state grants, and fundraising. The mountain-biking trail will be the third in Dubuque County, along with one in Asbury's Cloie Creek Park and another being completed at the Interstate Power Co. Forest Preserve (*Telegraph Herald* 2019).	Unknown
Pinnacle Dairy feedlot	128-acre site	50 miles south of Madison in Green County, WI	The WDNR approved a permit for a dairy feedlot that would generate an estimated 95 million gallons of manure and wastewater annually in the Sugar River watershed about 40 miles south of Madison. The Pinnacle Dairy feedlot will keep 5,800 cows on a 128-acre site in Green County (*Wisconsin State Journal* 2018b).	Unknown
Enbridge Pipeline Line 61 Pump Station	Unknown	Waterloo, Dane County, WI	Enbridge is in the process of increasing capacity on Line 61, a 42-inch-diameter crude oil pipeline which spans from Enbridge's terminal in Superior, Wisconsin, to the company's Flanagan Terminal near Pontiac, Illinois. After completion of Line 61 upgrades, the project would have the infrastructure in place to transport up to 1.2 million barrels per day of crude. The pipeline is currently carrying approximately 930,000 barrels per day (Enbridge 2015).	Unknown

Project Name	Estimated Project Size	Project Location	Project Description	Anticipated Project Schedule
Turkey River Bottoms forest restoration project	Approximately 200 acres	Refuge	The Refuge's Comprehensive Conservation Plan (USFWS 2006a) identified forest restoration, especially of mast-producing trees, as an objective. Until 2008, several fields on the Turkey River bottoms portion of the Refuge, approximately between river miles 606 and 608, were farmed through a cooperative farming agreement between the Refuge and a third party. In 2008, cooperative farming ceased on the Turkey River bottoms and the Refuge began restoring the bottomland hardwood forest community. In the intervening 10 years, the Refuge has planted thousands of trees species, including swamp white oak, representative of a bottomland hardwood community. The Refuge's tree planning efforts have been supported by volunteers from several area schools in Cassville, Wisconsin and Guttenberg, Iowa. Hundreds of middle school and high school students have assisted the Refuge with planting and maintenance of established trees on the Turkey River bottoms.	Ongoing
Habitat restoration and enhancement in Pool 11	Approximately 500 acres	Refuge	Habitat restoration and enhancement near Potosi, Wisconsin would involve reconstruction of islands, floodplain forest restoration, and backwater dredging to restore, enhance, and protect fish and wildlife habitat.	2019–2022
Infrastructure reconstruction near Oak Road	Approximately 50 acres	Refuge	Significant flooding in Spring 2019 caused extensive damage to Oak Road and other Refuge infrastructure (boat landings on the Turkey River and Mississippi River), which will require reconstruction of Oak Road and the boat landings.	2019–2020
Illinois DOT – U.S. 20 Galena Bypass Project	6.8 mile; 2,760 acres of ROW	U.S. 20 in Elgin, Jo Daviess, Stephenson, and Winnebago Counties, Illinois	The scope of the Galena Bypass project includes the design of a fully access-controlled, four-lane freeway for a distance of approximately 6.5 miles. Proposed interchanges are at Illinois Route 84, northwest of Galena, and at existing U.S. 20, near Horseshoe Mound. The proposed alignment includes eight new bridge structures and improvements along six crossing and adjacent roadways (Illinois DOT 2019).	Plans were completed in May 2013. Pending receipt of additional funding, roadway and structure plans for the various bridges located along the proposed bypass will be developed, thereby completing the design engineering work. Limited funds have been made available to purchase ROW required along the Galena Bypass corridor. However additional funding is needed to complete this land acquisition phase. Additional funding is also needed before construction of the proposed bypass could begin. As such, a construction timeline is not available at this time.
Iowa DOT – U.S. 18	8 miles; 40 acres	Clermont to West Street in Postville, Allamakee, and Clayton Counties, IA	Pavement rehabilitation and widening on U.S. 18, with an estimated cost of $3,984,000 (Iowa DOT 2018).	2019

Project Name	Estimated Project Size	Project Location	Project Description	Anticipated Project Schedule
Iowa DOT – Iowa Highway 3	6 miles 29 acres	North of Boy Scout Road to south of County Road C9Y in Sageville, Dubugue County, IA	This project is a grade and pave on Iowa Highway 3 with an estimated cost of $19,746,000 (Iowa DOT 2018).	2019–2023
Iowa DOT – U.S. 20	2.5 miles; no information as to what new ROW width will be; Bridge 0.03-acre	1. Old Highway road to Devon Drive in Dubuque 2. Swiss Valley Road in Dubuque 3. Swiss Valley Road in Dubuque Dubuque County, IA	1. Pavement rehabilitation and widening on U.S. 20, with an estimated cost of $3,200,000. 2. Grade and pave project on U.S. 20, with an estimated cost of $6,395,000. 3. New bridges on U.S. 20 for 2019 and 2020, with estimated costs of $957,000 and $1,651,000 (Iowa DOT 2018).	2019–2020
Iowa DOT – U.S. 52N	5.5 miles; 27 acres	U.S. 61/U.S. 151 to U.S. 20 in Dubuque, Dubuque County, IA	This project is an erosion control project on U.S. 52 with an estimated project cost of $477,000 (Iowa DOT 2018).	2020
Iowa DOT – U.S. 52S	2.2 miles; 10.5 acres	Mississippi River Bridge to north of Sabula, Jackson County, IA	This project is a grade and pave on U.S. 52 with an estimated cost of $24,608,000 (Iowa DOT 2018).	2023
Iowa DOT – U.S. 52 Bridge	0.06 acre	U.S. 61/151 to U.S. 20 in Dubuque, Dubuque County, IA	This project is a new bridge on U.S. 52 with an estimated cost of $7,350,000 (Iowa DOT 2018).	2019–2023

For the C-HC Project, the following types of projects were identified for the cumulative action scenario: urban development projects, large restoration projects, recreation improvements, renewable energy generation, other electric transmission projects, major transportation improvements, and pipelines.

4.3.1 Projects Considered and ELIMINATED from Detailed Cumulative Impact Analysis

4.3.1.1 *Nemadji Trail Energy Center*

Dairyland Power Cooperative and Minnesota Power, a utility division of ALLETE, based in Duluth, Minnesota, are proposing a 550-MW gas plant in the city of Superior, Douglas County, Wisconsin. The site is approximately 30 acres and is located in an industrial site. Site development is expected to begin in 2020. The in-service date for the project is December 2024, depending on regulatory approvals.

A new 345-kV collector bus would be constructed adjacent to the power plant to transfer the output from the generating plant to a new off-site 345-kV substation via a new radial 345-kV transmission line. The proposed radial transmission line would be approximately 3.3 to 5.5 miles in length depending on the route selected.

The plant would be designed to burn natural gas with fuel oil as a backup. New facilities for the natural gas infrastructure would include a hot tap and new meter station at the Great Lakes Interstate Pipeline. The new 16-inch-diameter lateral pipeline would extend 6.8 miles from this meter station to the preferred site.

This project falls outside of all spatial boundaries for the cumulative impact analysis associated with the C-HC Project. Therefore, the Nemadji Trail Energy Center is not included in the cumulative action scenario analyzed for C-HC Project cumulative impacts.

4.3.1.2 *SOO Green Renewable Rail Project*

RUS received several public comments during the DEIS public review period which referenced the SOO Green Renewable Rail project, a proposed underground high-voltage direct current transmission line that would transport wind energy from the Upper Midwest to the eastern U.S. markets. The western terminal end of the transmission line would be outside Mason City, Iowa, and the eastern terminus would be a substation in Plano, Illinois. The transmission line would be buried in existing railroad ROW corridors and some highway or road ROWs and span approximately 349 miles (SOO Green Renewable Rail 2019).

Because this project is in the very early stages of conceptual development, RUS determined this project was not reasonably foreseeable; therefore, it is not included in the cumulative action scenario analyzed for C-HC Project cumulative impacts.

4.3.1.3 *Badger-Hawkeye Bridge in Cassville, Wisconsin*

The Badger-Hawkeye Bridge Coalition is supporting the initiative to build a new Mississippi River bridge crossing between Cassville, Wisconsin and Guttenberg, Iowa. One of the goals of this project is to spur economic opportunities by directing travelers through local communities that are otherwise bypassed due to travelers seeking out existing bridges crossing the Mississippi River. RUS received a few public comments that mentioned the bridge coalition and initiative. However, there do not appear to be any publicly available plans or documents about this potential bridge project that would suggest this is a

reasonably foreseeable project. Therefore, the Badger-Hawkeye Bridge is not included in the cumulative action scenario analyzed for C-HC Project cumulative impacts.

4.4 CUMULATIVE IMPACTS ANALYSIS

Cumulative impact analysis for all resources discussed in Chapter 3 are presented below. Similar to Chapter 3, the context and intensity of cumulative impacts are presented using the definitions presented in Table 4.4-1 and Table 4.4-2.

Table 4.4-1. Impact Duration Definitions

Duration	Description
Short-term	During the construction period through two growing seasons after construction is completed, 1 to 3 years
Long-term	Operational life of the C-HC Project, 3 to 60 years

Table 4.4-2. Impact Intensity Thresholds

Degree of Impact	Description
Minor Impact	Impacts would occur, but resources would retain existing characteristics and overall baseline conditions.
Moderate Impact	Impacts would occur, but resources would partially retain existing characteristics. Some baseline conditions would remain unchanged.
Major Impact	Impacts would occur that would create a high degree of change within the existing resource characteristics and overall conditions of the resources.

4.4.1 Geology and Soils

The spatial cumulative impact analysis area (CIAA) for geology and soils is the seven HUC-8 watersheds crossed by the C-HC Project alternatives. The temporal scope is the life of the C-HC Project, which is 60 years. Cumulative impacts discussed herein are based on the existing conditions for soils and geologic resources described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial analysis area.

The present and reasonably foreseeable projects that overlap with the geology and soils CIAA are all projects listed in Table 4.3-1, except for the Dane County Regional Airport Solar Farm and the Alliant Energy Center Campus Master Plan. It is estimated that there are approximately 467,146 acres of present and reasonably foreseeable projects within the CIAA for soils and geology. Adverse and beneficial impacts to geology and soils would occur from the present and reasonably foreseeable projects in the CIAA, depending on the nature of the projects as described in Table 4.3-1.

Environmental impacts to geology and soils are generally localized where they occur. Any projects that disturb soil resources, such as transportation improvement projects, new energy development, new or rebuilt transmission lines, and urban development projects, would contribute to the cumulative adverse impacts that may occur as a result of added erosion, compaction, or disturbance to shallow and sensitive soils. Construction activities associated with project listed in the Table 4.3-1 are expected to have similar impacts to sensitive soils and geologic features as the construction of the C-HC Project, with potential for loss of soil productivity due to disturbance and compaction as well as soil erosion from wind and water

along access roads, construction areas, and laydown areas. Long-term loss in soil productivity would occur where foundations and other permanent infrastructure, such as buildings, roads, and trails are located.

It is assumed that projects over 1 acre would need to obtain a construction site erosion control and stormwater discharge permit (in Wisconsin) or National Pollutant Discharge Elimination System (NPDES) permit (in Iowa), which would require responsible stabilization of soils against erosion, and therefore limit impacts. Erosion and sediment control measures, including measures for stabilization of disturbed areas during and at the completion of construction, would be defined in the SWPPP for the project.

In all potential projects, erosion of sensitive soils is the single greatest impact to soils and geology, and if left unrepaired, erosion could migrate to a broader area, impacting surrounding soils (including steep slopes, wet soils, and prime farmland soils) and water resources (such as streams and lakes) with increased sediment loads. Appropriate measures to avoid erosion (implementation of erosion and sediment controls) and repair erosion damage immediately would likely result in long-term and moderate adverse cumulative impacts to geology and soils.

Restoration projects, such as those planned for the Refuge and the Southwest Wisconsin Grassland and Stream Conservation Area, would work to improve and conserve soil productivity. Approximately 12,690 acres of restoration projects are proposed within the CIAA. Conservation programs and activities could protect sensitive areas from development, which would result in long-term beneficial impacts to soils and sensitive geologic features, such as karst topography. Restoration of these areas could reverse trends of erosion and compaction over the long term, resulting in long-term beneficial cumulative impacts to soil resources.

4.4.2 Vegetation, including Wetlands and Special Status Plants

The spatial CIAA for vegetation, including wetlands and special status plants, is the Savanna and Coulee Sections of the Driftless Area Ecoregion bounded to the north by where the Turkey and Wisconsin Rivers join the Mississippi River. The temporal scope is the life of the C-HC Project, which is 60 years. Cumulative impacts discussed herein are based on the existing conditions of vegetation, including wetlands and special status plans described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial CIAA.

The present and reasonably foreseeable projects that overlap with the vegetation, including wetlands and special status plants spatial CIAA, include all projects listed in Table 4.3-1 except for the following: Sugar River Wind Project, Dane County Regional Airport Solar Farm, Alliant Energy Center Campus Master Plan, Highway M improvements, rail expansion project by Pattison Sand Company, Pinnacle Dairy Feedlot, and Enbridge Pipeline Line 61 Pump Station. It is estimated that there are approximately 305,181 acres of present and reasonably foreseeable projects within the spatial CIAA for vegetation, including wetlands and special status plants. Adverse and beneficial impacts to vegetation, including wetlands and special status plants would occur from the present and reasonably foreseeable projects in the spatial CIAA, depending on the nature of the projects as described in Table 4.3-1.

Cumulative effects on vegetation would occur where vegetation is removed or disturbed, special status species are impacted, and invasive species are introduced. Any project that involves surface-disturbing activities—such as transportation improvement projects, new energy development, and new or rebuilt transmission lines—would contribute to the cumulative adverse impacts that may occur as a result of vegetation removal, disturbance, and conversion of vegetation and plant communities, and the potential introduction of invasive species.

Vegetation in the spatial CIAA includes grassland (e.g., dry prairies, dry-mesic prairies), forest (e.g., southern dry forests, southern mesic forests), and other natural vegetation communities. As discussed in Section 3.3, direct and indirect impacts from the C-HC Project on vegetation, including vegetation communities, special status species, and invasive species, would be both short and long term and moderate, depending on the location and extent of the impact.

Project proponents often implement BMPs to avoid and minimize direct impacts to special status species. However, the cumulative impacts on vegetation communities as a result of removal, alteration, and fragmentation would further reduce the availability of suitable habitat for special status species in the region. Additionally, the cumulative impacts of disturbance to vegetation, creation of edges, and use of foreign vehicles or equipment transporting invasive species would contribute to a potential increase in those species.

Restoration projects, such as those planned for the Refuge and the Southwestern Wisconsin Grassland and Stream Conservation Area, would work to improve and conserve vegetation, including wetlands and special status plants. Approximately 12,690 acres of restoration projects are proposed within the CIAA. Conservation programs and activities could protect areas from development, which would result in long-term beneficial impacts to vegetation, including wetlands and special status plants. Restoration of these areas could reverse trends of degradation over the long term, resulting in long-term beneficial cumulative impacts to vegetation, including wetlands and special status plants.

4.4.3 Wildlife, including Special Status Species

The spatial CIAA for wildlife, including special status species, is the Savanna and Coulee Sections of the Driftless Area Ecoregion bounded to the north by where the Turkey and Wisconsin Rivers join the Mississippi River. The temporal scope is the life of the C-HC Project, which is 60 years. Cumulative impacts discussed herein are based on the existing conditions of wildlife, including special status species described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial CIAA.

The present and reasonably foreseeable projects that overlap with the wildlife, including special status species spatial CIAA include all projects listed in Table 4.3-1 except for the following: Sugar River Wind Project, Dane County Regional Airport Solar Farm, Alliant Energy Center Campus Master Plan, Highway M improvements, rail expansion project by Pattison Sand Company, Pinnacle Dairy feedlot, and Enbridge Pipeline Line 61 Pump Station. It is estimated that there are approximately 305,181 acres of present and reasonably foreseeable projects within the spatial CIAA for wildlife, including special status species. Adverse and beneficial impacts to wildlife, including special status species, would occur from the present and reasonably foreseeable projects in the spatial CIAA, depending on the nature of the projects as described in Table 4.3-1.

Cumulative effects on wildlife occur when an action results in modification, degradation, or fragmentation of their habitat, or affects the natural processes that sustain them and their ability to feed, breed, and shelter. Habitat within the C-HC Project analysis area includes forested areas, grassland, wetlands, open water habitat, and streams. Additionally, there are both High and Low Potential Occurrence zones for rusty patched bumble bees and algific talus slopes that may be occupied by Iowa Pleistocene snails. As discussed in Section 3.4, direct and indirect impacts from the C-HC Project to wildlife would be both short and long term and moderate.

Any projects that remove, degrade, or fragment habitat—such as transportation improvement projects, new energy development, and new or rebuilt transmission lines—would contribute to the cumulative adverse impacts that may occur by converting undeveloped areas to developed areas, changing forested

and shrubland land cover types to grassland, and loss of area to structure and ancillary facilities. The transmission line projects would pose a similar risk for avian collision as the C-HC Project. The wind energy generation projects would present additional risk of collision for bird and bat populations. The availability of unfragmented forested blocks would decrease. Construction of each project poses a risk of degrading wetland, open water, and stream habitat through siltation and erosion. These cumulative impacts to wildlife would be long term and adverse.

Restoration projects, such as those planned for the Refuge and the Southwestern Wisconsin Grassland and Stream Conservation Area, would work to improve and conserve habitats and improve water quality in the region. Approximately 12,690 acres of restoration projects are proposed within the CIAA. Conservation programs and activities could protect areas from development, which would result in long-term beneficial impacts to wildlife. Restoration of these areas could reverse trends of habitat loss, degradation, and fragmentation over the long term, resulting in long-term beneficial cumulative impacts to wildlife.

4.4.4 Water Resources and Quality

The spatial CIAA for water resources is the seven HUC-8 watersheds crossed by the C-HC Project alternatives. The temporal scope is the life of the C-HC Project, which is 60 years. Cumulative impacts discussed herein are based on the existing conditions for water resources described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial CIAA.

The present and reasonably foreseeable projects that overlap with the water resources spatial CIAA are all projects listed in Table 4.3-1, except for the Dane County Regional Airport Solar Farm and the Alliant Energy Center Campus Master Plan. It is estimated that there are approximately 467,146 acres of present and reasonably foreseeable projects within the CIAA for water resources. Adverse and beneficial impacts to water resources would occur from the present and reasonably foreseeable projects in the spatial CIAA, depending on the nature of the projects as described in Table 4.3-1.

Direct and indirect impacts from the C-HC Project would primarily be associated with construction activities. These impacts include 1) potential adverse impacts on water quality due to the effect of construction activities on discharges, 2) potential changes to water quantity because of diversion or use of water, and 3) impacts to floodplains due to fill associated with project footprints. The first two impacts are short term. The third impact is long term.

Cumulative effects on water resources and quality from projects listed in the cumulative action scenario would occur as a result of construction activities. Cumulative impacts to groundwater and surface water from potential sediment discharges from disturbed areas or hazardous materials would be minor and short-term. Industry BMPs would be implemented and Federal and state regulations would be followed, which are typically effective at minimizing these impacts to groundwater and surface waters. Where construction activities take place near to or across riparian areas, such as other transmission projects, the removal of trees and grubbing within project footprints could cause an increase in water temperatures until permanent vegetative cover is reestablished. Cumulative impacts to groundwater from dewatering activities for construction purposes would also be minor and short-term.

Restoration projects, such as those planned for the Refuge and the Southwest Wisconsin Grassland and Stream Conservation Area, would work to improve and conserve water resources. Approximately 12,690 acres of restoration projects are proposed within the CIAA. Conservation programs and activities could protect sensitive areas from development, which would result in long-term beneficial impacts to water resources. Restoration of these areas could reverse trends of degraded water quality over the long term, resulting in long-term beneficial cumulative impacts to water resources.

4.4.5 Air Quality and Climate Change

The spatial CIAA for air quality is the 5-mile area surrounding the Proposed Action alternatives. The temporal scope is the construction duration of the C-HC Project, which is 2 years. Cumulative impacts discussed herein are based on the existing air quality conditions described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial analysis area.

The present and reasonably foreseeable projects that overlap with the air quality CIAA and temporal boundary include the Montfort Wind Farm, Red Barn Wind Project, Badger Hollow Solar Farm, several other renewable energy projects, existing and proposed transmission line projects, transportation projects proposed by WisDOT and the City of Madison, and two ecosystem restoration projects listed in Table 4.3-1. It is estimated that there are approximately 159,915 acres of present and reasonably foreseeable projects within the CIAA for air quality. Adverse impacts to air quality would occur from the present and reasonably foreseeable projects in the CIAA, depending on the nature of the projects as described in Table 4.3-1.

Impacts to air quality resulting from construction activities are generally localized where they occur. Any projects that disturb soils—such as transportation improvement projects, new energy development, new or rebuilt transmission lines, and urban development projects—would contribute to the adverse impacts in the form of fugitive dust, especially during windy weather conditions. In addition, construction equipment and vehicles would contribute air pollutant emissions. Transportation improvement projects could result in increased air emissions from traffic; however proposed transportation projects must demonstrate conformity with the State Implementation Plan and therefore, no cumulative air quality impacts are expected from the transportation improvement projects. Cumulative effects to air quality from the C-HC Project and projects listed in the cumulative action scenario would be short-term, adverse, and localized.

4.4.5.1 *Climate Change*

The spatial CIAA for climate change is the United States to allow for the comparison of potential greenhouse gas estimates presented below is based on the U.S. greenhouse gas emission estimate for 2017 (EPA 2019b). The temporal scope is the life C-HC Project, which is 60 years.

RUS received several public comments during the DEIS public comment period which suggested that RUS estimate the CO_2 emissions from generation sources that could be served by the C-HC Project. Due to the connectivity of the electric grid and the changing national generation mix, it is not possible to identify which electricity generations sources would be served by the C-HC Project for the life of the project. RUS analyzed two different electricity generation sources (coal-fired generation and wind-powered generation) to estimate a range of CO_2 emissions from electricity generation sources that could have access to transmission from the C-HC Project.

As stated in Chapter 1, Section 1.4, the C-HC Project would increase the transfer capability by approximately 1,300 MW during the months of June, July, and August, and by approximately 1,200 MW during the rest of the year. This computes to approximately 11 million megawatt hours (MWh) annually. The U.S. Energy Information Administration estimates that 1 MWh of electricity generated by coal produces approximately 2,445 pounds of CO_2, and 1 MWh of electricity generated by wind produces 54 pounds of CO_2 (U.S. Energy Information Administration 2018).

For the purposes of estimating potential CO_2 emissions from generation sources served by the C-HC Project, two scenarios were calculated. If the C-HC Project served 100% coal-fired electricity generators, approximately 12.3 CO_2 million metric tons (MMT) would be served by the equivalent transfer capability

of the C-HC Project per year. Comparatively, if the C-HC Project served 100% wind-generated electricity, 0.272 CO_2 MMT would be served by the equivalent transfer capability of the C-HC Project per year (Table 4.4-3).

In 2017, total CO_2 emissions generated in the United States were 5,270.7 MMT (EPA 2019b). When comparing the estimate of CO_2 emissions from the C-HC Project serving 100% coal generation to the nation's total CO_2 emissions, the C-HC Project's electricity transfer capability would comprise approximately 0.23% the nation's total CO_2 emission in 2017. Under the 100% renewable scenario, the C-HC Project's transfer capability would comprise approximately 0.005% of nation's total CO_2 emissions for 2017. Table 4.4-3 summarizes the emission calculations associated with these generation scenarios.

Table 4.4-3. CO_2 Emissions Estimates for Potential Generation Sources Served by the C-HC Project

	CO_2 Emissions from 1 MWh of Electricity (pounds)	C-HC Transfer Capability (MWh per year)	CO_2 Emissions from the Equivalent of C-HC Project Transfer Capability (MMT per year)	Portion of U.S. Total CO_2 Emissions (%)
Coal generation	2,445	11,116,968	12.3	0.23
Wind generation	54	11,116,968	0.272	0.005

4.4.6 Noise

The spatial CIAA for noise is the 2-mile analysis area surrounding the Proposed Action alternatives. The temporal scope is the life of the C-HC Project, which is 60 years. Cumulative impacts discussed herein are based on the existing noise conditions described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial analysis area.

The present and reasonably foreseeable projects listed in Table 4.3-1 that overlap with the noise CIAA include the Montfort and Red Barn wind projects; the Badger Hollow Solar Farm; ATC wind and solar projects; J870 and J871 solar projects; existing electric transmission infrastructure; Dane County/Madison local recreation projects; Highway M improvements; WisDOT planning studies along U.S. Routes 14 and 18/151; the WisDOT Improvement Program; the Southwest Wisconsin Grassland and Stream Conservation Area Project; proposed Dairyland, ATC, and ITC transmission projects; and the Turkey River Bottoms forest restoration project. It is estimated that there are approximately 77,357 acres of present and reasonably foreseeable projects within the CIAA for noise. Adverse impacts from noise would occur from the present and reasonably foreseeable projects in the CIAA, depending on the nature of the projects as described in Table 4.3-1.

Noise impacts from construction activities are generally localized where they occur. Any projects that require construction equipment and personnel could generate noise during working hours. Adverse noise impacts are expected from the construction of transportation improvement projects, new energy development, new or rebuilt transmission lines, and urban development projects. Transportation improvement projects could result in increased noise from traffic if new travel lanes are added or if roads are routed closer to sensitive receptors, such as residences, schools, hospitals, or nursing homes. Renewable energy projects would also contribute adverse noise impacts to the local area primarily during construction. Operation and maintenance of the renewable energy projects could generate periodic levels of noise; however, these adverse impacts are likely to be infrequent in duration and moderate. Ecosystem restoration projects, such as the activities planned within the Refuge and the Southwest Wisconsin Grassland and Stream Conservation Area, would have short-term minor noise impacts during restoration

activities because motorized equipment and personnel would be needed to implement the restoration actions. Once the restoration activities were complete, noise levels would return to baseline conditions. Cumulative effects to noise from the C-HC Project and projects listed in the cumulative action scenario would be short-term, minor to moderate, adverse, and localized. Based on the periodic nature of operational noise, ongoing cumulative effects would only occur for a short time during construction and during routine maintenance activities; there would be no long-term cumulative noise impacts.

4.4.7 Transportation

The spatial CIAA for transportation is the 5-mile area surrounding the Proposed Action alternatives. The temporal scope is the construction duration of the C-HC Project, which is 2 years. Cumulative impacts discussed herein are based on the existing transportation conditions described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial analysis area.

The present and reasonably foreseeable projects that overlap with the transportation CIAA and temporal boundary include the Montfort Wind Farm, Red Barn Wind Project, Badger Hollow Solar Farm, several other renewable energy projects, existing and proposed transmission line projects, transportation projects proposed by WisDOT and the City of Madison, and three ecosystem restoration projects, which are listed in Table 4.3-1. It is estimated that there are approximately 159,915 acres of present and reasonably foreseeable projects within the CIAA for transportation, which would all require delivery of construction equipment, access to the project areas from existing roadways, and construction workers traveling to and from the project sites. Adverse and beneficial impacts to transportation would occur from the present and reasonably foreseeable projects in the CIAA, depending on the nature of the projects as described in Table 4.3-1.

Impacts to the transportation network from construction of applicable projects listed in Table 4.3-1 would primarily include increased traffic associated with construction workers and movement of construction equipment to and from the worksite. Some construction activities, if proposed near existing roadways, may require temporary lane closures or redirected access for the general traveling public. For those transportation improvement projects proposed within 5 miles of the C-HC Project, there would be a minor beneficial impact to transportation because these projects are intended to improve travel conditions and safety for the traveling public. As discussed in Section 3.8, direct and indirect impacts to the transportation network from the C-HC Project would be minor, as traffic congestion on any one road segment is unlikely and roadway conditions would remain unchanged. Cumulative effects to transportation from the C-HC Project and projects listed in the cumulative action scenario would be short-term, minor to moderate, adverse, and localized. Projects listed in the cumulative action scenario would be required to comply with all applicable roadway, airport, rail, and waterway authorities' management standards and policies during construction; therefore, cumulative potential effects would not significantly change the transportation trends in the study area.

4.4.8 Cultural and Historic Resources

The spatial CIAA for cultural and historic resources is the 2,000-foot indirect APE defined in Chapter 3, Section 3.9. The temporal scope is the life of the C-HC Project, which is 60 years. Cumulative impacts discussed herein are based on the existing conditions for cultural and historic resources described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial analysis area.

The present and reasonably foreseeable projects that overlap with the cultural and historic resources CIAA and temporal boundary include the Montfort Wind Farm, Red Barn Wind Project, Badger Hollow Solar Farm, several other renewable energy projects, existing and proposed transmission line projects, transportation projects proposed by WisDOT and the City of Madison, and three ecosystem restoration

projects, which are listed in Table 4.3-1. It is estimated that there are approximately 31,269 acres of present and reasonably foreseeable projects within the CIAA for cultural and historic resources. Adverse and beneficial impacts to cultural and historic would occur from the present and reasonably foreseeable projects in the CIAA, depending on the nature of the projects as described in Table 4.3-1.

While these projects vary in scope and impacts, the principal types of impacts that may have an effect on cultural resources would be the direct impact to historic properties or other cultural resources themselves, such as through demolition, fill, grading, blasting, subsurface excavation, and vibration; such impacts may impact the integrity of one or more elements needed to convey the significance of the historic property. Other impacts include the diminution of the integrity of setting and feeling through imposition of undesirable elements in the viewshed or environment of the historic property. All of the present and reasonably foreseeable projects would have the potential to cause both general types of impacts to historic properties. Although it is not known whether any cultural resources are present within the areas where impacts from the present or reasonably foreseeable projects within the CIAA may occur, it may be assumed that potentially significant cultural resources could be identified in association with any of the present and reasonably foreseeable projects identified within the cumulative impact scenario.

Restoration projects, such as those planned for the Refuge and the Southwest Wisconsin Grassland and Stream Conservation Area, could result in protection of cultural and historic resources because conservation programs and activities would protect sensitive areas from development, which would result in long-term beneficial impacts to cultural and historic resources. Limited visual impacts to cultural and historic resources could result from restoration projects, but the cumulative impacts would be minimal at most. Approximately 12,190 acres of restoration projects are proposed within the CIAA.

The construction and operation of the C-HC Project could affect previously recorded and unknown cultural resources within the analysis area. These resources would be identified through the NHPA Section 106 procedures in consultation with the Iowa and Wisconsin SHPOs, RUS, the Utilities, and affected Tribal groups, among other stakeholders. Associated with that effort, RUS and the Utilities would seek to avoid, minimize, or mitigate adverse impacts to any historic properties within the C-HC Project analysis area.

Projects that are directed, overseen, funded, partially funded, or permitted by a Federal agency, would be subject to review under Section 106 of the NHPA, and would be avoided, minimized, and mitigated, resulting in negligible to minor adverse cumulative impacts to cultural resources. Similarly, any project which involves a Federal agency and constitutes a major Federal action would involve a review of impacts to cultural resources under NEPA. In addition, any projects which receive a Wisconsin Public Services Commission certificate are reviewed by the Wisconsin Historical Society, providing some protection to resources that have been previously recorded within the Wisconsin Historic Preservation Database. Any historic structures that have been previously listed on the NRHP are also protected under Wisconsin statute. The same protection is not afforded to NRHP-listed structures in Iowa. Outside Federal and Wisconsin state actions, only human burial sites are generally universally protected. As such, if projects are privately funded and avoid any Federal or state permitting, protections on cultural resources would not necessarily be in place and these projects may have an adverse cumulative impact on cultural resources.

4.4.9 Land Use, including Agriculture and Recreation

The spatial CIAA for land use, including agriculture and recreation, is the six counties crossed by the C- HC Project alternatives. The temporal scope is the life of the C-HC Project, which is 60 years. Cumulative impacts discussed herein are based on the existing conditions of land use, including

agriculture and recreation described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial CIAA.

The present and reasonably foreseeable projects that overlap with the land use spatial CIAA include all projects listed in Table 4.3-1 except for the following: Sugar River Wind Project, ITC transmission projects, Pinnacle Dairy feedlot, Illinois DOT – U.S. 20 Galena Bypass Project, and Iowa DOT – U.S. 52S. It is estimated that there are approximately 346,091 acres of present and reasonably foreseeable projects within the spatial CIAA for land use. Adverse and beneficial impacts to land use would occur from the present and reasonably foreseeable projects in the spatial CIAA, depending on the nature of the projects as described in Table 4.3-1.

Cumulative effects to land use would occur where lands are converted from one use to another (i.e., undeveloped land is converted to utility infrastructure). Land in the analysis area is predominantly rural in nature and undeveloped. As discussed in Section 3.10, direct and indirect impacts from the C-HC Project on land use would be both short and long term and major, depending on the geographical location of the impact.

Any project that converts lands from one use to another—such as such as transportation improvement projects, new energy development, new or rebuilt transmission lines, and urban development projects—would contribute to the cumulative adverse impacts through modification of land cover in the area (i.e., by converting undeveloped areas to developed areas, changing forested and shrubland land cover types to grassland, and contributing to the loss of area to structure and ancillary facilities). There would be cumulative impacts to agricultural lands, and the increase in transmission line ROWs across these lands would impact operation and productivity of farmland. Recreational settings and experiences would be altered and recreational opportunities in undeveloped landscapes would become more limited as more transmission line ROWs are built within the area. Natural areas would also experience cumulative impacts because when more transmission line ROWs exist in the area, the areas available for conservation are smaller and more limited. Cumulative impacts to land use, including agriculture and recreation, would be long term and moderate. Previous land uses would be expected to change with parts of the region to be compatible with projects listed in the cumulative action scenario. A moderate portion of the agricultural lands within the region may be used for purposes other than agriculture, although agricultural uses would be compatible with several of the projects listed in the cumulative scenario. For recreation, the visitor experiences would be slightly changed near specific projects, but recreational experiences would still be available in the region.

Restoration projects, such as those planned for the Refuge and the Southwest Wisconsin Grassland and Stream Conservation Area or park improvement projects, would work to improve and conserve recreation and natural areas and agricultural land uses. Approximately 12,690 acres of restoration projects are proposed within the CIAA. Conservation programs and activities could protect these areas development, which would result in long-term beneficial impacts to land use, including agriculture and recreation.

4.4.10 Visual Quality and Aesthetics

The spatial CIAA for visual quality and aesthetics is the 2-mile buffer surrounding the C-HC Project alternatives. The temporal scope is the life of the C-HC Project, which is 60 years. Cumulative impacts discussed herein are based on the existing conditions for visual resources described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial analysis area.

The present and reasonably foreseeable projects listed in Table 4.3-1 that overlap with the visual quality and aesthetics CIAA include the Montfort and Red Barn wind projects; the Badger Hollow Solar Farm; ATC wind and solar projects; J870 and J871 solar projects; existing electric transmission infrastructure;

Dane County/Madison local recreation projects; Highway M improvements; WisDOT planning studies along U.S. Routes 14 and 18/151; the WisDOT Improvement Program; the Southwest Wisconsin Grassland and Stream Conservation Area Project; proposed Dairyland, ATC, and ITC transmission projects; and the Turkey River Bottoms forest restoration project. It is estimated that there are approximately 77,357 acres of present and reasonably foreseeable projects within the CIAA for visual quality and aesthetics. Adverse and beneficial impacts to visual resources would occur from the present and reasonably foreseeable projects in the CIAA, depending on the nature of the projects as described in Table 4.3-1. In addition, present and ongoing activities that alter the landscape include agricultural activities (mainly crop production and livestock grazing), residential and industrial developments, and dirt-surface roads and paved roads, which have all contributed to changes to the existing scenic quality and landscape in the area.

Any projects that would result in modification of the landscape—such as transportation improvement projects, new energy development, new or rebuilt transmission lines, and urban development projects—would contribute to the cumulative adverse impacts to visual quality and aesthetics. These developments, when added to the direct effects of the proposed C-HC Project, would incrementally convert the scenic quality of the natural landscapes into a more developed and industrialized landscape that would adversely affect scenery, and sensitive viewers over time. Restoration projects, such as those planned for the Refuge and the Southwest Wisconsin Grassland and Stream Conservation Area, would work to improve the visual quality and aesthetics in the CIAA. Approximately 12,190 acres of restoration projects are proposed within the CIAA. Conservation programs and activities could protect sensitive areas from development, which would result in long-term beneficial cumulative impacts to visual resources.

Due to the energy projects listed in the Table 4.3-1 likely to be developed in the region, it is likely that additional electrical infrastructure (transmission and distribution lines and substations) would be built in the future. Standard transmission siting practices state that when siting a new transmission line, efforts should be made to parallel existing linear features. If, at some time in the future, an additional transmission line is proposed within the project area, it is likely that the current project would be seen as an opportunity site for the construction of additional transmission features. Since characteristics of the landscape have previously changed and will continue to change over time, all action alternatives would contribute to long-term, moderate cumulative impacts to visual resources.

4.4.11 Socioeconomics and Environmental Justice

The spatial CIAA for socioeconomics is the six counties that are overlapped by the C-HC Project alternatives. The temporal scope is the life of the C-HC Project, which is 60 years. Cumulative impacts discussed herein are based on the existing socioeconomic conditions described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial analysis area.

The present and reasonably foreseeable projects that overlap with the socioeconomics CIAA are all projects listed in Table 4.3-1, except for the Iowa DOT – U.S. 52S; the Illinois DOT – U.S. 20 Galena Bypass Project; the Pinnacle Dairy feedlot; the ATC wind and solar projects in Dodge, Green, Jefferson, and Rock Counties; the Sugar River Wind Project; and the portion of the Iowa DOT – U.S. 18 in Allamakee County. It is estimated that there are approximately 346,091 acres of present and reasonably foreseeable projects within the CIAA for socioeconomics. Adverse and beneficial impacts to socioeconomics would occur from the present and reasonably foreseeable projects in the CIAA, depending on the nature of the projects as described in Table 4.3-1.

Potential beneficial cumulative impacts to socioeconomics would include an increase in electrical power generation and transmission options, including wind, solar, and electrical transmission projects, that would benefit electrical power customers in the CIAA for socioeconomics. Road improvement projects in

the CIAA may have beneficial socioeconomic impacts by improving transportation for tourism and other commercial uses. Restoration projects in the Refuge, the Proving Grounds Recreation Area project, and recreation improvement projects in Dane County may have beneficial socioeconomic impacts on tourism to these areas. Employment and income impacts from present and reasonably foreseeable future projects in the CIAA would be minor, beneficial, and both short and long term for similar reasons to those discussed in Section 3.12.2.

Adverse cumulative socioeconomics impacts could result from an increase in construction activities, surface disturbance, and infrastructure that would have a potential adverse impact on tourism and property values in the areas where these activities occur. Present and reasonably foreseeable future actions in the CIAA include construction and surface disturbance associated with road improvements, electrical transmission infrastructure, wind and solar projects, rail expansion, and a pipeline pump station. These activities would have potential cumulative impacts on tourism and property values that would be similar in nature to the impacts discussed in Section 3.12.2. Potential adverse cumulative impacts on tourism from present and reasonably foreseeable future projects would be site-specific to the projects, and would be minor, negative, and both short and long term for similar reasons to those discussed in Section 3.12.2. Potential adverse cumulative impacts to property values from the present and reasonably foreseeable future projects would be similar to impacts typically experienced by property abutting industrial developments. These impacts would be similar to, and as variable as, the potential impacts to property values discussed in Section 3.12.2.

The seven census tracts with environmental justice communities would possibly experience adverse impacts from the proposed transmission line infrastructure projects and transportation projects identified in the cumulative action scenario. These adverse impacts would be associated with potential changes in visual quality and aesthetics, increased noise from construction and operations, and a potential increase in traffic. These adverse impacts would likely be long term.

4.4.12 Public Health and Safety

The spatial CIAA for public health and safety is a 300-foot analysis area that encompasses the proposed ROW and substations along each alternative. The temporal scope is the life of the C-HC Project, which is 60 years. Cumulative impacts discussed herein are based on the existing public health and safety conditions described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial analysis area.

The present and reasonably foreseeable projects that overlap with the public health and safety CIAA include various wind and solar projects, electrical transmission projects, road and transportation improvement projects, the Turkey River Bottoms forest restoration project, and the repair of flooded infrastructure in the Refuge near Oak Road. All of these projects are listed in Table 4.3-1. It is estimated that there are approximately 8,000 acres of present and reasonably foreseeable projects within the CIAA for public health and safety. Adverse and beneficial impacts to public health and safety would occur from the present and reasonably foreseeable projects in the CIAA, depending on the nature of the projects as described in Table 4.3-1.

Potential beneficial cumulative impacts to public health and safety would include an increase in the reliability and availability of electrical power transmission because of increased electrical generation and transmission options resulting from wind, solar, and electrical transmission projects. Beneficial impacts to public health and safety would also occur as a result of road and transportation improvement projects that would provide safer roadways and bridges.

Adverse cumulative impacts to public health and safety in the CIAA could result from construction activities that would increase the potential for accidents affecting worker safety in construction areas. Present and reasonably foreseeable future electrical transmission projects would also have a potential adverse impact on public health and safety by increasing potential exposure to EMF, increasing the risk of fires, and increasing the generation of solid, hazardous, and toxic materials and waste in the CIAA. The impacts that present and reasonably foreseeable future electrical transmission projects in the CIAA would have regarding EMF would be similar in nature as those described in Section 3.13.2.3. Additional sources of EMF in the analysis area would not combine to create greater levels of EMF, but would create additional, discrete locations of EMF. In other words, each additional source would create a certain level of EMF, but that level would not be increased when added to other sources of EMF nearby. Because the levels of EMF created by the proposed project would be relatively low when compared to the recommended public and occupational exposure guidelines, the cumulative impact from EMF under all alternatives would be minor and long term.

The impacts that present and reasonably foreseeable future electrical transmission projects in the CIAA would have regarding risk of fires and solid, hazardous, and toxic materials and wastes would be similar in nature as those described in Section 3.13.2.3. As described in Section 3.13.2.3, utilities must comply with applicable standards and regulations that address worker safety, risk of fires, and the proper storage and disposal of waste materials. These standards and regulations would help address potential cumulative adverse impacts to public health and safety resulting from present and reasonably foreseeable future electrical transmission projects in the CIAA. Because of these standards and regulations, cumulative adverse impacts to public health and safety, including risk of fire, worker safety, and solid, hazardous, and toxic materials and waste, would be long term and minor.

4.4.13 Upper Mississippi River National Wildlife and Fish Refuge

The spatial CIAA for the Refuge is Pool 11 of the Refuge, which is between Lock and Dam 10 (upstream) and Lock and Dam 11 (downstream) on the Mississippi River. The temporal scope is the life of the C-HC Project, which is 60 years. Cumulative impacts discussed herein are based on the existing conditions of the Refuge as described in Chapter 3 and the cumulative actions presented in Table 4.3-1 that occur within the spatial analysis area.

The present and reasonably foreseeable projects that overlap with the Refuge CIAA and temporal boundary include the existing transmission line infrastructure, Oak Road and boat launch areas that will need to be repaired after recent flooding, the Turkey River Bottoms forest restoration project, and the habitat restoration and enhancement project near Potosi, Wisconsin, which are listed in Table 4.3-1. It is estimated that there are approximately 769 acres of present and reasonably foreseeable projects within the CIAA for the Refuge, of which approximately 690 acres are restoration projects. Adverse and beneficial impacts to the Refuge's resources would occur from the present and reasonably foreseeable projects in the CIAA, depending on the nature of the projects as described in Table 4.3-1.

The Turkey River Bottoms restoration project and habitat restoration project near Potosi would have long-term beneficial effects to resources within the Refuge. Similarly, the repair of existing roadway and boating infrastructure in the Refuge would ameliorate any resource damage caused by the flooding. Short- term adverse impacts to resources could occur from these repair activities due to the presence of construction workers and equipment. However, the long-term impacts from these repairs would be beneficial to Refuge resources.

Three of the alternatives (Alternatives 1, 5, and 6) as part of the C-HC Project would cross the Refuge at and would intersect the Turkey River Bottoms forest restoration project area. These alternatives that would intersect the restoration area would offset or negate some of the beneficial cumulative impacts of

the forest restoration project. As discussed in Section 3.3 and 4.4.2, direct and indirect impacts from the C-HC Project on vegetation, including vegetation communities, special status species, and invasive species, would be both short and long term and moderate, depending on the location and extent of the impact. Cumulative impacts would occur because of the removal, disturbance, and conversion of vegetation and plant communities, and the potential introduction of invasive species from the C-HC Project that would intersect the Turkey River Bottoms forest restoration project area. These cumulative impacts would be short and long term and moderate.

Alternative 2, 3, and 4 would avoid the Turkey River Bottoms forest restoration project area; therefore, trees planted as part of the Refuge's forest restoration effort would not be affected.

4.5 UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are effects that cannot be avoided due to constraints in the proposed alternatives. These effects do not have to be avoided by a project, but they are required by NEPA to be disclosed, discussed, and mitigated, if possible (40 CFR 1500.2(e)).

Most potentially adverse impacts that have been described in previous sections of this document can be avoided or minimized by selecting an alternative or alignment option that avoids or minimizes impacts on environmental resources through refinement of the alignment, or through incorporation of mitigation measures. The unavoidable adverse impacts identified for this project, which have been addressed in previous sections, are reiterated here.

4.5.1 Wetlands

The construction phase of the project would create unavoidable impacts to wetlands by the disturbance and/or destruction of these resources from construction-related activities (e.g., dewatering, filling). The operations and maintenance phase of the project would not create additional unavoidable impacts to wetlands, but in some cases the impacts from the construction phase would be sustained through the life of the project, and in other cases the impacts from the construction phase would be mitigated. The degree of adverse impacts to wetlands would vary based on the alternative selected and the effectiveness of environmental commitments implemented. Environmental commitments would be implemented to revegetate the disturbed land after construction and decommissioning activities would aim to return the disturbed land to preconstruction conditions at the end of the project life.

4.5.2 Floodplains

The construction phase of the project would create unavoidable impacts to water resources, and specifically to floodplains, by the disturbance and/or destruction of these resources from construction-related activities (e.g., dewatering, filling). The operations and maintenance phase of the project would not create additional unavoidable impacts to floodplains, but in some cases the impacts from the construction phase would be sustained through the life of the project, and in other cases the impacts from the construction phase would be mitigated. The degree of adverse impacts to floodplains would vary based on the alternative selected and the effectiveness of environmental commitments implemented. Environmental commitments would be implemented to revegetate the disturbed land after construction and decommissioning activities would aim to return the disturbed land to preconstruction conditions at the end of the project life.

4.5.3 Air Quality and Noise

The construction phase of the project would create unavoidable impacts from air emissions, noise, and vibration due to the use and deployment of equipment, machinery, vehicles, and manpower. The operations and maintenance phase of the project would also create unavoidable impacts from air emissions from vehicles and noise due to corona activity along the transmission line (a crackling or humming sound) and periodic maintenance activities along the transmission line route. The degree of adverse impacts from noise would vary based on the distance from the noise source to the receptor, and whether mitigation to abate that noise source was implemented.

4.5.4 Cultural and Historic Resources

In the event that cultural and/or historical resources were identified during the construction of the proposed project, then the construction phase of the project could create unavoidable impacts to the resource encountered due to the unintended disturbance and potential destruction of that resource. The operations and maintenance phase of the project would not create additional unavoidable impacts to cultural and historical resources but would sustain the impacts from the construction phase through the life of the project, with unknown potential for returning the impacted resource to its preconstruction condition at the end of the life of the project. The degree of adverse impacts to cultural and historical resources would vary based on potential discoveries in the field (i.e., they are unanticipated and unknown at this time), and whether mitigation to stop the disturbance at the time of discovery was implemented.

4.5.5 Land Use, including Agriculture and Recreation

The construction phase of the project would create unavoidable impacts to land use due to the removal and reallocation of land from its current use (e.g., agricultural, recreational, undeveloped, wildlife habitat) to use as a transmission line ROW or support structure or facility. The operations and maintenance phase of the project would not create additional unavoidable impacts to land use but would sustain the impacts from the construction phase through the life of the project, with potential for returning portions of the recently disturbed land to its preconstruction use for agriculture, recreation, and wildlife habitat. The degree of adverse impacts to land use would vary based on the alternative selected and the effectiveness of environmental commitments implemented. Environmental commitments would be implemented to revegetate the disturbed land after construction and decommissioning activities would aim to return the disturbed land to preconstruction conditions at the end of the project life.

4.5.6 Visual Quality and Aesthetics

The construction phase of the project would create unavoidable impacts to visual quality and aesthetics (visual resources) due to the long-term alteration of the viewshed to a transmission line ROW or substation. It should be noted, however, that a large portion of each project alternative includes a transmission line route that is already operating as a transmission line ROW or support structure or facility. The operations and maintenance phase of the project would not create additional unavoidable impacts to visual resources but would sustain the impacts from the construction phase through the life of the project. The degree of adverse impacts to visual resources would vary based on the alternative selected, and the viewshed from sensitive receptors.

4.6 SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

NEPA requires that an EIS include a discussion of the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity (42 U.S.C. 4332(C)(iv))

(see also 40 CFR 1502.16). This section discusses whether construction and operation of the proposed project could cause short-term uses of the environment that would affect, either positively or negatively, the long-term productivity of the environment.

For the purposes of this discussion, "short term" generally refers to the more immediate period of time during which the proposed project would be constructed, whereas "long term" refers to an indefinite period beyond this time frame.

Short-term uses of the environment associated with the proposed alternatives are described for each environmental resource analyzed in Chapter 3, to include the intended use and resultant potential impacts. These impacts include both short- and long-term "use" of the physical environment as a result of constructing and operating the proposed project.

In considering the effect of these uses on long-term productivity, four types of long-term productivity were identified as being affected: land use and soils; vegetation and wildlife, including wetlands and special status species; water resources, including floodplains; and economics.

4.6.1 Land Use and Soils

Construction of the project would not affect geology but would affect productivity of both land and soils through clearing, grading, and occupation by project facilities. At tower and substation sites and along access roads, project construction would have a long-term effect on land and soil productivity since these lands and their associated soils would be taken out of use for the life of the project or longer if facilities are abandoned and not restored. In areas between tower and substation sites and outside of access roads, the proposed project would not be expected to affect long-term land and soil productivity since these areas would be restored, either actively or naturally, to general pre-project conditions, and the lands and soils in these areas could be put to other uses in the long term.

4.6.2 Vegetation and Wildlife, including Wetlands and Special Status Species

Plant communities, fish, and wildlife contribute to biological productivity; their long-term productivity provides an ecological and recreational benefit in sensitive or remote areas. Project construction would affect both biological resources and vegetation communities, such as wetlands, forests, and bluffs, through land clearing, grading, erosion and sedimentation, and occupation by project components.

After construction, natural recovery and restoration would take place in some areas but in others, terrestrial and aquatic habitat would be permanently lost, altered, and/or fragmented. Also, trees and shrubs within the ROW would not be permitted to grow beyond allowable limits during the life of the project.

4.6.3 Water Resources, including Floodplains

Construction of the project would affect water resources (e.g., rivers, floodplains) through land clearing, grading, filling, and occupation by project facilities. Water bodies and floodplains would lose some productivity in the short term from construction-related pollutants, sedimentation, and erosion. In areas between tower and substation sites and outside of access roads, the project would not affect long-term floodplain or groundwater productivity since those areas would be either restored as a mitigation measure or through natural recovery, to similar pre-project conditions.

4.6.4 Economics

Transmission line construction and operation could affect the economic productivity of some resources by limiting their long-term revenue potential (e.g., agricultural land such as tree farms and orchards), but could also contribute to long-term revenue potential in other sectors that benefit from a reliable transmission system (e.g., expanding businesses and attracting new businesses to the region).

4.7 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible or irretrievable commitment of resources refers to impacts to or losses of resources that cannot be recovered or reversed as a result of the proposed project. Examples include permanent conversion of wetlands and loss of cultural resources, soils, wildlife, agricultural production, or socioeconomic conditions.

Irreversible is a term that describes the loss of future options. It applies primarily to the impacts of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long periods of time.

Irretrievable is a term that applies to the loss of production, harvest, or use of natural resources for a period of time (whether long or short). For example, if farmland is used for a non-agricultural event, some or all of the agricultural production from an area of farmland is lost irretrievably while the area is temporarily used for another purpose. The production lost is irretrievable, but the action is not irreversible.

The following is a list of the anticipated potential irreversible and irretrievable commitment of resources to be experienced over the life of the C-HC Project:

- Water—consumption of water for dust control, equipment washdown, cleanup during construction
- Wetlands and floodplains—destruction of wetlands and floodplains during construction of transmission line support structures
- Biological resources—destruction of terrestrial and aquatic vegetation and wildlife habitat, including forested areas and bluffs, during construction
- Land use and ownership—consumption of land for transmission line ROW, support facilities, and access roads
- Construction materials and labor—consumption of non-recyclable building materials such as concrete, steel, wiring, etc., and the human effort to plan, construct, and operate the phases of the proposed project
- Energy resources—consumption of fossil fuels such as gas, oil, and diesel fuel by construction equipment and employee vehicles
- Visual resources—alteration to the viewshed by clearing land, cutting and filling, and constructing transmission line structures
- Financial resources—permanent loss of the cost to implement the proposed project.

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CHAPTER 5. COORDINATION AND CONSULTATION

5.1 COORDINATION WITH COOPERATING AGENCIES

As defined by CEQ regulations, a cooperating agency, or cooperator, is an agency (other than the lead agency) that has special expertise with respect to an environmental issue and/or has jurisdiction by law. Federal, state, and local agencies that have clear jurisdiction over portions of the C-HC Project were invited to become a cooperator in preparation of the EIS. The role of a cooperator is to participate in the process and provide leadership, expertise, guidance, and review, as well as to offer information related to the agency's authority. The USACE, USFWS, and USEPA accepted invitations to serve as cooperating agencies during preparation of the EIS. The USFWS will evaluate the Utilities' request for a ROW easement and a Special Use Permit to cross the Refuge. The USACE will review a ROW request as well as permit applications and requests for permission by the Utilities, as required by Section 10 and Section 408 of the Rivers and Harbors Act and Section 404 under the CWA. The USFWS will complete Section 7 consultation under the Endangered Species Act, which is discussed in further detail in Section 5.4. More information about the decisions to be made by the USFWS and USACE is provided in Chapter 1. The USEPA will provide project-related input on impact assessment methodologies; participate in coordination meetings, webinars/conference calls, and field visits; and provide comments on preliminary information developed for the EIS, including the administrative draft of the DEIS. The NPS was invited but did not accept the invitation to serve as a cooperating agency.

An initial cooperating agency meeting was held on September 21, 2016, in Marquette, Iowa. RUS and the cooperating agencies met frequently during the development of the DEIS and FEIS. Monthly project status update calls were held throughout the NEPA process as well as additional meetings and calls as necessary. Cooperating agencies were provided opportunities to review and comment on the administrative draft scoping report, biological assessment, cultural resource reports, and chapters of the DEIS and FEIS. Cooperating agencies also informed the proposed analysis approach for the EIS and helped identify key observation points for the visual simulations presented in Chapter 3.

5.2 COORDINATION WITH OTHER AGENCIES

On October 14, 2016, a letter was sent to 38 Federal and state agencies inviting them to participate in public and agency scoping meetings. Agency scoping meetings were held to provide updates and answer questions about the C-HC Project. Iowa agencies were invited to attend a meeting in Peosta, Iowa, on October 31, 2016. Wisconsin agencies were invited to attend a meeting in Middleton, Wisconsin, on November 3, 2016. Table 5.2-1 lists those agencies that attended the meetings in October and November 2016.

Table 5.2-1. Agencies that Attended the Agency Scoping Meetings

Agencies Represented at Peosta, Iowa Meeting October 31, 2016	Agencies Represented at Middleton, Wisconsin Meeting November 3, 2016
Iowa State Historic Preservation Office	Federal Aviation Administration
U.S. Fish and Wildlife Service	Wisconsin Department of Transportation
U.S. Army Corps of Engineers	Wisconsin Public Service Commission
Iowa Utilities Board	Wisconsin Department of Natural Resources
	Wisconsin Department of Agriculture, Trade, and Consumer Protection

Agencies Represented at Peosta, Iowa Meeting October 31, 2016	Agencies Represented at Middleton, Wisconsin Meeting November 3, 2016
	National Park Service
	U.S. Army Corps of Engineers

RUS also coordinated with the Public Service Commission of Wisconsin throughout the development of the DEIS and FEIS. Meetings and conference calls between RUS and PSCW were held periodically to discuss the status of each agencies' environmental review process and to share pertinent information about the C-HC Project.

RUS met with NPS staff responsible for managing the Ice Age National Scenic Trail on June 12, 2017, and February 5, 2018. These meetings were held to discuss concerns about the proximity of the C-HC Project to the trail and Cross Plains Complex as well as to review the visual simulations prepared for the C-HC Project segments that were proposed near the trail.

On June 14, 2017, RUS met with the Dubuque City Manager and other staff to review the alternatives considered for crossing the Mississippi River.

5.3 COORDINATION WITH TRIBES

RUS contacted federally recognized tribes on three different occasions during the development of the DEIS for the C-HC Project. Appendix B provides lists of the tribes contacted on each occasion as follows:

- On October 17, 2016, RUS mailed the first round of letters to 26 tribes announcing the public scoping period and public meetings held in October and November for the NEPA process.
- On November 17, 2016, RUS mailed the second round of letters to 26 tribes announcing the addition of two more public scoping meetings held in December in the proposed project area.
- On September 28, 2017, RUS mailed the third round of letters to 57 tribes initiating the Section 106 process and soliciting information about any specific historic properties or important tribal resources in the APE.
- On December 3, 2018, emails and certified letters were sent to RUS's master list of tribes notifying tribes of the availability of the DEIS for the C-HC Project, public meetings, and the public comment period.
- On January 15, 2019, a notice of cancelled public meetings was sent out via email and certified mail to the RUS's master list of tribes.
- On January 31, 2019, emails and certified letters were mailed to tribes, notifying them of the extension of the public comment period to April 1, 2019.
- On February 21, 2019, a final email and certified mailings were sent tribes notifying them of the rescheduled public meetings in March 2019.

As RUS sent correspondence to tribes announcing updates in the NEPA process and coordination of the NHPA Section 106 process, RUS collected responses from tribes. Any tribe that responded to correspondence from RUS or the Utilities affirming interest in the C-HC Project was tracked in a separate mailing list for NHPA Section 106-specific mailings (Table 5.3-1).

Table 5.3-1. RUS Tribal Mailing List for NHPA Section 106

Flandreau Santee Sioux Tribe	Mille Lacs Band of Ojibwe Indians	Saginaw Chippewa Indian Tribe of Michigan	Winnebago Tribe of Nebraska
Ho-Chunk Nation	Otoe-Missouria Tribe	Shakopee Mdewakanton Sioux Community of Minnesota	Yankton Sioux Tribe
Iowa Tribe of Kansas and Nebraska	Prairie Island Indian Community	Spirit Lake Tribe	
Leech Lake Band of Ojibwe	Rosebud Sioux Tribe	Turtle Mountain Band of Chippewa Indians	
Menominee Indian Tribe of Wisconsin	Sac and Fox Tribe of the Mississippi in Iowa	Upper Sioux Community, Minnesota	

Starting in March 2019, the NHPA Section 106 mailing list (see Table 5.3-1) was used to email interested tribes of the development of a Programmatic Agreement (PA) for the C-HC Project. Tribes that responded affirming interest in developing the PA are:

- Ho-Chunk Nation
- Rosebud Sioux Tribe
- Upper Sioux Community, Minnesota

In May 2019, a notice was sent via email to the three tribes who responded in the affirmative to participating in the PA development. The notice requested review of and comment on an example PA for the C-HC Project. In September 2019, the three tribes were invited to participate in one of three conference calls with consulting parties to provide comments for the revised PA. The Rosebud Sioux Tribe participated in the conference call held on September 19, 2019. The final PA was circulated with the tribes listed in Table 5.3-1 (above) for signature as concurring parties on October 1, 2019. The Final PA is included in Appendix H.

5.4 FORMAL CONSULTATION

RUS is required to prepare the EIS in coordination with any studies or analyses that are required under the ESA (16 U.S.C. 1531 et seq.) and the NHPA, as amended (54 U.S.C. 300101 et seq.)

5.4.1 Section 7 of the Endangered Species Act

Section 7 of the ESA requires Federal agencies to ensure that their actions do not jeopardize the continued existence of threatened or endangered species or result in the destruction of their designated critical habitat. It may also require consultation with the USFWS in making this determination.

On October 23, 2017, a letter (from SWCA on behalf of RUS) was sent to USFWS requesting technical assistance for the DEIS. USFWS provided comments on the Administrative Draft Biological Assessment, submitted by the Utilities, on January 5, 2018. These comments provided recommendations on specific species that may be potentially affected by the C-HC Project as well as suggested mitigation measures. RUS formally submitted the Draft BA to USFWS on November 3, 2018. USFWS submitted the draft Biological Opinion to RUS on April 22, 2019. The final BO was issued by USFWS on July 1, 2019. The BO is contained in Appendix G of this FEIS. Consultation with USFWS is ongoing.

5.4.2 Section 106 of the National Historic Preservation Act

Section 106 of the NHPA requires Federal agencies to consider the effects of their actions on historic properties (including archaeological sites) that are listed, or are considered eligible for listing, on the NRHP (a historic property is an eligible site). In so doing, the lead agency must consult with Native American tribes, the Advisory Council on Historic Preservation, interested members of the public, and appropriate SHPOs. The ultimate goal of consultation is to identify and resolve any adverse effects of an undertaking on historic properties.

The Section 106 process is initiated with the establishment of the undertaking (§800.3), which was done after RUS published the NOI in the Federal Register in October and November 2016. RUS is the lead Federal agency for Section 106 compliance. RUS used the NEPA process to satisfy the public involvement process for Section 106 of the NHPA (16 U.S.C. 470f), as provided for in 36 CFR 800.2(d)(3). The Section 106 process was coordinated with the NEPA process, starting with public scoping. During this period, potential consulting parties were identified and notified of the project. These parties include the tribes listed in Appendix B, USACE, USFWS, Wisconsin and Iowa SHPOs, local governments, the PSCW, and the IUB.

The Section 106 process entails the identification of historic properties (§800.4) within a defined "area of potential effects" (APE). The APE for this undertaking was determined in consultation and forms the parameters for the identification effort. Identification of historic properties began with a Class I-level inventory, which included the review of existing information such as previous inventories and previously recorded sites. A Class III inventory was conducted for the alternative routes within the Refuge. In accordance with §800.4 (b)(2), for projects "where alternatives under consideration consist of corridors or large land areas," a phased approach can be followed to identify and evaluate historic properties. Further, "the agency official may also defer final identification and evaluation of historic properties if it is specifically provided for in a . . . programmatic agreement executed pursuant to §800.14(b)." The Final PA is included in Appendix H.

For a project of this scale, an intensive Class III inventory would be conducted on the selected alternative prior to the start of construction. Right-of-entry, as appropriate, would be obtained prior to any fieldwork.

During the Class III inventory, the cultural resources identified would be evaluated for their significance and assessed for their eligibility for the NRHP. Determinations of eligibility would be made in consultation; sites determined eligible or listed in the NRHP are "historic properties." However, since the identification effort would take place in stages for the C-HC Project, the identification and evaluation process would be provided for in the PA and deferred until after the Record of Decision and associated approvals.

The assessment of adverse effects on historic properties (§800.5) is typically the next step in the Section 106 process. An adverse effect is found "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association." To resolve the potential adverse effects of the undertaking on historic properties, a project-specific PA was developed among the Section 106 Consulting Parties. The Final PA is provided in Appendix H. The PA must be executed before RUS, USACE, and USFWS issue their decisions in the Record of Decision.

CHAPTER 6. LIST OF PREPARERS

6.1 INDIVIDUALS AND ORGANIZATIONS

This FEIS was prepared and reviewed by a team from RUS, USFWS, USACE, and USEPA. A team associated with SWCA assisted RUS in conducting research, gathering data, and preparing the FEIS and supporting documents. Table 6.1-1 identifies the team members and their roles.

Table 6.1-1. List of Preparers and Reviewers

Agency/Firm	Name	Title/Document Role
USDA Rural Utilities Service		
RUS	Dennis Rankin	Agency Co-Project Manager
RUS	Lauren Cusick	Agency Co-Project Manager
RUS	Joe Dorava	Wisconsin State Office
RUS	Ken Solano	Project Engineer
RUS	Emily Flanigan	Project Engineer
RUS	Colin Waddell	Project Engineer
RUS	Erika Martin Siebert	Federal Preservation Officer
U.S. Environmental Protection Agency		
USEPA, Region 5	Ken Westlake	Chief, NEPA Implementation Section
USEPA, Region 5	Kathleen Kowal	NEPA Reviewer
USEPA, Region 7	Amber Tilley	NEPA Reviewer
U.S. Army Corps of Engineers		
USACE, Regional Planning	Wendy Frohlich	Biologist
USACE, Rock Island, Real Estate	Susan Monson	Realty Specialist
USACE, Rock Island Real Estate	Cheryl Shocklie	Realty Specialist
USACE, Rock Island District	Paul St. Louis	Section 408 Program Manager
USACE, Regional Planning	Jim Ross	Archaeologist
USACE, Rock Island District	Abby Steele	Biologist
USACE, Mississippi River Project	Joseph Lundh	Supervisory Natural Resource Specialist
USACE, St. Paul District	April Marcangeli	Regulatory Project Manager
U.S. Fish and Wildlife Service		
USFWS, Upper Mississippi River National Wildlife and Fish Refuge (Refuge)	Tim Yager	Deputy Refuge Manager
USFWS, Refuge	Brandon Jones	McGregor District Manager
USFWS, Refuge	Wendy Woyczik	McGregor District Deputy Manager
USFWS, Minnesota-Wisconsin Field Office	Andrew Horton	Biologist

Agency/Firm	Name	Title/Document Role
Contractor Team		
SWCA	Joseph J. Fluder III	CEO, project principal, senior reviewer
SWCA	Coleman Burnett	Senior project manager, environmental planner/senior project manager, lead author
SWCA	Amanda Nicodemus	Deputy project manager, EIS author
SWCA	Jennifer Wynn	Environmental planner, EIS author
SWCA	Kely Mertz	Ecologist, vegetation lead author
SWCA	Drew Carson	Ecologist, wildlife lead author
SWCA	Brad Sohm	Senior air quality specialist, air quality lead author
SWCA	Joanna Guest	Air quality specialist, noise lead author
SWCA	Wes Mattox	Archaeologist/principal investigator, cultural resources lead author
SWCA	Adrian Hogel	Ecologist, visual resources lead author
SWCA	Greg Poremba	Senior NEPA specialist, socioeconomics and environmental justice lead author
SWCA	Jeremy Eyre	Public health and safety lead author
SWCA	Earl Smith	Senior GIS specialist, GIS lead
SWCA	Julia Zorn	GIS specialist, GIS support
SWCA	Christy Hartmann	Senior NEPA planner, senior reviewer
SWCA	Heidi Orcutt-Gachiri	Managing editor
SWCA	Kelley Cox	Publication specialist
Olsson Associates	Tony Baumert	Olsson project manager and wetlands lead author
Olsson Associates	Joan Darling	Senior oversight
Olsson Associates	Ted Hartsig	Geology and soils lead author
Olsson Associates	Karen Griffin	Water resources lead author
Olsson Associates	Carter Hubbard	Floodplains lead author
Olsson Associates	Jeff McKerrow	Transportation coauthor
Olsson Associates	Corrine Donahue	Transportation coauthor
Olsson Associates	Gunnar Malek-Madani	GIS specialist, GIS support

CHAPTER 7. LITERATURE CITED

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CHAPTER 8. DISTRIBUTION LIST

In addition to the RUS website, electronic copies (via CD) of the FEIS will be available for public viewing in the 14 locations listed in Table 8-1.

Table 8-1. Public Locations where the Environmental Impact Statement will be Distributed

Library	Address
Allen-Dietzman Public Library	220 W. Barber Avenue, Livingston, WI 53554
Barneveld Public Library	107 W. Orbison Street, Barneveld, WI 53507
Dodgeville Public Library	139 S. Iowa Street, Dodgeville, WI 53533
Dubuque County Library, Asbury Branch	5290 Grand Meadow Drive, Asbury, IA 52002
Eckstein Memorial Library	1034 E. Dewey Street, Cassville, WI 53806
Guttenberg Public Library	603 S. 2nd Street, Guttenberg, IA 52052
Middleton Public Library	7425 Hubbard Avenue, Middleton, WI 53562
Montfort Public Library	102 E. Park Street, Montfort, WI 53569
Mount Horeb Public Library	105 Perimeter Road, Mount Horeb, WI 53572
Platteville Public Library	65 S. Elm Street, Platteville, WI 53818
Potosi Branch Library	103 N. Main Street, Potosi, WI 53820
Rosemary Garfoot Public Library	2107 Julius Street, Cross Plains, WI 53528
Schreiner Memorial Library	113 W. Elm Street, Lancaster, WI 53813
USFWS McGregor District Office	470 Cliff Haven Road, Prairie du Chien, WI 53821

CHAPTER 9. GLOSSARY

Algific talus slopes—Algific talus slopes are rare, fragile soil formations and habitat that exist on north-facing slopes of ridges and canyons in the "Driftless Area" of Wisconsin and Iowa.

Aquifer—An underground body of porous materials, such as sand, gravel, or fractured rock, filled with water and capable of yielding useful quantities of water to a well or spring.

Auger—Any sort of various tools or devices with a helical shaft or part that is used for boring holes (as in wood, soil, or ice) or moving loose material (such as snow).

A-weighted decibel (dBA)—A logarithmic unit of sound measurement based on an A-weighted scale, commonly used for measuring environmental and industrial noise levels.

Borings—The drilling of a hole, tunnel, or well in the earth.

Bus—Also referred to as a "node" or a "station" or a "substation." A common connection point for two or more electrical components, such as a transformer, a generator.

Capacity—A measure of the ability of a transmission line, groups of transmission lines (path), or a transmission system to carry electricity; the maximum load that a generator, piece of equipment, substation, transmission line or system can carry for a given period of time without exceeding approved limits of temperature or stress.

Centerline—A line on a map or flagged on the ground that indicates the location of a linear feature such as a road or a transmission line. The linear feature is further defined by its total width, either for construction or operation, which is bisected into two equal parts by the centerline.

Certificate—A type of permit for public convenience and necessity issued by a utility commission, which authorizes a utility or regulated company to engage in business, construct facilities, provide some services, or abandon service.

Certificate of Public Convenience and Necessity (CPCN)—A CPCN or certificate of public convenience is a type of regulatory compliance certification for public service industries.

Circuit—An electrical device that provides a path for electrical current to flow, or along which an electrical current can be carried. In the case of high-voltage transmission, a set of wires energized at transmission voltages extending beyond a substation which has its own protection zone and set of breakers for isolation.

Circuit breaker—A device designed to open and close an electrical circuit.

Conductor—The wire cable strung along a transmission line through which electricity flows.

Corona noise—The discharge of energy from an energized transmission line that occurs when the voltage gradient exceeds the breakdown strength of air. Corona occurs in regions of high electric field strength on conductors, insulators, and hardware when sufficient energy is imparted to charged particles to cause ionization (molecular breakdown) of the air.

Corridor—A continuous strip of land, of defined width, through which a linear utility route (or routes) passes.

Current—The amount of electrical charge flowing through a conductor (as compared to voltage, which is the force that drives the electrical charge), which is measured in amperes or amps.

Dead-end structures—Transmission line tower structures that are more robust than tangent structures used 1) to add longitudinal strength to the line; 2) at turning points (angles); 3) for added safety at crossings of other utilities (e.g., other transmission lines and roads); and 4) to interrupt long distances of suspension structures that would otherwise provide more exposure to catastrophic line failure over long distances.

Demand—1) The rate at which electric energy is delivered to or by a system or part of a system, generally expressed in kilowatts or megawatts, at a given instant or averaged over any designated interval of time; 2) the rate at which energy is being used by the customer.

Demand response—"Changes in electric use by demand-side resources [consumers] from their normal consumption patterns in response to changes in the price of electricity, or to incentive payments designed to induce lower electricity use at times of high wholesale market process or when system reliability is jeopardized" as defined by FERC.

Distribution line—The structures, insulators, conductors, and other equipment used to deliver electricity directly to the customer, including commercial facilities, small factories, or residences.

Double-circuit transmission line—A transmission line composed of six electrical phases (two independent circuits of three phases each) and two lightning protection shield wires.

Easement—A grant of certain rights to the use of a piece of land. A grant of easement across a private parcel for a transmission line typically includes the right to enter the easement area to build, maintain, and repair transmission facilities, including access roads. Permission for these activities is included in the negotiation process for acquiring easements over private land. The land itself remains in private ownership.

Electric and magnetic fields (EMF)—Fields describing properties of a location or point in space and its electrical environment, including the forces that would be experienced by a charged body in that space by virtue of its charge or the movement of charges. The voltage, which is the "pressure," produces an electric field that moves the electricity through wires. The current produces a magnetic field, which is a measure of how much electricity is flowing. Thus, wherever there is electric current flowing (including through any type of wiring), there is both an electric and a magnetic field.

Erosion—The wearing away of land surface by wind or water that occurs naturally from weather or runoff but can be intensified by land-clearing practices related to such activities as farming, residential or industrial development, road building, or timber-cutting.

Federal Energy Regulatory Commission (FERC)—The independent agency that regulates the interstate transmission of natural gas, oil, and electricity.

Franchise—The authorization of the Iowa Utilities Board (IUB) for the construction, erection, maintenance, and operation of an electric transmission line.

Generation—The act of converting various forms of energy input (thermal, mechanical, chemical, and/or nuclear energy) into electric power. Also, the amount of electric energy produced, usually expressed in kilowatt hours (kWh) or megawatt hours (MWh).

Grid—A transmission grid is a network of high-voltage, long-distance transmission lines and substations that connect generating facilities to distribution systems.

Hazard tree—Hazard trees include dead or dying trees, dead parts of live trees, or unstable live trees (due to structural defects or other factors) that are within striking distance of people or property (a target). Hazard trees have the potential to cause property damage, personal injury, or fatality in the event of a failure.

Herbicide—Chemicals substances used to control undesirable vegetation by interfering with specific physiological and biochemical pathways.

High voltage—Lines with 230 kV or above electrical capacity.

Induced Voltage—An electric potential created by an electric field, magnetic field, or a current. It may be natural or human-made.

Insulator—A component of the hardware assembly at either a suspension or dead-end transmission line structure made of a non-conducting material, such as ceramic or fiberglass, generally bell-shaped; connects the conductor to the suspension structure and is used to keep electrical circuits from jumping over to ground.

Interconnection—Two or more electric systems having a common transmission line that permits a flow of energy between them. The physical connection of the electric power transmission facilities allows for the sale or exchange of energy.

Invasive species—A species that is not native to the habitat under consideration and whose introduction causes, or is likely to cause, economic or environmental harm (Executive Order 13112). Invasive plants are typically adaptable, aggressive, and have a high reproductive capacity.

Karst—Landscape created where water dissolves the limestone and dolomite rocks. The rocks are dissolved primarily along fractures which create caves and conduits for groundwater flow. Karst landscapes typically have deep bedrock fractures, sinkholes, and springs.

Key observation points (KOPs)—Viewing locations chosen to be generally representative of visually sensitive areas where it can be assumed that viewers may be affected by a change in the landscape setting from a proposed project. Views from KOPs are described by distance zones and are based on perception thresholds (changes in form, line, color, and texture).

Laydown yard—See staging area.

Line losses—Energy consumed by the conductor generating heat during transport of power through each line; a function of load, circuit length, conductor size, and electrical “resistance.”

Load—The amount of electric power or energy delivered or required at any specified point or points on a system. Load originates primarily at the energy-consuming equipment of customers.

Load-serving—Secures energy and transmission service to serve the electrical demand and energy requirements of its end-use customers

Loess—An unstratified silt, usually buff to yellowish brown loamy deposit; found in North America, Europe, and Asia; believed to be chiefly deposited by the wind.

Megawatts (MW)—A megawatt is 1 million watts, or 1,000 kilowatts; an electrical unit of power.

Midcontinent Independent System Operator, Inc. (MISO)—MISO operates the transmission system and a centrally dispatched market in portions of 15 states in the Midwest and the South, extending from

Michigan and Indiana to Montana and from the Canadian border to the southern extremes of Louisiana and Mississippi.

Midwest Reliability Organization (MRO)—In 2007, FERC approved agreements by which NERC delegates its authority to monitor and enforce compliance to Regional Entities established across North America, of which MRO is one. MRO's primary responsibilities are to: ensure compliance with mandatory Reliability Standards by entities who own, operate, or use the interconnected, international bulk power system (BPS); conduct assessments of the grid's ability to meet electricity demand in the region; and analyze regional system events.

MISO Transmission Expansion Plan (MTEP)—A electric infrastructure plan developed annually by MISO to evaluate various types of transmission projects that ensure reliable operation of the transmission system; support achievement of state and Federal energy policy requirements; and enable a competitive electricity market to benefit all customers. More information about the MTEP process can be found here: https://www.misoenergy.org/planning/transmission-studies-and-reports/#nt=/report-study-analysistype:MTEP.

Monopole—A single self-supporting vertical pole with no guywire anchors, usually consisting of a metal or a wooden pole with below-grade foundations.

Multi-value projects (MVP)—Multi-value projects are a group of projects approved by MISO based on planning analysis showing that they provide multiple benefits (economic, reliability, and public policy) to the region.

National Landcover Database (NLCD)—NLCD is a land cover database for the nation that provides spatial reference and descriptive data for characteristics of the land surface, such as thematic class (for example, urban, agriculture, and forest), percent impervious surface, and percent tree canopy cover. NLCD is used for a variety of Federal, state, local, and nongovernmental applications to assess ecosystem status and health, understand the spatial patterns of biodiversity, predict effects of climate change, and develop land management policy.

Natural Resources Conservation Service (NRCS)—Formerly known as the Soil Conservation Service (SCS), the NRCS is an agency of the United States Department of Agriculture (USDA) that provides technical assistance to farmers and other private landowners and managers.

Network—A system of interconnected lines and electrical equipment.

Noise sensitive receptors—Defined as locations where people reside or where the presence of unwanted sound may adversely affect the existing land use. Typically, noise-sensitive land uses include residences, hospitals, places of worship, libraries, performance spaces, offices, and schools, as well as nature and wildlife preserves, recreational areas, and parks.

North American Electric Reliability Corporation (NERC)—A not-for-profit company formed by the electric utility industry in 1968 to promote the reliability of the electricity supply in North America. NERC consists of nine Regional Reliability Councils and one Affiliate whose members account for virtually all the electricity supplied in the United States, Canada, and a portion of Mexico.

Noxious weed—A legal term, meaning any plant officially designated by a federal, state, or local agency as generally possessing one of more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or non-native, new, or not common to the United States.

Operating guides—Procedures carried out by transmission operators when certain events occur on the system that may compromise system reliability if no action is taken.

Ordinary high-water mark (OHWM)—The ordinary high-water mark defines the boundaries of aquatic features for a variety of federal, state, and local regulatory purposes.

Outage—The unavailability of electrical equipment; could be planned for maintenance or unplanned (forced) by weather or equipment failures.

Overload—Occurs when power flowing through wires or equipment is more than they can carry without incurring damage.

Palustrine—Wetlands dominated by trees, shrubs, and persistent emergent plants associated with water bodies that cover less than 20 acres or with water less than 6.6 feet deep.

Prime farmland—A land use classification used by the U.S. Department of Agriculture (7 CFR §657.5) where a favorable growing season, adequate precipitation or irrigation source, and soil characteristics result in good to excellent crop production.

Pulling site—A staging area located at the beginning of a segment along the transmission line where equipment (i.e., a puller) is set up and used to pull the conductor through the transmission line.

Rebuild—Removing an existing line and replacing it with a new line with either the same or a higher capacity.

Regional Transmission Organizations (RTOs)—An RTO in the United States is an electric power transmission system operator (TSO) that coordinates, controls, and monitors a multi-state electric grid. The transfer of electricity between states is considered interstate commerce, and electric grids spanning multiple states are therefore regulated by FERC. The voluntary creation of RTOs was initiated by FERC Order No. 2000. The purpose of the RTO is to promote economic efficiency, reliability, and non-discriminatory practices while reducing government oversight.

Reliability—The degree of performance of the elements of the bulk electric system that results in electricity being delivered to customers within accepted standards and in the amount desired. The ability to deliver uninterrupted electricity to customers on demand, and to withstand sudden disturbances such as short circuits or loss of system components.

Right-of-way (ROW)—The right to pass over another's land and includes land or an interest in land acquired for the purposes of laying, placing, maintaining, replacing, and removing transmission lines or wires along with support structures for the conveyance of electric power.

Shunt reactor—A shunt reactor is an absorber of reactive power, thus increasing the energy efficiency of the system. It is the most compact device commonly used for reactive power compensation in long high-voltage transmission lines and in cable systems.

Silt—Silt is granular material of a size between sand and clay, whose mineral origin is quartz and feldspar. Silt may occur as a soil or as sediment mixed in suspension with water and soil in a body of water such as a river.

Single-circuit transmission line—A transmission line composed of three electrical phases and two lightning protection shield wires. One of the lightning protection shield wires is a steel overhead ground wire (OHGW), and the other is typically an optical ground wire (OPGW).

Soil compaction—Compaction of soil is the compression of soil particles into a smaller volume, which reduces the size of pore space available for air and water.

Staging area—The area cleared and used by the construction contractor to store and assemble materials or structures immediately before and during construction.

Stray voltage—Small voltage (less than 10V as defined by the USDA) that can be measured between two possible contact points. When these two points are connected together by an object, such as a person or an animal, a current will flow.

Substation—An assemblage of equipment, enclosed by a fence, occurring at points along a transmission line. A facility in an electrical transmission system with the capability to route and control electrical power and to transform power to a higher or lower voltage. Equipment includes transformers, circuit breakers, and other equipment for switching, changing, or regulating the voltage of electricity.

System Control and Data Acquisition (SCADA)—This equipment is used to send data from a remote location to a central location, and to communicate control commands from a central location to remote devices.

Terminal—The point at which a conductor comes to an end and provides a point of connection to external circuits.

Traditional cultural property (TCP)—Any built or natural location, area, or feature eligible for the NRHP because of its associations with cultural practices or beliefs of a living community that (a) are routed in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.

Transfer capability—The measure of the ability of interconnected electric systems to reliably move or transfer power from one area to another over all transmission lines (or paths) between those areas under specified system conditions.

Transformers—Electrical equipment usually contained in a substation that is needed to change voltage on a transmission system.

Transmission—An interconnected group of lines and associated equipment for the movement or transfer of electric energy between points of supply, and points at which it is transformed for delivery to customers or is delivered to other electric systems.

Transmission line—A system of structures, wires, insulators, and associated hardware that carry electric energy from one point to another in an electric power system. Lines are operated at relatively high voltages varying from 69 kV up to 765 kV and are capable of transmitting large quantities of electricity over long distances.

Transmission structures—Poles or towers that support the conductors and separate the overhead wires.

Viewshed—Visible portion of the specific landscape seen from a specific viewpoint, normally limited by landform, vegetation, distance, and existing cultural modifications.