Bioeconomy Development Opportunity Zone Rating Chippewa County, WI
Date of Issue: April 17, 2024
Rating Grade: **'A'**

A
High Quality

Rating Parameters:

Category	Rated Quantity	Delivered Price	BDO Zone Size
Corn Stover	380,000 bdt/yr	$86-$94/bdt	75-mi drive distance from Chippewa Falls, WI

BDO Zone Assets

- **Steady increase in grain crops planted area, pointing to a positive outlook for corn stover availability.**
- **Lack of established competition for corn stover within 150-mi drive distance from Chippewa Falls, WI.**
- **Access to North America's largest and farthest inland freshwater port, providing access to global markets.**
- **Rail line running adjacent to the industrial site and the road network provides east-west access from Canadian border in Sault Ste. Marie, ON, to Seattle, WA.**

BDO Zone Liabilities

- **Corn stover supply chains need to be established due to a lack of historical commercial-scale demand for corn stover**
- **Large number of farmers produce cash crops and cattle, providing them revenue options that may impact their willingness to harvest corn stover for their livestock use.**
- **Yield variability within the Supply Zone means a more fragmented supply chain with increased production risk.**

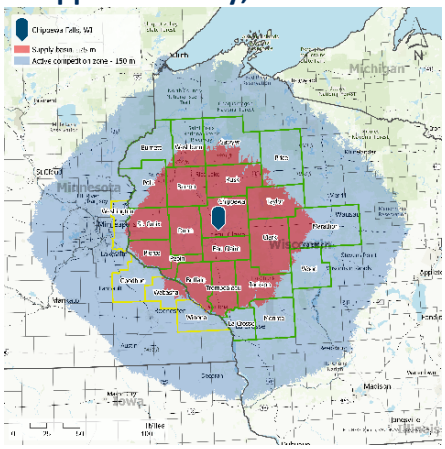
Rating Grade

The Chippewa County, WI, Bioeconomy Development Opportunity Zone is rated 'A,' or 'low' risk.

Risk Rating Grades are defined as follows: AAA (*extremely low*), AA (*very low*), A (*low*), BBB (*low-moderate*), BB (*moderate*), B (*moderate-high*), and C (*high*).

'A' ratings denote high prospective viability of Feedstock Supply and Infrastructure and low expectations of default risk in the Zone. Capacity to support new biobased plant operations is considered strong. This capacity may, nevertheless, be more vulnerable to adverse weather, supply chain, economic, or infrastructure conditions than is the case for higher ratings.

Chippewa County, WI BDO Zone



Scoring & Rating Methodology

In assessing the biomass supply chain risk for the Bioeconomy Development Opportunity (BDO) Zone, 88 Risk Indicators from the US Standards for Biomass Supply Chain Risk (BSCR) were applied. These BDO Zone Risk Indicators are the subset of BSCR Risk Indicators applicable to evaluating feedstock risk within a BDO Zone.

Feedstock quantities are expressed in bone dry tons per year (bdt/yr), while feedstock costs are expressed in United States (USD) dollars. Maximum transport distance is based on a 75-mile driving distance from the center point (Chippewa Falls, WI).

The BDO Zone rating is based on an aggregation of the scores assigned to each BDO Zone Risk Indicator (RI) assessed in this report. First, each BDO Zone Risk Indicator is given a **Raw Risk Likelihood (RRL)** score which denotes the likelihood of a risk to future BDO Zone projects due to the Risk Indicator. RRL Scores are scaled as either *very low* (2), *low* (4), *medium* (6), *high* (8), or *very high* (10).

Each BDO Zone Risk Indicator is given a **Raw Risk Impact (RRI)** score which denotes the impact on a future BDO Zone project due to the Risk Indicator. RRI scores are scaled as either *very low* (2), *low* (4), *medium* (6), *high* (8), or *very high*

(10). Impact level scores are based on the impact level of a risk on the successful development and deployment of a BDO Zone project with no mitigation measures.

Then, the **Gross Risk Indicator (GRI)** score is then calculated as the product of the RRL and the RRI scores. For example, if the 'Competitor Price and Price Sensitivity' is scored at an RRL of 2 and an RRI of 8, then the GRI for this risk indicator is 2 X 8 = 16.

If the analyst deems that a typical bio-based project could put in place economically reasonable measures or best practices that mitigate the likelihood (RRL), the impact (RRI), or both, then the GRI will be notched accordingly.

The **Loaded RI** score for each Risk Indicator is the product of the GRI score and any notched scores. Loaded RIs are the final score for a Risk Indicator.

Loaded RI scores of 20 or less are deemed *very low risk*; scores between 21 and 40 are deemed *low risk*; scores between 41 and 60 are deemed *medium risk*; scores between 61 and 80 are deemed *high risk*; and scores of 81 and greater are deemed *very high risk*.

The total risk rating for the BDO Zone is the average of all Loaded RI scores. The BDO Zone score for Location is ***20.75 out of 100, resulting in an 'A' designation***.

All scoring and rationale for each Risk Indicator are provided in Appendix B.

Analyst Notes

The Chippewa County, WI, BDO Zone assesses competition in a 150-mile drive distance from Chippewa Falls, WI, and the potential corn stover supply within a 75-mile drive distance from the same location, comprising 27 counties, 23 in Wisconsin, and 4 in Minnesota.

The region is a mix of cash crops and dairy cattle, where most farmers grow both. The grain planted area has been steadily increasing over the years, replacing land formerly used for hay and alfalfa.

The 10-year average harvested area is around 680,000 acres, with a corn yield of 157 bu/acre. Considering availability restraints, particularly sustainability factors, the rated quantity of corn stover available at low risk is estimated to be 380,000 bdt/yr.

BDO Zone Assets

Even though yields within the Supply Zone are highly variable, almost half of the counties present grain yields well above the sustainability threshold for biomass removal. This indicates that a new bio-based project would likely be able to source feedstock from areas where soil quality will not be a big concern.

The industrial site assessed in this report benefits from a strategic logistical position, with access to an east-west road corridor, rail connectivity, and proximity to water freight access, which is an unusual advantage in the Midwest.

Wisconsin is actively promoting biomass projects in alignment with its Clean Energy Plan, targeting 100% carbon-free electricity by 2050 and reduced greenhouse gas emissions. State-supported initiatives include funding for feasibility studies and pilot projects related to biogas and anaerobic digestion, all of which benefit the development of bio-based projects.

BDO Zone Liabilities

There is significant yield variability from county to county, where some are at the lower limits of what the literature suggests for maintaining healthy levels of organic matter in the soil, which means that not all corn-growing areas would be suitable for corn stover removal. In this case, farmer outreach would play a more relevant role in defining the specific areas where feedstock would be more likely to be sourced.

The coordination of the supply chain will be an added challenge, given that this BDO Zone has never had large-scale demand for this feedstock. Cost-efficient supply chains, including harvesting, collection, handling, transportation, and storage of commercial quantities of corn stover, need to be developed in the BDO Zone region.

Additionally, most farmers grow cash crops and raise cattle, and some harvest corn for silage and may eventually collect some corn stover for animal bedding. In other words, unlike exclusively grain-producing regions, farmers in this Supply Zone have additional revenue options. They may be less willing to participate in a new supply chain, especially one that requires substantial financial investment in new field equipment.

Infrastructure Profile

The industrial site is a 40-acre property with all utilities available nearby. The land is mostly flat with no environmental liabilities.

The industrial site benefits from proximity to a rail line running adjacent to the parcel and a road network that facilitates east-west connectivity from Sault Ste. Marie, Canada, to Seattle, WA. Notably, the Port of Duluth-Superior, a major freshwater port, lies 150 miles north, providing significant water freight access for bulk cargo.

In previous decades, the BDO Zone experienced significant investment in fracking activities, which are now defunct. During that time period, the region's transportation infrastructure was well-developed to support that industry, boasting three rail spurs, sizable fleets of trucks and trailers, and access to freshwater ports like Duluth and Green Bay.

New Auburn is a small village and depends on nearby towns for essential services, such as healthcare and education. Labor will likely come from adjacent towns as well. Some educational institutions partner with private companies to provide vocational education in various disciplines. Despite New Auburn's modest school ranking, the Eau Claire metro area's competitive labor costs have a median hourly wage of $20 and an annual income of $53,000.

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Figure 1: Risk Indicators (Sorted by Risk Level)

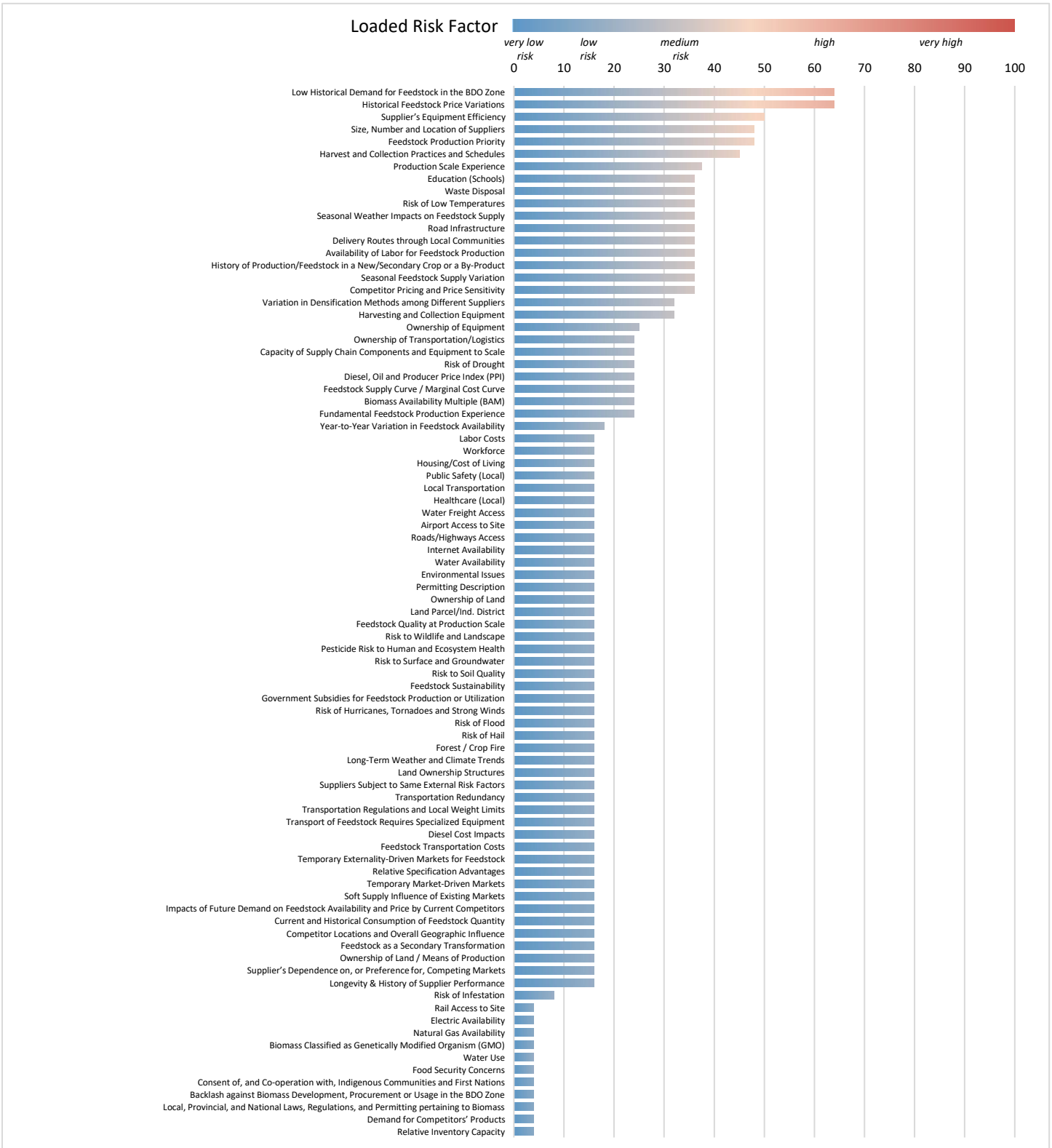


Table 1: Risk Indicators and Associated Scores

	Feedstock Supply Chain Risk Indicators	Raw Risk Likelihood	Raw Risk Impact	Gross Risk Indicator	Mitigation /Notching	Loaded RI Score
	Category 1.0: Supplier Risk					
1.1.1	Longevity & History of Supplier Performance	4	4	16	NN	16
1.2.1	Supplier's Dependence on, or Preference for, Competing Markets	4	4	16	NN	16
1.3.1	Ownership of Land / Means of Production	4	4	16	NN	16
1.3.2	Ownership of Equipment	10	10	100	75%	25
1.3.3	Ownership of Transportation/Logistics	6	4	24	NN	24
1.3.4	Feedstock as a Secondary Transformation	4	4	16	NN	16
1.4.1	Fundamental Feedstock Production Experience	8	6	48	50%	24
1.4.2	Production Scale Experience	10	10	100	63%	37.5
1.5.1	Supplier's Equipment Efficiency	10	10	100	50%	50
1.6.1	Feedstock Production Priority	8	8	64	25%	48
	Category 2.0: Competitor Risk					
2.1.1	Competitor Locations and Overall Geographic Influence	4	4	16	NN	16
2.1.2	Current and Historical Consumption of Feedstock Quantity	4	4	16	NN	16
2.1.3	Competitor Pricing and Price Sensitivity	6	6	36	NN	36
2.1.4	Impacts of Future Demand on Feedstock Availability and Price by Current Competitors	4	4	16	NN	16
2.1.5	Soft Supply Influence of Existing Markets	4	4	16	NN	16
2.1.6	Temporary Market-Driven Markets	4	4	16	NN	16
2.2.1	Relative Inventory Capacity	2	2	4	NN	4
2.2.2	Relative Accessibility / Delivery Hours and Wait Times	NR	NR	NR	NR	NR
2.2.3	Relative Specification Advantages	4	4	16	NN	16
2.2.4	Demand for Competitors' Products	2	2	4	NN	4
	Category 3.0: Supply Chain Risk					
3.1.1	Biomass Availability Multiple (BAM)	4	6	24	NN	24
3.1.2	Feedstock Supply Curve / Marginal Cost Curve	6	4	24	NN	24
3.1.3	Seasonal Feedstock Supply Variation	6	8	48	25%	36
3.1.4	Year-to-Year Variation in Feedstock Availability	6	6	36	50%	18
3.2.1	Historical Feedstock Price Variations	8	8	64	NN	64
3.2.2	Low Historical Demand for Feedstock in the BDO Zone	8	8	64	NN	64
3.2.3	History of Production/Feedstock in a New/Secondary Crop or a By-Product	6	6	36	NN	36
3.3.1	Diesel, Oil and Producer Price Index (PPI)	6	4	24	NN	24
3.3.2	Currency Risk	NR	NR	NR	NR	NR
3.3.3	Border Risk	NR	NR	NR	NR	NR
3.3.4	Temporary Externality-Driven Markets for Feedstock	4	4	16	NN	16
3.4.1	Harvest and Collection Practices and Schedules	8	10	80	44%	45
3.4.2	Harvesting and Collection Equipment	8	8	64	50%	32
3.4.3	Variation in Densification Methods among Different Suppliers	8	8	64	50%	32
3.4.4	Availability of Labor for Feedstock Production	8	8	64	44%	36
3.5.1	Feedstock Transportation Costs	4	4	16	NN	16
3.5.2	Diesel Cost Impacts	4	4	16	NN	16
3.5.3	Transport of Feedstock Requires Specialized Equipment	4	4	16	NN	16
3.5.4	Delivery Routes through Local Communities	6	6	36	NN	36
3.5.5	Transportation Regulations and Local Weight Limits	4	4	16	NN	16
3.5.6	Road Infrastructure	6	6	36	NN	36
3.5.7	Transportation Redundancy	4	4	16	NN	16
3.6.1	Size, Number and Location of Suppliers	6	8	48	NN	48
3.6.2	Suppliers Subject to Same External Risk Factors	4	4	16	NN	16
3.6.3	Land Ownership Structures	4	4	16	NN	16
3.7.1	Seasonal Weather Impacts on Feedstock Supply	6	6	36	NN	36
3.7.2	Long-Term Weather and Climate Trends	4	4	16	NN	16
3.7.3	Forest / Crop Fire	4	4	16	NN	16
3.7.4	Risk of Infestation	2	4	8	NN	8
3.7.5	Risk of Hail	4	4	16	NN	16
3.7.6	Risk of Flood	4	4	16	NN	16
3.7.7	Risk of Drought	6	4	24	NN	24
3.7.8	Risk of Hurricanes, Tornadoes and Strong Winds	4	4	16	NN	16
3.7.9	Risk of Low Temperatures	6	6	36	NN	36
3.8.1	Government Subsidies for Feedstock Production or Utilization	4	4	16	NN	16
3.8.2	Local, Provincial, and National Laws, Regulations, and Permitting pertaining to Biomass	2	2	4	NN	4
3.8.3	Backlash against Biomass Development, Procurement or Usage in the BDO Zone	2	2	4	NN	4
3.8.4	Consent of, and Co-operation with, Indigenous Communities and First Nations	2	2	4	NN	4

3.8.5	Food Security Concerns	2	2	4	NN	4
3.9.1	Feedstock Sustainability	4	4	16	NN	16
3.9.2	Risk to Soil Quality	4	4	16	NN	16
3.9.3	Risk to Surface and Groundwater	4	4	16	NN	16
3.9.4	Water Use	2	2	4	NN	4
3.9.5	Pesticide Risk to Human and Ecosystem Health	4	4	16	NN	16
3.9.6	Risk to Wildlife and Landscape	4	4	16	NN	16
3.9.7	Biomass Classified as Genetically Modified Organism (GMO)	2	2	4	NN	4
	Category 4.0: Feedstock Scale-up Risk					
4.1.1	Feedstock Quality at Production Scale	8	8	64	75%	16
4.1.2	Capacity of Supply Chain Components and Equipment to Scale	8	8	64	63%	24
	Category 5.0: Infrastructure					
5.1.1	Land Parcel/Ind. District	4	4	16	NN	16
5.1.2	Ownership of Land	4	4	16	NN	16
5.1.3	Permitting Description	4	4	16	NN	16
5.1.4	Environmental Issues	4	4	16	NN	16
5.2.1	Natural Gas Availability	2	2	4	NN	4
5.2.2	Electric Availability	2	2	4	NN	4
5.2.3	Water Availability	4	4	16	NN	16
5.2.4	Waste Disposal	6	6	36	NN	36
5.2.5	Internet Availability	4	4	16	NN	16
5.3.1	Roads/Highways Access	4	4	16	NN	16
5.3.2	Rail Access to Site	2	2	4	NN	4
5.3.3	Airport Access to Site	4	4	16	NN	16
5.3.4	Water Freight Access	4	4	16	NN	16
5.4.1	Healthcare (Local)	4	4	16	NN	16
5.4.2	Education (Schools)	6	6	36	NN	36
5.4.3	Local Transportation	4	4	16	NN	16
5.4.4	Public Safety (Local)	4	4	16	NN	16
5.4.5	Housing/Cost of Living	4	4	16	NN	16
5.5.1	Workforce	4	4	16	NN	16
5.5.2	Labor Costs	4	4	16	NN	16
					Average	***20.75***



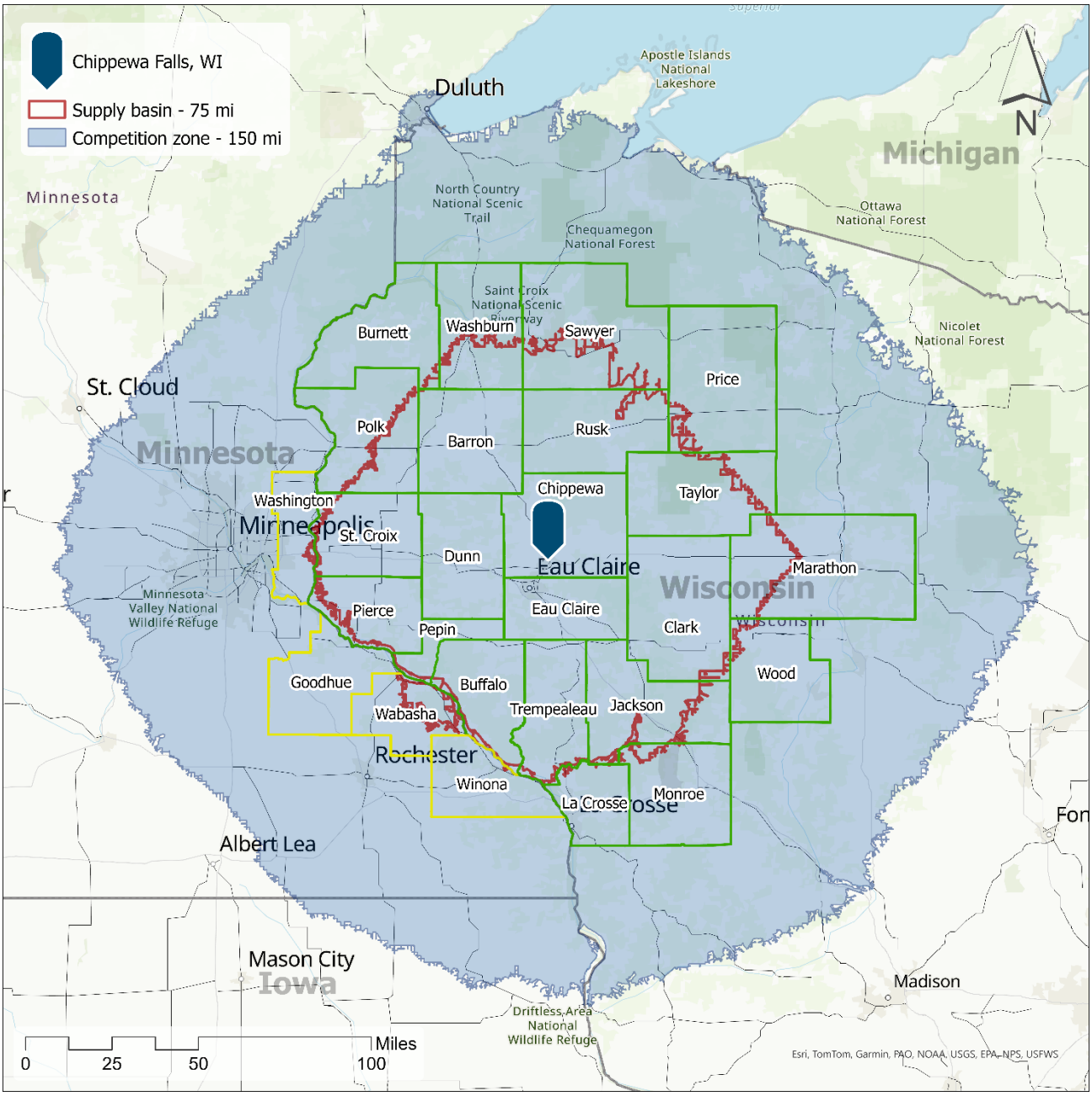
Chippewa County, WI, BDO Zone Independent Review Committee (IRC)

Al Blaha – New Auburn Economic Development Corporation
Anthony Bowe – Local Farmer
Casey Hedrington – Chippewa Economic Development Corporation
Charlie Walker – Chippewa Economic Development Corporation
Dan North – New Auburn Economic Development Corporation
Dennis Hawkins – Local Farmer
Jerry Clark – AG Extension
Jim Pingel – Local Farmer
Kelli Ludwigson – New Auburn Economic Development Corporation
Marc Boettcher – Local Farmer
Randy Woodruff – Local Farmer
Tim Schilla – New Auburn Economic Development Corporation
Tony Fanetti – Local Farmer
Dave Fellon – Progressive Rail
Scott Beers – Beers Specialized Transport LLC
Karen Smith – Security Bank
Neal Kemmet – Ace Ethanol

APPENDIX A: BIOMASS AVAILABILITY AND PRICING

This section provides an overview of the availability and pricing of corn stover as feedstock for bioenergy, biofuels, and potentially other bio-based products in Chippewa County, Wisconsin (WI) as a BDO Zone region, with the center point being Chippewa Falls, WI. The BDO Zone region consists of 27 counties: 23 in Wisconsin and 4 in Minnesota. Map A-1 below illustrates the supply and competition zones.

Map A-1. BDO Zone Region Map



Study Region

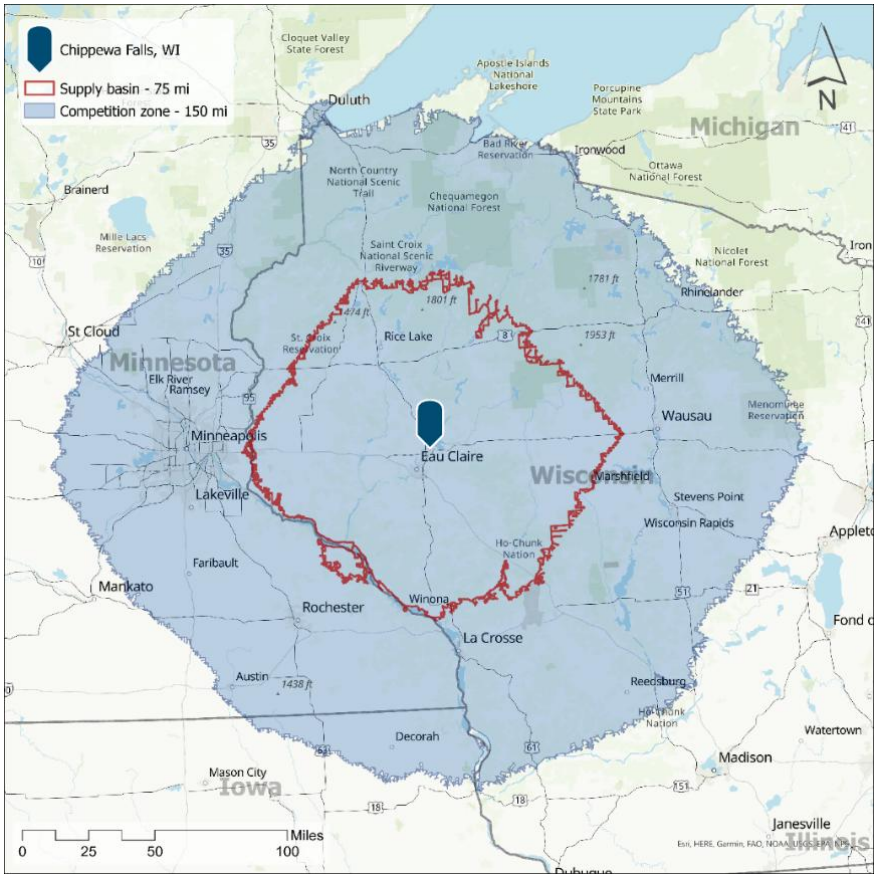
The BDO Zone Region is defined by a 75-mile drive from Chippewa Falls, WI (Map A-2) (referred to as the Supply Zone). It assesses corn stover availability within this region while also investigating current and emerging competing markets within the broader 150-mile drive distance (referred to as the competition zone).

The BDO Zone region's primary agricultural activities are corn and soybean cultivation, dairy production, and cattle for beef on a smaller scale. The usual crop rotation is corn and soybeans, but grain producers may grow corn on corn for 2 years in a row, depending on market conditions. Outreach has found that most crop growers follow this practice in a given year and that 75-85% of their harvest is sold as grain, while the remainder is harvested for silage.

The number of dairy farms has slowly been decreasing over the years, causing hay and alfalfa planted areas to give way to grain crop production. The larger dairy operations have been expanding their cash crops planted area as well and are sourcing animal bedding from their own land.

For the 2022 season,[1] corn grain was harvested on 695,294 acres, while soybeans were harvested on 359,323 acres. The 10-year average harvested area for corn is estimated to be 682,959 acres, with an average yield of 157 bu/acre.

Map A-2. Corn Stover Supply and Competition Zones



[1] https://quickstats.nass.usda.gov/

Outreach has found that over the last decade, agricultural land in the Supply Zone that was once dedicated to dairy and beef cattle and hay and alfalfa production has been converted to grain crops (corn and soybeans). Although the grain crops area has increased, the number of cattle has remained steady. Outreach has also found that corn stover baling occurs in about 5% of the harvested area for animal bedding in dairy operations.

Methodology for Estimating the Rating Quantity of Corn Stover in the Supply Zone

The BDO Zone Risk Indicators are scored based on specific feedstock quantity and price metrics, termed the rated quantity and price in this report. The rated quantity represents the low-risk biomass that a prospective bio-based project is likely to secure, accounting for factors such as competition, logistics, sustainability, and operational constraints. Essentially, it serves as a conservative estimate of biomass availability for future ventures.

This report employs five parameters to estimate the rated quantity of corn stover in the Supply Zone:

1. Average production of corn stover in the Supply Zone:

This is determined by analyzing historical corn grain production data over the past 10 years obtained from the USDA's online database. The Ecostrat methodology is utilized to process information on cropland areas and yields. A corn stover generation ratio of 1:1 between grain and corn stover is applied, and the resulting quantity is converted to a bone-dry-ton (bdt) measure by adjusting for 22% moisture content,[2] referred to as the average annual corn stover generation.

2. Current demand for corn stover in the Supply Zone:

This parameter accounts for the primary demands for crop stover, such as animal feed or bedding. In regions with livestock operations, corn crops may be harvested for silage, rendering those areas unable to generate corn stover. Data on current consumption are gathered and validated through outreach to farmers and local experts. The calculated demand is then deducted from the total corn stover generation estimates (parameter 1) to determine the potential availability of corn stover.

Potential availability = average annual corn stover generation (parameter 1) – current demand in the competition zone (parameter 2)

3. Sustainable removal quantity:

Utilizing best practice estimates from agronomic research,[3] a sustainable removal rate of 40% is applied, with the recommendation to leave 60% of produced biomass in the field. This conservative approach accounts for regional variations in field and soil conditions and agricultural practices, although specific data for the BDO Zone region are lacking. Thus, a cautious assumption of 40% removal is utilized, recognizing potential discrepancies between regional conditions and research findings from other states.

Sustainable removal quantity = Potential availability of crop residues (parameter 2) – the sustainable amount left in the field (60% of potential availability estimated in step 2)

(4) Field equipment efficiency to remove corn stover from the field:

Recognizing that not all corn stover can be effectively collected during harvesting operations, an equipment efficiency factor of 82% is applied to the sustainable removal quantity determined in parameter 3. This efficiency figure was sourced from one of the largest harvest groups in the country.

[2] Industrial Corn Stover Harvest, Iowa State University Extension and Outreach, PM 3050 page 6, March 2024.
[3] Science-based maize stover removal can be sustainable, Maecio R. Nunes et.al. Agronomy Journal, 2021; Vol. 113 page 3178-3192 (https://acsess.onlinelibrary.wiley.com/doi/10.1002/agj2.20724)

Field removal quantity = Sustainable removal quantity * Equipment efficiency (82%)

The summary of assumptions utilized to calculate the quantities of corn stover available for sustainable removal within the Supply Zone is detailed in Table A-1 below:

Table A-1. Assumptions to estimate sustainable quantity of corn stover available for removal in the Supply Zone

Harvested corn stover to grain ratio	1:1	Total corn stover produced given the production of corn grain
Sustainable Removal Rate	60%	Biomass sustainably harvested from field
Equipment Efficiency	82%	Efficiency of field equipment to harvest and collect corn stover from the field
Moisture Content[4]	22%	Average moisture content of corn stover at the harvest time

(5) Biomass Availability Multiple (BAM)[5] and Farmer Participation Rate:

Inherent risk factors within the corn stover supply chain include challenges in harvesting within a limited timeframe and ensuring acceptable quality with minimal soil contamination. Farmers may underestimate these challenges, particularly in the absence of established large-scale markets for corn stover. Consequently, only a portion of produced corn stover is likely to be available for biomass projects.

To address these uncertainties, a Biomass Availability Multiple (BAM) is applied to the field removal quantity, thereby deriving the low-risk rated quantity. BAM introduces redundancy in the corn stover supply chain, as it accounts for the likelihood that only a portion of available corn stover will be accessible for future biomass projects due to limited farmer interest in supplying their biomass.

The resulting rated quantity offers a conservative estimate of biomass availability, incorporating factors such as competition, farmer participation rate, logistics, sustainability, and operational constraints.

In summary, the rated quantity is derived by subtracting from the total corn stover generation: current competition (parameter 2), the sustainable amount that must remain in the field (parameter 3), field operation inefficiencies (parameter 4), and the BAM factor (parameter 5), as delineated in Table A-2.

[4] Industrial Corn Stover Harvest, Iowa State University Extension and Outreach, PM 3050 page 6, March 2024

[5] Biomass Availability Multiple (BAM) indicates the degree of redundancy in the biomass supply in the BDO Zone. BAM is the mean ratio of biomass feedstock available to a project, in relation to delivered cost, divided by the biomass project's mean rated quantity. BAM is a strong indicator of supply chain resilience when stressed by supply shortage and/or supplier breach.

Table A-2. Summary of parameters and their description to estimate the rated quantity

Parameter Name	Description
Total corn stover generation	Based on USDA data and a 1:1 ratio between grain and corn stover (Step 1)
Potential availability	Total corn stover generation – current demand (Step 2)
Sustainable removal quantity	Potential availability after sustainability factor to maintain the soil organic matter (step 3)
Field removal quantity	Sustainable removal quantity after the consideration of field equipment efficiency (step 4)
Rated quantity	Field removal quantity / BAM (step 5)

Historical Corn and Corn Stover Production

The report relies on data from the USDA's National Agricultural Statistics Service (NASS),[6] offering a comprehensive 10-year overview of grain yields, production, and harvested areas at the county level, with the latest available data up to 2022. According to USDA harvest data, the average yield of corn grain within the Supply Zone is estimated at 157 bu/acre, equivalent to 3.43 bdt/acre.[7] Details of this calculation are provided in Table A-5.

Figure A-1 illustrates the total corn grain planted and harvested area in the Supply Zone over a 10-year period, indicating that, on average, 80% of the planted acreage undergoes harvesting. The 10-year average harvested area in the Supply Zone amounts to 682,959 acres. Data for the 2022 harvest season indicates a harvested area of 695,294 acres, representing a slight increase of approximately 1.8% compared to the ten-year average.

Regarding corn grain production, the 10-year average stands at around 3,000,000 tons per year (equivalent to 2,200,000 bdt/yr), with the 2022 harvest season yielding approximately 5% higher production than the average. Notably, the 2022 yield of 159 bu/acre slightly surpasses the 157 bu/acre average.

This report relies on 10-year averages to account for fluctuations in acreage and yields over time, influenced by market signals and varying weather conditions.

[6] https://quickstats.nass.usda.gov/
[7] = 157 * 56 /2000 *(1-22%) = 3.43

Figure A-1. 10-year corn grain planted and harvested areas within the Supply Zone

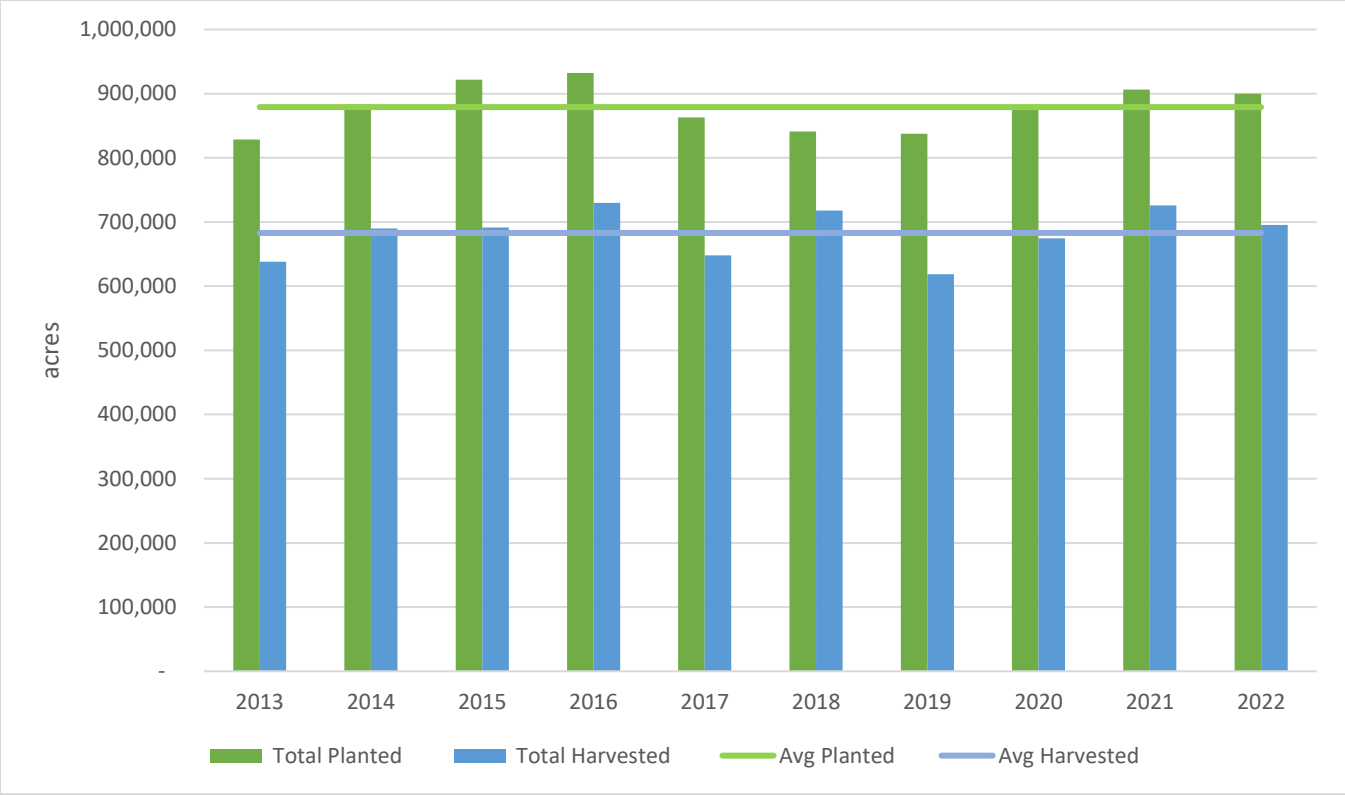


Table A-3 summarizes the average 10-year low and high for corn grain planted area, harvested area, and yield.

Table A-3. Corn grain planted and harvested area and yield comparison over the period of 2012-2022

	2022 harvest season	10-year Average (2012-2022)	10-year low (2012-2022)	10-year high (2012-2022)
Planted Area	899,775	879,072	828,288[8]	932,420[9]
Harvested Area	695,294	682,959	618,536[10]	730,036[11]
Avg Grain Yield (bu/acre)	159	157	116[12]	166[13]

The total corn stover generation is calculated by multiplying the 10-year average harvested area by the grain yield in bone-dry tons (bdt) per acre, resulting in a yearly total of 2,341,784 bdt of corn stover. Table A-4 shows the detailed calculations below.

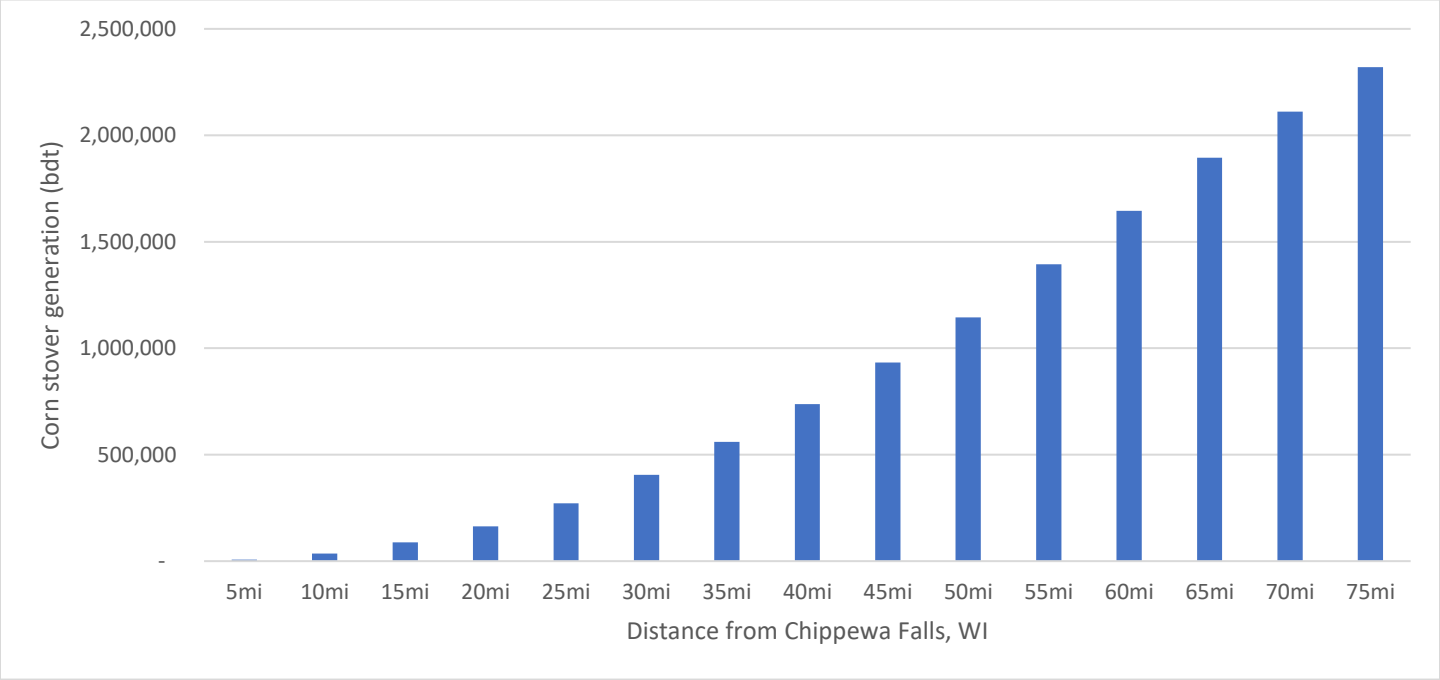
[8] 2013 Harvest season data from USDA
[9] 2016 harvest season data from USDA
[10] 2019 Harvest season data from USDA
[11] 2016 harvest season data from USDA
[12] Tons per acre in 2013 harvest season data from USDA
[13] 2021 harvest season data form USDA

Table A-4. Detailed corn stover generation calculation

Average area harvested in the last ten years (acre)	682,959
Average corn yield in the last 10 years (bu/acre)	157
Corn lbs (wet)/acre	8,792
tons (wet)/acre	4.40
Corn stover yield at the field (bdt/acre)	3.43
Average annual corn stover generation (bdt/yr)	**2,341,784**

The corn stover generation supply curve is depicted below, illustrating the distribution of corn stover generation in 5-mile increments from the center point of Chippewa Falls, WI. Approximately half of the corn stover generation is theoretically available within a 50-mile drive distance from the center point.

Figure A-2. Estimated corn stover generation quantities by distance from Chippewa Falls, WI



Current Competition

Research conducted for the BDO Zone has revealed that no large-scale facilities within the 150-mile Competition Zone consume corn stover. However, a significant portion of corn is harvested as silage for animal feed, accounting for approximately 20% of the harvested area in the Supply Zone. This percentage is subtracted from the total corn stover generation to estimate the competition quantity, resulting in a potential availability for future biomass projects.

Competition quantity (20% of total): 2,341,784 bdt/year * 80% = 1,873,428 bdt/year

Additionally, a small amount of corn stover is baled in the region for animal bedding, representing less than 5% of the total generation. It is anticipated that the current demand for corn stover bales is unlikely to experience significant changes. Further details of this calculation step are provided in Table A-5.

Table A-5. Potential availability of corn stover with the consideration of current competition

Percentage of biomass harvested for silage	20%
Potential availability of corn stover for future biomass projects (bdt/yr)	**1,873,428**

Sustainable Removal & Field Equipment efficiency quantity

When considering the optimal removal of crop residues from fields, it is crucial to acknowledge their role in maintaining soil health by regulating moisture levels, fostering beneficial microbial activity, enhancing soil organic matter, and recycling nutrients. However, excessive residue can impede soil warming during planting seasons, slow evaporation, and hinder planting machinery operation. The ideal removal rate of crop residues varies depending on factors like crop rotation and individual farmers' soil management practices. While the Agronomy Journal[14] suggests a sustainable biomass removal rate of 40%, approximately half of the counties in the BDO Zone exceed the recommended 150 bu/acre threshold, indicating that a higher removal rate may be feasible without compromising sustainability. Hence, a conservative removal rate of 60% is applied[15] in the calculations to account for these variations.

Furthermore, operational inefficiencies in machinery, transportation, and field operations can limit the effective harvesting and utilization of estimated quantities of feedstock. Given the scale of operations spanning thousands of tons annually, these inefficiencies can significantly impact quantity yields. To address this, an efficiency factor of 82% is applied to the sustainable quantities to estimate the actual field availability.

From the initial potential availability of 1,873,428 bdt per year, deductions are made for sustainability and equipment efficiency constraints,[16] resulting in a field availability figure of 921,726 bdt per year, as detailed in Table A-6:

[14] Science-based maize stover removal can be sustainable, Maecio R. Nunes et.al. Agronomy Journal, 2021; Vol. 113 page 3178-3192 (https://acsess.onlinelibrary.wiley.com/doi/10.1002/agj2.20724)
[15] Biomass removal rates are intended as modelling estimates only. Farmers should consult an agronomist before making a decision.
[16] INCUDE IOWA STATES REFERENCE

Table A-6. Sustainable removal quantity of corn stover

Soil Sustainability Factor (percent left in the field)	40%
Harvest Equipment Efficiency to remove stover	82%
Field availability (bdt/yr)	**921,726**

Low Risk Corn Stover Availability

The calculation of the low-risk quantity considers potential farmer reluctance to participate in the supply chain due to various factors such as pricing or soil health concerns. In areas with high yields (>3 bdt/acre) that have favorable planting and harvest seasons and high soil quality, farmer participation rates are expected to be higher compared to regions with lower yields, dry land areas, and frequent drought, where participation rates are anticipated to be lower. Given that many counties in the BDO Zone exhibit yields exceeding 3 bdt/acre and with the expansion of cropland area, a farmer participation rate of 50% is applied to the field availability, which already accounts for sustainability factors. This results in a farmer participation quantity of 460,863 bdt per year.

To address unknown risks associated with the supply chain and potential errors in assumptions, a Biomass Availability Multiple (BAM) is applied to the farmer participation quantity. Considering that previous calculation steps have already addressed various risks and constraints, such as competition, sustainability, and equipment efficiency, a BAM factor of 1.20 is utilized in this report. Consequently, this results in a low-risk rated quantity of over 380,000 bdt/yr.[17] The calculation steps can be found in Table A-7 as follows:

Table A-7. Detailed low-risk quantity calculation

Farmer Participation Rate	50%
Potential availability of corn stover with farmer participation rate (bdt/yr)	**460,863**
BAM Factor	1.20
Rated Quantity of corn stover for the BDO Zone (bdt/yr)	**384,053**
Rated quantity to total production ratio	16%

The low-risk quantity represents the annual quantity a potential project developer can reasonably expect to source, provided the region's risk profile is deemed acceptable.

[17] The low-risk rated quantity is rounded up to 380,000 bdt/ yr for presentation purposes from a calculated quantity of 384,053 bdt/ yr.

Rated pricing of corn stover

There are three distinct periods in the corn stover logistic operations:

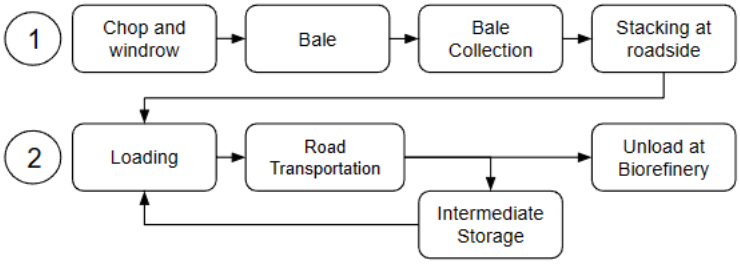
1. Harvest Season: This period immediately follows grain harvest, during which corn stover is harvested, chopped, baled, moved, and stacked on the side of the field.

2. Roadside Bale Pickup and Transportation: This phase occurs between grain harvest and corn planting season. During this window, the bales on the side of the field are loaded, transported, and unloaded, either directly to the biorefinery or an intermediate storage site for later delivery to the biorefinery.

3. Post-Harvest After Planting: After bales are removed from corn fields, they may be stored at an intermediate facility for several months before being transported to the biorefinery. It is recommended that they be stored on well-drained ground and covered with tarps to protect them against the elements and minimize dry matter loss.

Figure A-3 below illustrates the different phases of the logistics of harvesting and transporting corn stover bales:

Figure A-3. Corn stover logistics operations



The farm-gate cost estimation is derived from recent literature reviews and outreach modeling,[18] considering factors such as nutrient deficiency, chopping, bailing, and edge-of-field stacking costs.

Only a small fraction of growers, estimated to be less than 5% of the total biomass available within the Supply Zone, use corn stover for bedding. Typically, round bales are exchanged among neighboring farms in return for manure for fields. Due to this localized trade, there is no established market pricing benchmark for corn stover, whether as biomass or bales, making it challenging to ascertain pricing for potential bio-based projects.

When interpreting prices communicated by farmers for the sale of their bales, two limitations should be considered. Firstly, the cost of replacing nutrients due to biomass removal from the soil is a crucial consideration for crop growers, yet often not fully factored into pricing discussions. Secondly, ask prices for bales may be inflated or unrealistic, especially in markets with limited farmer participation as biomass suppliers. To mitigate these challenges, pricing calculations utilize data from machinery costs, fertilizer market prices, and verbal indications from farmers during outreach to establish a price that is as realistic as possible.

The pricing calculations to estimate the cost of a bale at the roadside of a field follow the methodology outlined by Iowa State University's Extension and outreach modeling,[19] which considers nutrient deficiency resulting from the removal of biomass from the field. Pricing data from Iowa's relatively established corn stover market is utilized for this purpose. Our outreach to local experts has confirmed that these pricing models also apply to the BDO Zone region, particularly as the corn stover market begins to establish itself due to the anticipated demand from future biomass projects.

[18] https://www.extension.iastate.edu/agdm/crops/html/a1-70.html
[19] Estimating a Value for Corn Stover | Ag Decision Maker (iastate.edu)

The latest fertilizer prices[20] are used to calculate nutrient replacement values paid to the crop growers to remove a portion of their corn stover as follows:

Table A-8. Nutrition calculation assumptions

Nutrient Removal Rate (lbs./bdt of biomass)		DTN Fertilizer Price (Dec 2023)		Cost of Nutrient Removal ($/bdt)
N	0	DAP	721	
P2O5	3.5	P/lbs.	0.73	3.00
P	1.5	Potash	514	
K2O	19.2	K/lbs.	0.32	6.50
K	15.9			

The calculated dollar value associated with the nutrient deficit resulting from biomass removal in this study is estimated to be $9.46/bdt, referred to as the "material cost." This cost is intended to compensate crop growers for replacing the nutrients depleted from the soil due to biomass removal.

Given the significant variation in soil type and yields across the BDO Zone region, this report assumes a range for nutrient replacement. A 10% premium is applied to the estimated nutrient removal, resulting in a final material cost compensation ranging from $9.46-10.40/bdt. This approach aims to incentivize farmers to supply their corn stover.

Additional assumptions considered in the methodology include:

1) Given fair corn stover prices, growers will likely be willing to supply.

2) The biomass project developer will successfully invest in creating relationships with growers to establish a supply.

3) Once the biomass facility is commissioned, the price of corn stover becomes attractive, and the supply chain develops, participation levels will likely increase.

Material Cost: $9.46-10.40/bdt

Flail Chopper Cost: $7-8/bdt

Bailing & Collection Cost: $25-30/bdt

Edge of field stacking Cost: $3-5/bdt

The field operation cost is estimated to range between $44-53/bdt,[21] which includes the material cost, chopping, baling, moving, and stacking at the edge of the field. However, this does not represent the full price that farmers would expect to be paid for the bale.

During outreach, it was indicated that farmers would require a profit of at least $18 per acre, or approximately $13.30 per bdt[22] (based on a corn stover removal rate of about 1.35 dry tons per acre). Therefore, considering the additional profit requirement, the estimated farm-gate corn stover price is $58 to $67 per bdt.

[20] https://www.dtnpf.com/agriculture/web/ag/crops/article/2023/08/30/major-retail-fertilizer-prices-lower
[21] Rounded amounts.
[22] There are local variations in these estimates depending on the farmer's micro-region's reality, some have expressed up to $50/ acre.

Transport Cost:

The bale weight (wet basis) range is assumed[23] to be 1,100 and 1,300 lbs. for large 5'x6' round bales and 4'x4'x8' square bales, respectively. The transport cost for corn stover is calculated based on an average bale weight of 1,200 lbs. (wet basis), equivalent to 0.60 tons or 0.47/bale.

Assuming an average drive distance of 50 miles for a supply radius of 75 miles, the transport cost is estimated at $4.00 per mile (one way).[24] Additionally, there is a cost associated with loading and unloading (bale handling), which is approximately $5.80 per bdt.

Table A-9. Bale load capacity configuration

Truck Configurations[a]	Load Limits		Payload		Maximum Load Bulk Density (DM lb/ft³)
	Length (ft)	GVW (lb)	Max (lb)	Square Bale Count	
(1) 48-ft flatbed trailer	48[b]	80,000[b]	51,100	24 – 4×4×8-ft 36 – 3×4×8-ft	16.6 – 4×4×8-ft 14.8 – 3×4×8-ft
(2) 53-ft flatbed trailer	53[c]	80,000[b]	50,800	26 – 4×4×8-ft 39 – 3×4×8-ft	15.3 – 4×4×8-ft 13.6 – 3×4×8-ft
(3) 24-ft flatbed tractor pulling two 30-ft flatbed trailers	105[d,e]	105,500[d]	59,500	44 – 4×4×8-ft 66 – 3×4×8-ft	10.6 – 4×4×8-ft 9.4 – 3×4×8-ft

As shown in Table A-9, a standard 53' flatbed trailer can carry between 26 and 39 bales per load, depending on the bale size. For commercial-scale biomass projects, it is common for the project developer to require large square bales to minimize transportation risks and storage costs. Assuming 39 bales with an average weight of 1,200 lbs. each, the payload is estimated to be 23.4 tons (wet) or 21.91 bdt. Given this average payload, the transportation cost is $21.91/bdt.

Based on the assumptions provided, the estimated delivery cost for corn stover is $86-94/bdt, including:

- Farm-gate price: $58-67/bdt
- Transportation cost: $21.91/bdt
- Loading/unloading cost: $5.80/bdt

[23] Bale weight varies based on the type of equipment and the operator's experience. Each manufacturer will publish numbers. For example, AGCO high-density balers will compact to 13 lbs./cubic feet. Publications refer to "assumptions." The provided bale densities are the average reported values

[24] Cost estimates acquired through direct outreach to transportation companies but are subject to change.

Table A-10. Rated price range calculation breakdown in $/bdt and $/bale.

Cost Component	$/bdt	$/bale
Material cost/Fertilizer replacement cost	9.46 – 10.40	4.45 – 4.89
Crop growers' compensation for removal of corn stover	13.30	6.25
Chopping	7-8	3.29 – 3.76
Baling and collection	25-30	11.75 – 14.10
Stacking at the field side	3-5	1.41 - 2.35
Handling (loading and unloading)	5.80	2.73
Transportation	21.91	9.96
Delivered price[25]	**86 - 94**	**40 – 44**

[25] Rounded cost

APPENDIX B: RISK INDICATOR SCORING METRICS

CATEGORY 1.0: SUPPLIER RISK

1.1 Risk Factor: Credit-Worthiness/Future Solvency of Suppliers

1.1.1 Longevity & History of Supplier Performance

Rationale: Number of years in business is a positive indicator of future solvency. Historical performance is an indicator of future performance.

Risk Information: The Supply Zone has historically been a crop-growing region, with dairy production and beef cattle on a smaller scale. Corn production has averaged around 3,000,000 tons per year in the last decade, and outreach has found that the planted area for crops has been steadily expanding. Growers' expertise and experience are well established in the Supply Zone.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

1.2 Risk Factor: Conflicts of Interest/Vested Interest with Competing Market(s)

1.2.1 Suppliers' Dependence on, or Preference for, Competing Markets

Rationale: Suppliers may have a vested interest or preference to supply to specific competitors for biomass feedstock. Preferences may be due to historical, long-term, or personal relationships, less stringent feedstock quality requirements, more flexible operating hours by competing markets, or supplier's dependences on competing markets to accept or purchase other products/by-products. During periods of feedstock shortage such suppliers may be more likely to allocate the scarce supply to a competitor resulting in supply disruptions for the Issuer.

Risk Information: Only dairy operations that also grow grain crops are currently collecting and baling corn stover for their own use as animal bedding. Due to the very limited use, presently, there is no particular preference or reliance on specific suppliers due to the small scale of this practice.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

1.3 Risk Factor: Supplier Control Over Production and Transportation

1.3.1 Ownership of Land/Means of Production

Rationale: Suppliers that own land where feedstock is produced, or a production facility, tend to have better control of supply chains and present lower degrees of supply risk.

Risk Information: Crop growers are owners of the land where feedstock is produced. These lands have been used for crop production, and the ownership structure will not impact the corn stover supply.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

1.3.2 Ownership of Equipment

Rationale: In most cases, suppliers which own or lease equipment for harvest, collection and processing feedstock are lower risk than those who are not. For example, third-party harvesting equipment may not be available when required. Short harvest windows may be missed if a farmer and contractor cannot schedule harvest times that are convenient and quantity shortages can result. However, in some circumstances reliance on third-party equipment to harvest or produce feedstock can decrease supply chain risk. For example, when harvesting agricultural residues such as corn stover, the use of a third-party company with standard equipment specializing in harvesting, collection and transportation may decrease quality variations (e.g., ash content) of final feedstock.

Risk Information: Currently, the dairy operations bale some corn stover in the BDO Zone to supply their animal bedding needs. These bales are round and expected to be no more than 5% of total availability. Equipment ownership is low.

A large-scale baling operation would require a significant investment to increase field equipment availability and fulfill an industrial demand by crop growers and equipment distributors. This will require incentives to buy and service this new inventory.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed *very high*, therefore the RRL is 10 out of 10.	**Score** **10**
Raw Risk Impact (RRI) The risk impact is deemed *very high*, therefore the RRI is 10 out of 10.	**Score** **10**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 100 out of 100.	**Score** **100**
Mitigation/Notching *RRL Mitigation (Notch)* The likelihood of this risk can be reduced by providing incentives such as offtake agreements and financing for the purchase of equipment, which would create a stable investment opportunity for farmers. However, even then, the likelihood of growers investing in highly specialized equipment is low. Due to the lack of established incentives, there is no notching in this category. *RRI Mitigation (Notch)* Certain biomass projects invest in the collection and bailing of fleets, taking the responsibility of owning equipment away from the farmer. Other third-party operators can provide this service, and such arrangements would greatly impact the feedstock quantity available for a project. Therefore, this risk impact is notched at 75%. The Total Notch (RRL Notch × RRI Notch) is 75%.	**Notch** **75%**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 25 out of 100.	**Score** **25**

1.3.3 Ownership of Transportation/Logistics

Rationale: In most cases, suppliers that own or lease transportation equipment necessary to transport biomass from forest or field are lower risk than those who do not. However, in some circumstances, reliance on third parties to transport biomass is common practice and does not contribute to risk.	
Risk Information: A limited quantity of bales in the supply region are typically transported using tractor trailers or flatbeds within short distances as part of farming operations. In the event of increased demand at a commercial scale, it is expected that corn growers would likely depend on existing transport companies for feedstock transportation. Our outreach indicates the region boasts a number of transportation companies, as indicated in Map C-6 in Appendix C, that could mitigate the usual upward pressure on prices from increased demand.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**Score** **6**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 24 out of 100.	**Score** **24**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 24 out of 100.	**24**

1.3.4 Feedstock as a Secondary Transformation

Rationale: A secondary transformation dependent upon the production of primary products, e.g., forest residues, corn stover, bark, or sawmill chips (unless from a dedicated chip mill) are all secondary transformations of a primary product.

Risks are higher if feedstock is a secondary transformation of a primary, more valuable product. It may not be economical for suppliers to produce biomass on its own, in the absence of markets for the primary product. For example, a supplier may produce dimensional lumber as its primary product and wood chips as a by-product, therefore relying on the health of the housing market for production levels. If the demand for dimensional lumber drops, so can the availability of sawmill residues.

In case of agricultural feedstocks such as corn stover, the feedstock is a by-product of a primary crop. Since the primary crop is significantly more lucrative than the residue, it will be a priority for the producer. If production of the primary crop requires resources to be taken away from the production of secondary crop (e.g., in case of shorter harvesting windows due to weather), the secondary feedstock supply will suffer. In times of stretched resources, suppliers may also perceive harvesting and collection of the feedstock as a nuisance, potentially decreasing production levels.

Understanding the economic drivers for suppliers' primary product can help gauge risk levels for secondary transformation biomass products.

Risk Information: The region has a long history of corn production and has been increasing in planted areas over the last few years. The demand for corn grain is stable and does not present a risk for production. For every ton of corn produced, one ton of corn stover is also produced, and with 10-20% of farmers growing corn over corn as a rotation, there is a low likelihood of another crop significantly displacing it.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**

Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

1.4 Risk Factor: Supplier Experience

1.4.1 Fundamental Feedstock Production Experience

Rationale: Risk is higher when suppliers have limited experience with planting/growing/harvesting/processing and/or collecting biomass. Limited experience may be common for stover or forest residue supply chains where farmers or forestry producers may have no previous experience.

Risk Information: Farmers in the BDO Zone have extensive crop production experience, but limited corn stover harvesting and collection experience. Only a small fraction (<5%) of it is harvested and baled for use by dairy producers. This creates a high risk for future biomass projects that depend on corn growers' participation in the biomass supply network. Farmers can operate various machinery, but a commercial-scale supply chain would require time to learn in order to achieve high efficiency and quality.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10.	**8**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *medium*, therefore the RRI is 6 out of 10.	**6**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 48 out of 100.	**48**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* A custom service provider or an integrated operation could perform the bailing operations, and such an arrangement would lower the impact on the supply of quantity and quality as well as accelerate the knowledge transfer. Assuming the service provider is an experienced party, the lack of expertise from the corn grower is greatly mitigated; therefore, this category is notched at 50%. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 24 out of 100.	**24**

1.4.2 Production Scale Experience

Rationale: Scale-up entails risk. Risk is higher when suppliers have limited experience with the production of the quantity of feedstock required.

Risk Information: The Supply Zone has no large-scale experience or capacity for supplying commercial quantities of corn stover bales. This poses a major challenge for a bio-based facility.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *very high*, therefore the RRL is 10 out of 10.	**10**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *very high*, therefore the RRI is 10 out of 10.	**10**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 100 out of 100.	**100**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) The fall weather in Kansas can present challenges for field access after the harvest season, which typically ends in late October and early November. Extension programs and various training resources play a crucial role in accelerating the learning process to support commercial harvesting in a short period of time. However, it remains unlikely to swiftly mitigate the scale-up risk for an entire Supply Zone in the short term. Therefore, this category is notched at 25%. *RRI Mitigation (Notch)* Selling biomass to a third party that can come into the field and bale the corn stover can drastically mitigate the scaling risk to a project. Skilled operators that have experience bailing in other regions can positively impact the entire supply chain, given that their reach is enough to cover the needs of a potential project within the Supply Zone. Therefore, this category is notched at 50%. The Total Notch (RRL Notch × RRI Notch) is 63%.	**63%**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 37.5 out of 100.	**37.5**

1.5 Risk Factor: Supplier Harvesting/Collection/Processing Capacity

1.5.1 Supplier's Equipment Efficiency

Rationale: Equipment efficiency significantly influences supplier's feedstock production capacity. Understanding supplier's equipment capability enables understanding of their ability to produce feedstock of suitable quality.

Risk Information: Larger dairy operations that also grow cash crops, utilize round balers to harvest corn stover for animal bedding. However, this equipment is not designed to meet the high efficiency and quality demands of an industrial operation. The limited field equipment infrastructure, not suited for large-scale use, is a critical risk factor for this BDO Zone.

Potential suppliers would need to make a significant financial investment in specialized field equipment and get buy-in from equipment distributors to invest in and service this new inventory. The externality of these issues makes mitigation unfeasible.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *very high*, therefore the RRL is 10 out of 10.	**10**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *very high*, therefore the RRI is 10 out of 10.	**10**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 100 out of 100.	**100**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* The introduction of a third-party service provider that will bring its own crews and field equipment for the bailing operation can significantly reduce the supply risk. However, no custom baling operators are currently active in the Supply Zone. Therefore, this category is notched at 50%. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**

Loaded RI Score	Score
The Loaded RI Score (Total Notch × GRI Score) is 50 out of 100.	50

1.6 Risk Factor: Supplier Motivation

1.6.1 Feedstock Production Priority

Rationale: When biomass feedstock is a secondary or non-core line of business, or when it is a by-product or a residual from a more valuable primary product, then suppliers may not put in sufficient effort for consistent production. Risk of breach increases when production and/or delivery of feedstock compromises a supplier's ability to make a primary product.

When biomass feedstock is a by-product of another main higher margin or main product (e.g., corn stover (e.g., corn) or forest residues (e.g., pulpwood)) supply may not be a top priority for a supplier.

Risk Information: Collecting and harvesting corn stover post-grain harvest is infrequent, as there is very limited demand for this feedstock. Consequently, establishing a supplier network would require growers to allocate resources—time, machinery, and labor—into this operation, which is a significant financial decision. The primary incentive developers can expect to offer to farmers is profit per acre; however, potential suppliers will consider the payment terms and the risks of supplying a buyer who is new to the region and has no track record. The high risk in this category arises from the cost variability and uncertainty surrounding farmers' preferences.

Raw Risk Likelihood (RRL)	Score
The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10.	8
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	8
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 64 out of 100.	64
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) Proper pricing that will drive farmers' willingness to participate in the corn stover supply chain is the mitigating factor, that can be achieved with appropriate outreach and a reputable project. Therefore, this category is notched at 25%. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 25%.	25%
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 48 out of 100.	48

CATEGORY 2.0: COMPETITOR RISK

2.1 Risk Factor: Influence on Feedstock Supply of Existing Markets

2.1.1 Competitor Locations and Overall Geographical Influence

Rationale: Competitors' locations relative to siting locations within a BDO Zone can affect the viability of procuring feedstock and the cost of that feedstock. Accurate and detailed competitor mapping provides an understanding of the geographical influence a competitor may have on new plants within a BDO Zone, including competitive advantages such as short hauling.

Risk Information: In this Supply Zone, there is no industrial-scale demand for corn stover bales; therefore, virtually no competition exists for this biomass, apart from a small quantity used by dairy operations.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

2.1.2 Current and Historical Consumption of Feedstock Quantity

Rationale: Clear understanding of feedstock consumption by key competitors for each rated type of feedstock in the BDO Zone is essential to quantifying competitor risk.

Understanding current consumption and historical trends of feedstock utilization can provide valuable information about feedstock price elasticity during shortages, and insight into events that may impact future supply conditions. It can enable more accurate estimates of the sensitivity of feedstock availability to potential future consumption levels or to the impact of external events (e.g., weather events, structural economic changes, seasonality, or policy change).

Risk Information: The Supply Zone has never had commercial scale demand for corn stover bales, therefore there are no meaningful trends for an analysis. As a secondary product, corn stover depends on the demand for corn grain, which shows a historically stable outlook and has averaged production of 3,000,000 tons of grain annually over the past decade, with an average yield of 157 bu/acre.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

2.1.3 Competitor Pricing and Price Sensitivity

Rationale: Understanding how much competitors pay (or receive) for different feedstock types is an essential step to determining competitiveness of Issuer and to accurate assessment of the delivered cost range in the BDO Zone rating.

Current and historical prices paid/received by competitors provide insight into their procurement behaviors and exert pressure on suppliers in the BDO Zone. Such as ability/willingness to pay premiums for feedstock during times of feedstock shortage or reduce prices (or cut off deliveries) during gluts. Competitors that have an ability to offer higher prices for feedstock during feedstock shortages can pose significant risk to Issuer.

Knowledge of competitor pricing and price sensitivity is also an essential prerequisite to formulating a feedstock cost curve which can enable predictions of feedstock redundancy, i.e., how much feedstock could become available at different pricing levels (see Category 3–Supply Chain Risk 3.1.3).

Risk Information: Due to the absence of large-scale demand, there is no established market price for corn stover bales in the Supply Zone. When determining a price, farmers' primary aim is to enhance profit per acre, considering factors like fertilizer replacement costs. The decision-making process is significantly influenced by the opportunity cost of allocating time and resources to corn stover activities and the net increase in profit per acre. The uncertainty surrounding the acceptable price range for growers and payment terms increases the risk in this category.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**6**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *medium*, therefore the RRI is 6 out of 10.	**6**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 36 out of 100.	**36**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100.	**36**

2.1.4 Impacts of Future Demand on Feedstock Availability and Price by Current Competitors

Rationale: Feedstock utilization in a BDO Zone can change over time. Expansion of feedstock demand by current competitors can put additional pressure on feedstock and can lead to higher prices, feedstock disruptions, shortages or supplier breach or other types of supply chain disruption.

If current markets for feedstock have been publicly signaling the potential for increased demand for feedstock (in the case of a sawmill adding a shift, or pulp mill potentially expanding into production of renewable chemicals, for example), high interest in a supply basin can make suppliers overconfident, leading to a supplier-controlled market where short-term contracting becomes the norm and supply chain reliability is compromised for the Issuer. If and when it occurs, increased demand on feedstock may decrease availability and increase cost for new plants within the BDO Zone.

Risk Information: There is currently no significant demand for corn stover, and no biorefinery projects have been proposed. Therefore, the chances of shortages and supplier breaches due to competition are considered low.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

2.1.5 Soft Supply Influence of Existing Markets

Rationale: In some cases, existing markets for feedstock may be able to exert high degrees of pressure over local suppliers, effectively enabling control feedstock, especially during times of shortage. This control can derive from qualitative or "soft" factors such as long previous relationships between local suppliers and existing markets for feedstock.

Risk Information: Historically, there has never been a commercial market for corn stover bales in this Supply Zone. It is estimated that less than 5% of all biomass available is baled for use as animal bedding. The current demand is not significant enough to influence availability or pricing for a new project.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

2.1.6 Temporary Market-Driven Markets

Rationale: Alternative, non-traditional, market-driven competitors for feedstock can drive feedstock demand in unusual circumstances. A BDO Zone Rating Issuer based on corn stover as a feedstock, for example, would not typically compete with higher-end animal feed markets due to quality issues. However, in times of significant hay shortage (e.g., during drought), farmers use corn stover in place of hay, driving the price of feedstock and decreasing availability for bio-projects.[26]

Risk Information: There are no historical non-traditional or market-driven markets for corn stover in the supply zone.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

2.2 Risk Factor: Specific Competitors' Competitive Advantage

2.2.1 Relative Inventory Capacity

Rationale: The more inventory a competing biomass facility is able to store, the more competitively pressure it can exert on supply. Ability to store large inventories allows competitors to purchase inventory when the prices are low, potentially giving it an economic advantage. Additionally, the ability to store inventory during feedstock supply surpluses can enable competitors to continue to intake feedstock when the Issuers plant (with lesser inventory capacity) may be forced to put suppliers on quota. Larger inventory capacity on the part of competing markets thereby creates supplier loyalty and can make it more difficult for new projects to secure supply without paying a significant premium.

[26] Bergtold, 2018.

Risk Information: No large-scale facilities are currently operating, and, therefore, there is no established inventory of corn stover in the region.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10.	**Score** **2**
Raw Risk Impact (RRI) The risk impact is deemed *very low*, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 4 out of 100	**Score** **4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 4 out of.	**Score** **4**

2.2.2 Relative Accessibility/Delivery Hours and Wait Times

Rationale: The value attributed by suppliers to local competing markets for biomass is often directly related to the degree of flexibility the market provides in terms of delivery hours, and the more efficiently discharge can occur.	
Risk Information: There is no established market, and therefore, this risk indicator is not relevant.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed *not relevant*, therefore the RRL is not rated.	**Score** **NR**
Raw Risk Impact (RRI) The risk impact is deemed *not relevant*, therefore the RRI is not rated.	**Score** **NR**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is not rated.	**Score** **NR**
Mitigation/Notching The Total Notch (RRL Notch × RRI Notch) is not rated.	**Notch** **NR**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is not rated.	**Score** **NR**

2.2.3 Relative Specification Advantages

Rationale: When choosing a market for biomass feedstock, suppliers not only look at price, but also at relative quality requirements or specifications. It is important to understand feedstock quality specifications for competing markets within the BDO Zone in order to accurately quantify the risk that competitors can exert on the Issuer's supply chain.	
Risk Information: There is no commercial-scale demand for feedstock in the region. Therefore, quality and specifications cannot be used as a tool to pressure competitors.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**

Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

2.2.4 Demand for Competitors' Products

Rationale: Increased demand for competitor's final product can cause an increased demand for feedstock by the competitor. For example, an increased demand for wood pellets due to high energy prices in Europe or for biofuels due to a favorable clean fuels policy can cause increased pellet/biofuel production by competing markets. Thereby driving demand for feedstock within a BDO Zone.

Risk Information: There is no commercial demand for corn stover.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10.	**Score** **2**
Raw Risk Impact (RRI) The risk impact is deemed *very low*, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 4 out of 100.	**Score** **4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100.	**Score** **4**

CATEGORY 3.0: SUPPLY CHAIN RISK

3.1 Risk Factor: Feedstock Availability

3.1.1 Biomass Availability Multiple (BAM)

Rationale: Biomass Availability Multiple (BAM) indicates the degree of redundancy in an Issuer's supply chain in relation to the rated quantity in the BDO Zone. BAM is the mean ratio of biomass feedstock available to a project, in relation to delivered cost, divided by the Issuer's mean rated quantity. BAM is a strong indicator of supply chain resilience when stressed by supply shortage and/or supplier breach. BAMs of 1.5 or higher are generally signals of lower feedstock risk for new projects in BDO Zones.

Risk Information: Not all the corn stover produced will be available for future biomass projects due to uncertainty in the length of the harvest season, future competing demands, and labor/machine availability. Supply redundancy is necessary to achieve a low-risk level; therefore, this report attributes a BAM of 1.2 to the farmer participation quantity, arriving at the low-risk rated quantity of 380,000 bdt/year of corn stover.

However, assumptions of future biomass supply and demand are part of the BAM factors. Unforeseen supply and market factors such as new competitors, weather events, and economic conditions can significantly impact our assumptions and, thus, biomass availability. While the risk likelihood is deemed low, the impact is deemed medium.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *medium*, therefore the RRI is 6 out of 10.	**Score** **6**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 24 out of 100.	**Score** **24**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 24 out of 100.	**Score** **24**

3.1.2 Feedstock Supply Curve/Marginal Cost Curve

Rationale: The greater the feasible transport distance, the more feedstock is accessible to the Issuer, but at a higher delivered cost. The feedstock supply curve, sometimes referred to as the marginal cost curve, is a function of feedstock availability over its cost which is primarily, but not exclusively, a function of distance. The feedstock supply curve is used to determine the availability of redundant feedstock at various price points, and the cost of replacing feedstock with substitutes located at different distances.

Feedstock cost curves are useful in determining supply chain resilience; they provide information about the cost of feedstock availability in times of supply disturbance. Biomass supply chains are prone to supply disturbances over time; suppliers can become insolvent, or weather events can temporarily disrupt feedstock availability. When a disturbance occurs, the Issuer may need to source replacement feedstock from different suppliers at different locations and costs. A biomass supply curve indicates quantities of feedstock available at various price levels from suppliers generally located further away than core supplier.

Risk Information: A supply curve illustrating the availability of corn stover based on distance can be found in Figure A-2. The supply curve does not represent actual corn stover biomass availability; rather, it illustrates an estimation of potential within the Supply Zone. Because the supply curve assesses the economic impact of sourcing biomass at longer distances, this study found that the rated quantity could theoretically be sourced within 55 miles. However, the limited information from farmer outreach and the difficulty in pinpointing where the actual supply would come from creates a challenge for calculating the cost impact of increased supply distances. Additionally, parts of the BDO Zone have hilly terrain that may pose a challenge for corn stover collection.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**Score** **6**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 24 out of 100.	**Score** **24**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 24 out of 100.	**Score** **24**

3.1.3 Seasonal Feedstock Supply Variation

Rationale: Biomass supply can present significant seasonal supply variations. Seasonal supply variations combined with limitations associated with longer-distance transportation and storage can lead to BDO Zone biomass supply imbalances[27] and can manifest in shortages and higher costs for Issuers.

Risk Information: Corn stover is only available after corn harvest, typically from late September through October, but eventually extends into December due to weather. Consequently, all corn stover must be harvested and stored within a few weeks before winter sets. Weather (specifically rain) can impact the collection and baling window, potentially affecting the quantity and quality of feedstock, which, at this time of the year, is common and will negatively affect quality. The stable production of corn in the region does not impact the availability of corn stover. However, the harvesting operation has a higher risk of impacting the feedstock quantities.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**Score** **6**
Raw Risk Impact (RRI) The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 48 out of 100.	**Score** **48**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* Inventory management can greatly lower the supply risk to a biorefinery. However, there is a limit to storing agricultural biomass due to the loss of dry matter and fire risks. Therefore, this category is notched at 25%. The Total Notch (RRL Notch × RRI Notch) is 25%.	**Notch** **25%**

[27] Golecha & Gan 2016.

Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100.	**36**

3.1.4 Year-to-Year Variation in Feedstock Availability

Rationale: Biomass can have significant year-to-year supply variations due to variability in yield from biomass harvesting operations, particularly with agricultural biomass.

Risk Information: Over the past 10 years, this Supply Zone has harvested around 80% of the planted area. Although the planted to harvested ratio is lower than in other growing regions, this figure has been stable and can serve as a consistent indicator of future production. However, the corn stover harvesting season is short and can be impacted by weather even after a bountiful grain harvest. The BAM quantity mitigates the variability in harvested area year over year. However, the harvesting period and competing interest of grain farmers to prepare the field for spring planting can negatively impact availability.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**6**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *medium*, therefore the RRI is 6 out of 10.	**6**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 36 out of 100.	**36**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) Sourcing corn stover from microregions that present higher average yields can mitigate the variability; therefore, this category is notched at 50%. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 18 out of 100.	**18**

3.2 Risk Factor: Historical Issues

3.2.1 Historical Feedstock Price Variations

Rationale: If volatility is shown in the historical feedstock price, then the risk of future price fluctuation is elevated. If feedstock prices have historically exceeded the price at which the Issuer would have to cease operations or breach a financial covenant (i.e., the "red line" feedstock cost), then mitigation measures should be put in place.

Risk Information: There is no historical price data for corn stover in the Supply Zone. Growers have no benchmark to create ask prices in a commercial supply operation and must be educated on the revenue potential for their biomass/corn stover bales. Corn stover bale price drivers include demand, cost of collecting, baling and transportation, nutrient replacement cost, and profit per acre. Due to the novelty of this operation within the Supply Zone, price variation may be significant in the early stages of establishing a supply chain while suppliers are getting familiarized with the cost of opportunity. This situation increases the risk for this category.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10.	**8**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**8**

Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 64 out of 100.	**64**
Mitigation/Notching *RRL Mitigation (Notch)* No mitigation measures are available for this category because pricing is unproven in the region. Eventually, the developer will be able to communicate price ranges to suppliers and better understand variability, but that will take time; therefore, this category is not notched. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 64 out of 100.	**64**

3.2.2 Low Historical Demand for Feedstock in the BDO Zone

Rationale: If Issuer BDO Zone does not have history of developed, large-scale feedstock procurement, suppliers may not have sufficient expertise in feedstock production to ensure reliable supply, especially in early years. This can be particularly true for forest residues, where the infrastructure for collection, processing, and delivery is typically immature.

Where supply chains are not well-established, risk can be mitigated when new bio-based plants control a higher degree of feedstock processing. For example, if a BDO Zone rating is issued for clean wood chips and the historical demand in the Zone has been exclusively for pulpwood, then supply chain risk will be decreased for new bio-based plants that intake of pulpwood and manage log debarking and chipping internally. Rather than requiring inexperienced suppliers to deliver debarked wood chips.

Risk Information: The Supply Zone has never had commercial-scale demand for corn stover bales, leading to limited expertise among suppliers in feedstock collection, harvesting, and logistics. Establishing a credible project would incentivize suppliers to participate in the supply chain.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10.	**8**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 64 out of 100.	**64**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 64 out of 100.	**64**

3.2.3 History of Production/Feedstock is a New/Secondary Crop or a Byproduct

Rationale: If feedstock is a new/secondary crop or a by-product, suppliers may either lack sufficient experience to mitigate risk, or be unable to react to such risk. Secondary crop or by-product producers may be less likely to prioritize production.

For new crop types, inexperience in planting, harvest, collection, and yield data may pose higher levels of risk.

If feedstock is a secondary transformation (i.e., wheat straw, corn stover, or forest residue), then production can be subject to variables beyond suppliers' control (e.g., changing demand for sawtimber, or primary crop prices).

Risk Information: Corn stover is a byproduct of corn production and has been harvested in historically low quantities. As a secondary product (byproduct), it competes for growers' resources and demands investment in specialized equipment. Corn grain prices are expected to remain flat in the coming harvest season, potentially incentivizing growers to find additional revenue for their acres. Even so, potential suppliers still lack the experience and incentive to supply large volumes of corn stover bales.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**6**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *medium*, therefore the RRI is 6 out of 10.	**6**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 36 out of 100.	**36**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100.	**36**

3.3 Risk Factor: Non-Weather Based Externalities

3.3.1 Diesel, Oil, and Producer Price Index (PPI)

Rationale: Diesel, oil, and PPI can impact feedstock cost of harvest and collection over time. Sensitivities to worst case scenarios should be run.

Risk Information: Diesel/oil prices and the Producer Price Index (PPI) affect the biomass price and the delivery cost of corn stover. Diesel prices directly affect planting, harvesting, baling, and transportation costs. According to EIA data, in the past 10 years, diesel pricing per gallon has decreased by around 13% in real terms (adjusted for inflation).

The PPI index indirectly affects baling and transportation costs through labor and admin/overhead costs. According to the Bureau of Labor Statistics, the PPI variation in the same period increased by 21%. With inflation expected to remain high for the next few years, costs are expected to suffer upward pressure across all supply chains.

Since diesel and PPI reflect the entire economy and not a competitive advantage, all sectors are affected by their change. Therefore, the impact on the ability of a project to receive feedstock reliably at market prices over a long period of time is not significant.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**Score** **6**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 24 out of 100.	**Score** **24**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 24 out of 100.	**Score** **24**

3.3.2 Currency Risk

Rationale: Where feedstock is purchased in a currency different than that which a new bio-based plant will locate in a BDO Zone, currency exchange rates and volatility can constitute risk exposure. BDO Zones that cross the US-Canada border, for example, which intake feedstock from both countries are exposed to such currency risk.

Risk Information: None of the feedstock would be sourced from or sold outside the region, therefore there is no currency risk.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *not relevant*, therefore the RRL is not rated.	**Score** **NR**
Raw Risk Impact (RRI) The risk impact is deemed *not relevant*, therefore the RRI is not rated.	**Score** **NR**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is not rated.	**Score** **NR**
Mitigation/Notching The Total Notch (RRL Notch × RRI Notch) is not rated.	**Notch** **NR**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is not rated.	**Score** **NR**

3.3.3 Border Risk

Rationale: Where feedstock is transported cross-border to another country, risk exposure to border closures and crossing delays becomes present. The availability of trucks willing to do cross-border runs is limited, which can decrease supply chain flexibility and resilience. Plants near the US-Canada border which intake feedstock from both countries are exposed to these risks.

Risk Information: None of the feedstock would be sourced from outside the region, therefore there is no border risk.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *not relevant*, therefore the RRL is not rated.	**Score** **NR**
Raw Risk Impact (RRI) The risk impact is deemed *not relevant*, therefore the RRI is not rated.	**Score** **NR**

Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is not rated.	**Score** **NR**
Mitigation/Notching The Total Notch (RRL Notch × RRI Notch) is not rated.	**Notch** **NR**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is not rated.	**Score** **NR**

3.3.4 Temporary Externality-Driven Markets for Feedstock

Rationale: Alternative, non-traditional, externality-driven competitors for feedstock can drive feedstock demand (and cost) in unusual circumstances. For example, an Issuer using corn stover as a feedstock would not typically compete with the higher-end animal feed market. However, in times of significant hay shortage (e.g., during drought), farmers may use corn stover as hay replacement, driving the price of stover feedstock and decreasing its availability for bio-projects.[28]

Risk Information: The dairy industry drives demand for corn stover bales in the Supply Zone. However, the quantities of corn stover collected are estimated to be less than 5% of the total available. Cattle for beef are a smaller part of the livestock, and although corn is harvested for silage, it would not affect corn stover availability.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

3.4 Risk Factor: Risks Related to Feedstock Production, Harvest and Collection

3.4.1 Harvest & Collection Practices & Schedules

Rationale: Differences in harvest timing and practices used can create risk to both the quantity and quality of feedstock. For example, feedstock harvested by different suppliers in different windows can undergo varying levels of exposure to sun, wind, and moisture, leading to variations in delivered feedstock quality.

For example, agricultural feedstocks and energy crops have optimal harvesting windows to ensure minimal moisture content. In certain BDO Zones these harvesting windows may coincide with heightened weather risk such as frost or rain.

[28] Bergtold, 2018.

For forestry biomass, unsightly clear cuts, and slash piles (even on plantation forests and especially when located near communities) can provoke unwanted public backlash even when suitable and sustainable replanting regimes are followed.

Risk Information: Corn stover has a short harvest window between late October and early December that requires intense resource use. Bales are usually stacked by the side of the field and must be moved no later than April, either to the biorefinery or to a secondary storage location. If exposed to the elements, precipitation will negatively affect the harvest operation and the quality of the bales.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10.	**8**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *very high*, therefore the RRI is 10 out of 10.	**10**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 80 out of 100.	**80**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) Careful planning and mobilization of equipment to optimize the short harvest window operation can somewhat mitigate this risk; therefore, this category is notched at 25%. *RRI Mitigation (Notch)* An experienced custom harvest group can reduce the feedstock supply risk to a bioprocessing facility by baling and moving inventory to an appropriate storage facility, lowering the quality risk; therefore, this category is notched at 25%. The Total Notch (RRL Notch × RRI Notch) is 44%.	**44%**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 45 out of 100.	**45**

3.4.2 Harvesting & Collection Equipment

Rationale: Different types of harvesting and collection equipment used by suppliers in a BDO Zone can have a significant impact on the quality and availability of feedstock. Use of different types and combinations of harvesting, collection and processing equipment among suppliers can lead to non-homogeneous feedstock. Equipment that is not designed specifically for biomass cultivation, harvesting and collection, can increase feedstock quality risks.

Relevant equipment should be specified for the sake of product consistency and risk reduction.

Risk Information: The few growers that bale for bedding currently use round balers because they are less expensive to acquire and require less maintenance than the high-density square balers. The Supply Zone does not presently have sufficient quantities of specialized equipment to supply large volumes.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10.	**8**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 64 out of 100.	**64**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* An experienced third-party baling company or a vertically integrated bio-project that uses its own equipment will significantly reduce the risk of feedstock supply. Therefore, this category is notched at 50%. The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 32 out of 100.	**32**

3.4.3 Variation in Densification Methods Among Different Suppliers

Rationale: The shape and density of the unit in which feedstock is supplied can impact feedstock cost and quality. Standard feedstock densification modes for biomass consist of round or square bales, pellets, cubes, chips, or grindings. The size of wood fiber processed in a grinder is less homogenous than if a chipper is used.

Bales of different densities can absorb moisture at different rates. In certain cases, round bales have been viewed as problematic due to their uneven moisture content distribution.[29]

Risk Information: The ideal standard for a biorefinery to receive corn stover is characterized by high-density square bales, typically weighing between 1,100 lbs. and 1,350 lbs. Achieving this level of density requires high-efficiency field equipment and square balers, which, in turn, requires a substantial financial investment from potential suppliers. As there is no existing commercial-scale demand in the Supply Zone, there are currently no standardized quality benchmarks among suppliers.

Bio-based projects favor square bales for their logistical efficiency, ease of handling, and enhanced safety compared to round bales, which can shift and are challenging to stack. The lack of assurance regarding the uniformity of supplied feedstock introduces an element of risk. A bio-processing facility could potentially introduce financial and contractual incentives for growers to invest in the necessary equipment and provide education and training to influence optimal quality and standards.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10.	**8**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 64 out of 100.	**64**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* A vertically integrated bio-project or hiring an experienced custom harvest group can significantly decrease variability in the feedstock quality and supply. Therefore, this category is notched at 50% The Total Notch (RRL Notch × RRI Notch) is 50%.	**50%**

[29] Huhnke, 2018.

Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 32 out of 100.	**32**

3.4.4 Availability of Labor for Feedstock Production

Rationale: Skilled labor shortages can be difficult to remedy in the short-term. Availability of suitable labor in an area can impact the ability to procure sufficient feedstock quantities on required schedules. Labor risks are higher where supply chains are not yet active; or for Issuer's for whom large feedstock requirements, or development of new (or expanded) supply chains, demand significant additions to the local labor force.

Risk Information: Labor requirements for collecting and transporting corn stover extend several weeks after the fall harvest. However, the Supply Zone faces a shortage of trained baler operators due to the historical absence of markets for corn stover and an underdeveloped supply chain. Outreach to Extension programs indicates a diminishing pool of available labor, with the remaining workforce demanding higher wages.

The scarcity of trained baler operators in the region, coupled with the considerable time required to acquire and refine the skills for this operation, presents an imminent risk.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10.	**8**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 64 out of 100.	**64**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) Having a project developer or university extension program offer training for suppliers can somewhat mitigate this risk. However, the time available for practical experience is short, and perfecting this skill would be a medium-term effort. Therefore, this category is notched at 25%. *RRI Mitigation (Notch)* Importing temporary labor from other regions, contracting a third party for harvest and collection, or providing similar services through a vertically integrated bio-project can significantly lower the labor risk. However, it is a complex plan to execute, and therefore, this category is notched at 25%. The Total Notch (RRL Notch × RRI Notch) is 44%.	**44%**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100.	**36**

3.5 Risk Factor: Transportation

3.5.1 Feedstock Transportation Costs

Rationale: Transportation can be one of the most significant cost components of biomass supply chains. The average transport cost and percentage of total feedstock cost attributable to transport should be known.

Transport distances of 80-120 km for biomass feedstocks are typical but larger distances can be common. Where average transport distance from suppliers to Issuer is high, the supply chain is subject to greater sensitivities to risks, such as increases in diesel cost, weather impacts, mechanical breakdown, and by the demand for scarce feedstock from competitors closer to the source.

Understanding average transport distance can help flag higher-risk BDO Zones where transport distance materially exceeds the average.
Risk Information: As illustrated by the theoretical supply curve (Figure A-4), it is possible that the rated quantity can be supplied within a 55-mile drive distance from the center point. However, modeling cannot predict the farmer participation rates and the actual locations where feedstock will be sourced. However, this report estimates that transportation makes up approximately 23%-25% of the total feedstock delivered cost. A relatively slight increase in the average transport distance can result in a substantial expansion of the feedstock supply basin without a substantial impact on the delivered price due to marginal increases in the transportation costs.
Raw Risk Likelihood (RRL) — **Score** The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. — **4**
Raw Risk Impact (RRI) — **Score** The risk impact is deemed *low*, therefore the RRI is 4 out of 10. — **4**
Gross Risk Indicator (GRI) — **Score** The Gross Risk Indicator (RRL × RRI) is 16 out of 100. — **16**
Mitigation/Notching — **Notch** *RRL Mitigation (Notch)* — **NN** No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).
Loaded RI Score — **Score** The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. — **16**

3.5.2 Diesel Cost Impacts

Rationale: Changes in diesel cost impact transport cost over time. Sensitivities to worst case scenarios should be run.
Risk Information: According to the EIA Midwest No.2 diesel prices fluctuated from U$ 3.86/gallon in September 2013 to U$ 3.88/gallon in December 2023 in nominal terms.[30] In real terms (adjusted for inflation using CPI), the diesel cost fell around 23% in this period. Diesel prices can fluctuate in the short term, which affects the entire supply chain. However, according to the EIA data, diesel prices have been on a slight downward trend. Short-term changes in diesel prices can exert pressure on operational margins; however, the likelihood of the price change being significant enough to pose a substantial risk that can affect operations is low.
Raw Risk Likelihood (RRL) — **Score** The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. — **4**
Raw Risk Impact (RRI) — **Score** The risk impact is deemed *low*, therefore the RRI is 4 out of 10. — **4**
Gross Risk Indicator (GRI) — **Score** The Gross Risk Indicator (RRL × RRI) is 16 out of 100. — **16**

[30] https://www.eia.gov/dnav/pet/pet_pri_gnd_a_epd2d_pte_dpgal_m.htm

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.5.3 Transportation of Feedstock Requires Specialized Equipment

Rationale: Requirements for specialized transport equipment (e.g., walking-floor trailers) can increase supply chain risk. Where there is low availability in required transportation equipment, equipment owners have increased leverage over transportation prices and supply chain resiliency can be lower.

Risk Information: Several commonly used tractor implements can be used for loading and unloading bales, such as pallet movers and bale spears. Flatbed trailers are commonly used in farming for general transportation, and their availability in sufficient numbers for transporting commercial quantities of corn stover bales is limited. However, transportation companies and other agricultural operations in the BDO Zone possess fleets that could be readily leveraged to support the delivery of commercial quantities of corn stover bales. The developer is encouraged to collaborate with local transportation companies in the Supply Zone to plan the expansion of their fleets based on long-term needs of the new biomass projects.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.5.4 Delivery Routes through Local Communities

Rationale: Transportation of biomass can become a nuisance to local communities, especially if a large number of trucks pass through residential and school areas. Local communities often have power to force regulations regarding truck transport, impeding the ability BDO Zone suppliers to transport feedstock.

Risk Information: The industrial site assessed for this BDO Zone is located on the Old US Highway 53, a single-lane highway crossing the Village of New Auburn. The delivery of feedstock would likely be done by truck instead of rail, which is adjacent to the site, and there would be no route other than transporting across the Village. The local

community would certainly be subject to increased traffic from a bio-based facility established on this site. Still, the extent of the increased traffic depends on the size of the biomass project and their daily biomass demand.
Raw Risk Likelihood (RRL) — **Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10. — **6**
Raw Risk Impact (RRI) — **Score**
The risk impact is deemed *medium*, therefore the RRI is 6 out of 10. — **6**
Gross Risk Indicator (GRI) — **Score**
The Gross Risk Indicator (RRL × RRI) is 36 out of 100. — **36**
Mitigation/Notching — **Notch**
RRL Mitigation (Notch) — **NN**
No adjustment.
RRI Mitigation (Notch)
No adjustment.
The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100. — **36**

3.5.5 Transportation Regulations & Local Weight Limits

Rationale: In many BDO Zones, transportation is regulated based on seasonal road conditions. These regulations (e.g., "frost laws") often take the form of weight restrictions or limits on the number of trucks allowed on roads. Such regulations can impede the project's ability to source sufficient feedstock or increase the cost of doing so at certain times of the year.
Risk Information: In Wisconsin, road weight restrictions typically apply to most vehicles. However, specific exemptions are granted for certain vehicles engaged in essential activities such as hauling abrasives or salt for winter highway maintenance and transporting particular forest products like logs cut crosswise. These exempted vehicles may be permitted to exceed the normal weight limit of 80,000 pounds, particularly when the roads are officially declared frozen by the Wisconsin Department of Transportation (WisDOT).
Raw Risk Likelihood (RRL) — **Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. — **4**
Raw Risk Impact (RRI) — **Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10. — **4**
Gross Risk Indicator (GRI) — **Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100. — **16**
Mitigation/Notching — **Notch**
RRL Mitigation (Notch) — **NN**
No adjustment.
RRI Mitigation (Notch)
No adjustment.
The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. — **16**

3.5.6 Road Infrastructure

Rationale: Feedstock cost and availability can be a function of road infrastructure, in particular the accessibility the infrastructure provides to feedstock. Issues with road networks will translate directly to risks to feedstock supply.

Risk Information: According to a U.S. News & World Report study, Wisconsin was ranked #29 for transportation infrastructure in the country. Another report found that the percentage of roads in poor condition is 28%, or 6th worst nationally.[31]

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**6**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *medium*, therefore the RRI is 6 out of 10.	**6**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 36 out of 100.	**36**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100.	**36**

3.5.7 Transportation Redundancy

Rationale: Transport equipment redundancy is important for dealing with seasonally variable feedstock supplies as well as the risk of equipment breakdowns.

Risk Information: Flatbed trailers are the most widely used method of transporting bales. This equipment is inexpensive and very common both in farming operations and transportation companies. Based on the rated quantity of 380,000 bdt/year, assuming 39 bales with an average weight of 1,200 lbs., the payload is estimated to be 23.4 tons (wet) or 21.91 bdt. Therefore, 11,800 loads would be necessary to move all the feedstock. Assuming a 330-day year, it equates to 36 loads per day. Around the 2010s, the BDO Zone underwent an intense period of investments in fracking, which is no longer active. This resulted in the development of a robust and extensive transportation infrastructure to support this industry, with multiple rail spurs considerable fleets of trucks and trailers, and access to freshwater ports such as Duluth and Green Bay, all of which are readily available to support a new bio-based project.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**

[31] https://www.moneygeek.com/living/states-worst-road-infrastructure/

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.6 Risk Factor: Supply Chain Resiliency

3.6.1 Size, Number and Location of Suppliers

Rationale: In general, a supply portfolio involving multiple suppliers of various sizes (and from multiple BDO Zones) is important for ensuring steady and uninterrupted feedstock supply with minimal price fluctuations. If a small number of large suppliers provides a high proportion of total feedstock, a disruption or supplier breach will have greater impact on the supply chain. In such cases the risk of disruption is lower, but the impact of those disruptions is higher. Conversely, many small suppliers are less likely to have the capacity to withstand internal disruptions and thus may be more likely to breach. Here, risk of disruption is higher, but their likely impact is lower. The number of suppliers as well as the ratio of small to large suppliers should be optimized.

There is no pre-determined number or optimal ratio of suppliers, although having too many or too few can both pose higher degrees of risk.

Risk Information: Although numerous crop farms in the BDO Zone indicate a high potential for suppliers, the variability in yields means that not all would be able to become suppliers due to soil health concerns. The actual commitment of farmers to participate in the supply chain and the mapping of feedstock sources will only be revealed when the proposed project starts its outreach. The coordination of a fragmented supply chain, coupled with the uncertainty of how many would participate in the project, increases risk. Effective operator outreach is essential for mitigating this factor.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**6**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 48 out of 100.	**48**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 48 out of 100.	**48**

3.6.2 Suppliers Subject to Same External Risk Factors

Rationale: When a single risk event can impact the feedstock production ability of all (or most) suppliers, then feedstock risk is higher and supply chain resiliency is lower. Resilience is maximized when biomass supply chains exhibit diversity in spatial location (i.e., geography), production practices and other elements of supply chain structures such that the impact of single high-risk events have varying impacts on suppliers.

Risk Information: The 10-year average harvested area for corn in the Supply Zone is around 680,000 acres. In the same time period, corn prices fluctuated from a high of $7.63/bu in 2012 to a low of $3.12/bu during the pandemic in 2020; however, the period's average has been $4.68/bu. The 10-year average yield for the Supply Zone is 157 bu/acre. The persistent demand for corn across various sectors, including energy, food, and animal feed, underscores its economic importance and justifies the vast amounts of land dedicated to its production. Given that corn stover is a by-product of this crop and the historical averages for the Supply Zone, it is reasonable to assume that availability is resistant to external disruptions. Although fluctuations in price and weather patterns may be the external factors that most impact biomass availability, the historical averages for harvested area and yields suggest that potential supply is resilient.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.6.3 Land Ownership Structures

Rationale: The ownership (or control) of the land base on which feedstock is produced can have significant impact on Issuer's feedstock risks. Risk of long-term variation in stumpage cost for wood fiber (i.e., the cost that one pays to a landowner for the right to cut and purchase their wood fiber) for example are much higher in the US where >90% of the land is private, and thus stumpage cost is determined on a competitive auction basis. Conversely, in Canada >90% of the land is owned by the Crown and stumpage is allocated by the government.

Risk Information: Landowners control the production of corn, and regardless of the structure, it is unlikely to be a risk for corn stover users.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.7 Risk Factor: Climate and Natural Risks

3.7.1 Seasonal Weather Impacts on Feedstock Supply

Rationale: Seasonal weather impacts are defined as those deriving from natural weather variations (i.e., spring thaws, rainy seasons, or dry seasons – as opposed to from singular weather events like fires, droughts, or hurricanes). Seasonal weather changes can be a significant risk factor affecting feedstock availability, quality, and price.

Given the major influence that weather has on multiple aspects of growing, harvesting, and transporting biomass, it is difficult to predict the availability of biomass at a specific location at different points in the future with a high degree of certainty. However, it is still possible, using past data and statistical models, to generate reasonable upper/lower bound estimates of biomass production in any given year in a wider supply basin. Such estimates are important in assessing feedstock risk and enable accurate assessment of the efficacy of Issuer's mitigation methods.

Risk Information: Weather can negatively influence corn production and, thus, the availability of corn stover year-to-year. In the past, Wisconsin's northwest and west central regions within the Supply Zone have harvested around 80% of the planted area, with a yield of 157 bu/acre. Even though there is a significant difference between planted and harvested areas, such difference has been historically constant, providing a predictable pattern instead of uncertainty. Outreach has found that wet weather significantly impacts seed emergence and subsequent crop yields. Additionally, the risk of early frost disrupting crop maturity influences decisions regarding grain harvest. In areas where livestock coexist with crops, growers can opt for silage harvest, which supports livestock feed, but eliminates the possibility of corn stover removal from those acres. In 2023, it was considered a drought year; less than 60% of the corn crop was rated Good & Excellent by USDA, compared to a high of 80% in 2020.[32] The annual precipitation (rain and snow) in the Supply Zone has been shown to vary greatly.[33] The region has two distinct weather patterns, with high humidity and ample rain during the growing season and a much drier period in the shoulder seasons. However, depending on the timing of the rain after harvest, some growers may choose to till fields before baling can take place, impacting the corn stover availability.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**6**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *medium*, therefore the RRI is 6 out of 10.	**6**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 36 out of 100.	**36**

[32] www.nass.usda.gov/Charts_and_Maps/Crop_Progress_&_Condition/2023/WI_2023.pdf
[33] https://weatherspark.com/y/11592/Average-Weather-in-Chippewa-Falls-Wisconsin-United-States-Year-Round

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100.	**36**

3.7.2 Long-Term Weather and Climate Trends

Rationale: In certain BDO Zones, climatic trends and significant potential changes to future weather patterns can create feedstock risk.

Risk Information: According to the Wisconsin Palmer Drought Severity Index, between 1895 and 2015, the region has been near normal with respect to drought conditions. In 2023, the northwest region of Wisconsin has been abnormally dry, with a few northern counties in a moderate drought. According to NIDIS (National Integrated Drought Information System), over the last century, precipitation trends in the region have been moving towards wetter conditions and fewer droughts than the region experienced in the early 20th century. The data shows that long-term climate trends do not seem to impact corn production or yields negatively.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.7.3 Forest/Crop Fire

Rationale: Forest/crop fires, especially when occurring at large-scale, destroy feedstock and create shortages.

Fire-prone conditions are predicted to increase across Canada. This could potentially result in a doubling of the amount of area burned by the end of this century compared with amounts burned in recent decades. Boreal forests, which have been historically greatly influenced by fire, will likely be especially affected by this change.

Other climate change impacts that could add damaged or dead-wood to the forest fuel load (e.g., as a result of insect outbreaks, ice storms, or high winds) may increase the risk of fire activity. New research is aimed at refining these climate change estimates of fire activity, and at investigating adaptation strategies and options to deal with future fire

occurrence. There is growing consensus that as wildfire activity increases, fire agency suppression efforts will be increasingly strained. However, analyses of fire history suggest that it is the effect of climate variability on precipitation regimes that is the primary reason for the decreasing fire activity in the southern BDO Zone of Canada.

Risk Information: According to the National Interagency Fire Center, information about fires, including wildfires and controlled burns, in 2020 shows that 1,533 acres were affected in Wisconsin. Crop fires are not an issue.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.7.4 Risk of Infestation

Rationale: Risk of future infestation, including its estimated consequences on feedstock supply, should be calculated into the overall risk profile.

Since forest insect populations are influenced by environmental conditions, future changes in climate can be expected to significantly alter the outbreak dynamics of certain forest insect species. In some cases, larger and more frequent insect outbreaks may occur, but in other cases recurring outbreaks may be disrupted or diminished. As climate continues to change, we can expect more situations, particularly at the margins of tree ranges, where sub-optimal conditions for tree growth and reduced tree vigor can lead to outbreaks of forest insects.

Risk Information: When equipment moves from farm to farm, the bale chamber is emptied, leaving any partial bale behind, and the equipment is pressure blown to eliminate the possibility of any material leaving the farm. This is part of the harvest team's biosecurity protocol. Farmers effectively control most diseases with proper management practices already widely in place.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10.	**2**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 8 out of 100.	**8**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 8 out of 100.	**8**

3.7.5 Risk of Hail

Rationale: Hail has negligible impact of forestry biomass but is one of the principal destroyers of agricultural crops in North America.

There is much uncertainty about the effects of anthropogenic climate change on the frequency and severity of extreme weather events like hailstorms and their subsequent economic losses. Some studies indicate a strong positive relationship between hailstorm activity and hailstorm damage, as predicted by minimum temperatures using simple correlations. This relationship suggests that hailstorm damage may increase in the future if global warming leads to further temperature increase.

Risk Information: Hail is a localized occurrence and affects a small acreage of the BDO Zone, likely less than 1%. This analysis should be part of the project logistics planning prior to mapping the fields where the harvest will occur. Overall, hail does not present a significant risk.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.7.6 Risk of Flood

Rationale: Floods can cause catastrophic disruption and delay in feedstock supply. Where there is high risk of flood and thus negative impact to feedstock supply, the BDO Zone rating should account for this risk.

Risk Information: Floods along the Chippewa River occur more frequently, affecting roads and nearby agricultural lands. Counties in the BDO Zone have dynamic action plans to mitigate the impact of floods, nevertheless, it occurs more frequently. Farmers, however, build their field drainage systems to remove excess water within 24 hours for best results.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching *RRL Mitigation (Notch)* Mitigation measures are already in place and are part of the farming operations. The BAM rated quantity accounts for such weather risks, therefore there is no notching. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.7.7 Risk of Drought

Rationale: Droughts can cause significant disruptions to feedstock supplies across entire BDO Zones for extended periods of time, especially in case of agricultural residues and energy crops. Parts of Western Canada are experiencing more frequent and severe droughts, and scientists expect drought to affect new areas across Canada going forward.

Tree species are adapted to specific moisture conditions. Having less water available through drought has a range of negative impacts on the health of forest ecosystems. Direct impacts include reduced growth, increased tree mortality and failure to regenerate. Indirect impacts include reduced ability to defend against insects and disease, and increased fire risk. These impacts can affect the availability of wood fiber for an Issuer.

Risk Information: According to the Department of Natural Resources in Wisconsin, some drought occurs nearly every year. The drought from 2021 to 2023 was the most severe in Wisconsin based on the high percentage of land affected and its duration. The drought has been more persistent in the northern counties of the BDO Zone. The impact on the corn harvest and planted area within the Supply Zone in that period was a difference of 29% or 196,000 acres. The historic 10-year yield in the region is 157 bu/acre, and during the 2021 drought, yields were 166 bu/acre due to new plant genetics. Drought conditions in the state occur frequently, once every five years or so since 2001.[34]

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**6**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 24 out of 100.	**24**

[34] https://www.drought.gov/states/wisconsin#historical-conditions

Mitigation/Notching	Notch
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 24 out of 100.	**24**

3.7.8 Risk of Hurricanes, Tornadoes and Strong Winds

Rationale: Hurricanes, tornadoes, and strong winds can destroy timber stands, crops, and feedstock piles. They can also delay forestry and agricultural operations. Hurricanes and tornadoes can indirectly cause temporary shortages of available transportation as available trucking moves to handle higher value disaster related contracts. For example, Katrina cleanup limited availability of live-bottom trailers in the North and South-East of the US for several months as truckers shifted operations to handle more lucrative government contracts.

Although scientists are uncertain whether climate change will lead to an increase in the number of hurricanes, warmer ocean temperatures and higher sea levels are expected to intensify their impacts.

Recent analyses conclude that the strongest hurricanes occurring in some BDO Zones including the North Atlantic have increased in intensity over the past two to three decades.

Risk Information: Tornadoes are uncommon in the Supply Zone; outreach has found that it is not a risk to corn production.

Raw Risk Likelihood (RRL)	Score
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.7.9 Risk of Low Temperatures

Rationale: Low temperatures can cause crop failure, leading to shortages of biomass. Additionally, low temperatures can have adverse impacts on the operations of feedstock processing equipment in Northern BDO Zones.

Risk Information: On average, the area harvests 80% of the planted acres due to various weather-related factors. On harvested acres, the risk of low temperatures is low. The mean monthly temperatures based on Chippewa Falls, at the

center of the BDO Zone, are ideal for corn production. However, winter weather can negatively impact corn stover harvest, either due to field conditions or farmers deciding to till.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**Score** **6**
Raw Risk Impact (RRI) The risk impact is deemed *medium*, therefore the RRI is 6 out of 10.	**Score** **6**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 36 out of 100.	**Score** **36**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100.	**Score** **36**

3.8 Risk Factor: Political and Social

3.8.1 Government Subsidies for Feedstock Production or Utilization

Rationale: Feedstock that is directly subsidized though government programs can pose greater long-term risk than feedstock that is not. Subsidies may be subject to amendment or repeal, sometimes with minimal notice.

NOTE: This risk indicator refers to direct feedstock subsides only; it does not apply to government subsidies that pertain indirectly to the operations of the Issuer such as Loan Guarantees or to the markets for products produced by the Issuer.

Risk Information: At this point there are no direct government subsidies for corn stover, however, corn is one of the biggest recipients of government subsidies in the US and its production directly affects the availability of corn stover.

The Agriculture Risk (ARC) and Price Loss Coverage (PLC) programs provide financial protections to farmers from substantial drops in crop prices or revenues based on a benchmark pricing of $3.70/bu. These programs have been in place for several decades and are not at risk of being repealed.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**

Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.8.2 Local, Provincial, & National Laws, Regulations, & Permitting Pertaining to Biomass

Rationale: Feedstock whose production is directly dependent on local, provincial, or national laws or government regulations can pose greater long-term risk than feedstock that is not, since laws and regulations may be subject to amendment or repeal.

If utilization of biomass requires specific permits (i.e., percentage removal of forest residues or corn stover, allowable cut limits, air emission, storage permits, rights-of-way, overweight permits for trucks, cross-border permitting for shipment of biomass, chain of custody, or certification of sustainability) then likelihood of obtaining such permits and/or complying with permitting requirements should be examined.

Risk Information: Currently, no regulations regarding corn stover removal and use exist.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10.	**2**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *very low*, therefore the RRI is 2 out of 10.	**2**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 4 out of 100.	**4**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100.	**4**

3.8.3 Backlash Against Biomass Development, Procurement or Usage in the Region

Rationale: Public backlash against biomass development in the Issuer BDO Zone can directly impact Issuer's ability to procure, transport, trans-load, store, or utilize feedstock by affecting local policies, regulations, and Issuer's ability to obtain necessary permitting.

Risk Information: The State of Wisconsin supports the development of biomass projects as part of its Clean Energy Plan, which aims to achieve 100 percent carbon-free electricity by 2050 and reduce greenhouse gas emissions across various sectors. Funds for feasibility studies and pilot projects related to biogas and anaerobic digestion have been allocated via the Energy Innovation Grant Program and the Critical Infrastructure Microgrid and Community Resilience Center Pilot Grant Program. The state has also worked with the Department of Natural Resources to facilitate water quality trading and pollution reduction credits for biogas facilities. Additionally, Wisconsin is part of two multi-state memorandums of understanding to advance clean hydrogen production, which can involve biomass as a feedstock.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10.	**2**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *very low*, therefore the RRI is 2 out of 10.	**2**

Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 4 out of 100.	**Score** **4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100.	**Score** **4**

3.8.4 Consent of, and Co-operation with, Indigenous Communities and First Nations

Rationale: Where new project development on or near Indigenous or First Nation land, or where near Indigenous or First Nations exert influence over feedstock producing areas, consent of, and co-operation with, Indigenous communities and First Nations decreases Issuer risk.

Risk Information: There is no risk associated with Indigenous or First Nation land for this BDO Zone.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10.	**Score** **2**
Raw Risk Impact (RRI) The risk impact is deemed *very low*, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 4.	**Score** **4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100.	**Score** **4**

3.8.5 Food Security Concerns

Rationale: Despite the fact that any significant correlation between food prices and biofuel production is unclear, claims that biofuel production has driven up food prices, taken food from communities or had a negative impact on land use can fuel public backlash. For example, removal of biomass may raise public concerns relating to food security if Issuer feedstock requires the use of land that would otherwise be used for growing food.

Risk Information: Since corn stover is a by-product of corn grain production, there is no competition between renewable fuels and food. Additionally, corn stover is not a suitable animal feed alternative and is seldom used as a last resort in the absence of any other alternative.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10.	**Score** **2**

Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *very low*, therefore the RRI is 2 out of 10.	**2**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 4 out of 100.	**4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100.	**4**

3.9 Risk Factor: Sustainability and Environmental Concern

3.9.1 Feedstock Sustainability

Rationale: Public concerns about sustainability of feedstock production can jeopardize biomass feedstock operations. Sustainability certification schemes should be utilized where applicable to ensure that feedstock comes from sustainable sources.

Canada leads all countries with 166 million hectares of certified forests, a figure that is nearly four times more than second place United States at 47 million hectares.

Risk Information: The primary concern regarding the feedstock sustainability for this project is the removal of corn stover and the impact of organic matter in the soil. Academic literature[35] suggests a minimum yield of 150 bu/acre to remove corn stover sustainably to maintain soil organic matter. However, in practice, crop rotation, farm practices (e.g., tilling/no tilling, irrigation), and weather conditions in planting and harvest season can allow the sustainable removal of corn stover in fields with yields lower than 150 bu/acre, which do happen in other regions of the country. Additionally, there is no established sustainability measure or large-scale life cycle analysis done for the collection and bailing of corn stover. Agronomic research suggests 60% of corn stover biomass to be left in the field, therefore, this category is deemed low.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**

[35] Science-based maize stover removal can be sustainable, Maecio R. Nunes et.al. Agronomy Journal, 2021; Vol. 113 page 3178-3192 (https://acsess.onlinelibrary.wiley.com/doi/10.1002/agj2.20724)

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.9.2 Risk to Soil Quality

Rationale: Soil sustainability can be defined as management of soil in a way that does not exert any negative or irreparable effects either on the soil itself or any other systems. There is a diversity of approaches to soil sustainability in jurisdictional guidelines for forest biomass harvesting and production. For different feedstock types, there are also different thresholds at which feedstock removal causes significant negative consequences on soil.

Poor soil quality that negatively impacts the long-term sustainability of the feedstock can entail long-term feedstock risk. Sub-optimal soil management can leave exposed soil post residue-harvest which can lead to soil wash-off and soil carbon loss from precipitation and wind. Over-harvesting of biomass also depletes the carbon stock in the soil and creates a negative feedback loop which can degrade the soil and its nutrients.

Risk Information: Sustainability of crop residue removal depends on factors like water availability, soil type, and management practices. For corn stover the two main challenges are the retention of enough nutrients on the ground and the protection from erosion. The timing of corn stover harvest in the fall creates a risk of soil compaction, which could lead to yield loss for the following crop. From 2018 onwards, manufacturers have improved their equipment to avoid and mitigate soil compaction. With the crop rotation changing to more soybeans, the soil potash levels are being depleted in some regions.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.9.3 Risk to Surface and Groundwater

Rationale: Excessive nutrient runoff from biomass feedstock production can accumulate in surface waters and result in algal blooms and hypoxia which can lead to habitat loss for aquatic species higher up the food chain and alter aquatic

ecosystem food webs. Damage to aquatic ecosystems can cause social and regulatory backlash. Water intake issues can also increase risk.
Risk Information: The soil impacts of corn stover removal will depend on its type and the amount removed. In areas with yields of 150 bu/acre and higher, literature[36] recommends that no more than 40% of biomass be removed from the ground as to preserve organic matter and also prevent evaporation, which can lead to wind erosion and other issues. Because there are no inputs into these operations (as opposed to planting a crop), there is little risk in this category.
Raw Risk Likelihood (RRL) **Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. **4**
Raw Risk Impact (RRI) **Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10. **4**
Gross Risk Indicator (GRI) **Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100. **16**
Mitigation/Notching **Notch**
RRL Mitigation (Notch) **NN**
No adjustment.
RRI Mitigation (Notch)
No adjustment.
The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).
Loaded RI Score **Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. **16**

3.9.4 Water Use

Rationale: Biomass feedstock operations can have significant impacts on the hydrological flux (infiltration, groundwater recharge, interception, and transpiration) of ecosystems. This can lead to water shortages, lower yields, and backlash from regulatory bodies if management plans are not properly instituted.
Risk Information: The stover harvest does not require water and the harvest season occurs when all crops have stopped growing in late fall, a time of year when evapotranspiration is not a factor.
Raw Risk Likelihood (RRL) **Score**
The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. **2**
Raw Risk Impact (RRI) **Score**
The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. **2**
Gross Risk Indicator (GRI) **Score**
The Gross Risk Indicator (RRL × RRI) is 4. **4**
Mitigation/Notching **Notch**
RRL Mitigation (Notch) **NN**
No adjustment.
RRI Mitigation (Notch)
No adjustment.
The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).

[36] However, in practice, crop rotation, farm practices (e.g., tilling/no tilling, irrigation), and weather conditions in planting and harvest season can allow the sustainable removal of corn stover in fields with yields lower than 150 bu/acre, which do happen in other regions of the country.

Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100.	**4**

3.9.5 Pesticide Risk to Human and Ecosystem Health

Rationale: Application of pesticides (i.e., herbicides, fungicides, and insecticides) on agricultural and forest landscapes can result in adverse health effects for humans and ecosystems. If pesticide application is required in feedstock production, the impact must be considered in the BDO Zone rating.

Risk Information: Farming in this BDO zone is not as intensive as areas in the eastern and southern part of the state. On a county basis, less than 10% of the lands are used for corn production, compared to over 70% elsewhere. The Department of Natural Resources addresses the preservation and restoration of grasslands to protect corridors for migratory birds using the Chippewa River corridor. Farmers contribute to ecosystem health using various tools implemented on farms to protect their soil and enhance their crops. Tools such as no fall tillage and cover crops providing green fodder through the non-growing season are important to support wildlife and cycle excess nutrients. Cover crops also protect against wind and water erosion. Overall, the assessment of the risk is low due to the size of the production areas.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

3.9.6 Risk to Wildlife and Landscape

Rationale: Biomass production and supply chain operations with negative impacts on wildlife and landscape are at a greater long-term risk of encountering project setbacks and disruptions.

Risk Information: There are several programs in place in the State to aid with conservation:

Natural Resources Conservation Service (NRCS): Provides technical assistance to farmers and other private landowners to develop conservation systems;

Natural Resources Foundation of Wisconsin (NRF): Supports on-the-ground conservation, environmental education, and capacity building for other conservation groups;

EQIP and RCPP1: Offers payments for over 120 basic conservation practices;

Wisconsin Knowles-Nelson Stewardship Program: Uses general obligation bonds to fund land conservation;

Wisconsin Conservation Reserve Enhancement Program (CREP): Participants voluntarily enroll in CRP for 14-year to 15-year contracts to remove cropland and marginal pastureland from agricultural production and convert the land to grasses, trees, or other approved vegetation or restore wetlands.[37]
Raw Risk Likelihood (RRL) — **Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. — **4**
Raw Risk Impact (RRI) — **Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10. — **4**
Gross Risk Indicator (GRI) — **Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100. — **16**
Mitigation/Notching — **Notch**
RRL Mitigation (Notch) — **NN**
No adjustment.
RRI Mitigation (Notch)
No adjustment.
The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. — **16**

3.9.7 Biomass Classified as Genetically Modified Organism (GMO)

Rationale: There are various risks associated with GMOs such as migration or dispersion across the landscape, which can generate community backlash and create supply chain risk. GMOs can also be heavily regulated. If planning to grow or procure GMO feedstocks, especially purpose-grown energy crops, it is important to understand the risks.
Risk Information: When it comes to stover, there is no quality designation enabling differentiation of feedstock sources.
Raw Risk Likelihood (RRL) — **Score**
The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. — **2**
Raw Risk Impact (RRI) — **Score**
The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. — **2**
Gross Risk Indicator (GRI) — **Score**
The Gross Risk Indicator (RRL × RRI) is 4 out of 100. — **4**
Mitigation/Notching — **Notch**
RRL Mitigation (Notch) — **NN**
No adjustment.
RRI Mitigation (Notch)
No adjustment.
The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. — **4**

[37] https://crsreports.congress.gov/product/pdf/R/R40763

Category 4.0 Feedstock Scale-Up Risk

4.1 Risk Factor: Feedstock Scale-Up

4.1.1 Feedstock Quality at Production Scale

Rationale: The physical and chemical properties of feedstock used in lab, pilot and field testing can fail to be representative of feedstock generated by large-scale operations.

It is important to conduct tests on feedstock representative of that which will be produced by large-scale operations. Failure to adequately test the full range of parameter values can result in severe problems during scale-up.

Risk Information: Corn stover is an inevitable part of corn production, and because it is a residue in the field, very little can be done to improve its quality in that state. Since the window to harvest this biomass is short, it is unlikely that quality will deteriorate. However, the biggest impact on quality would come from field operations and storage, where a high ash concentration can become an issue or overexposure of bales to the weather can damage its integrity and moisture. The collection and quality control of corn stover in this BDO Zone may present a challenge due to the lack of large-scale demand for this feedstock. Therefore, the impact could be significant.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10.	**8**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 64 out of 100.	**64**
Mitigation/Notching *RRL Mitigation (Notch)* With the establishment of markets for corn stover, the project developer should develop a protocol for collection and harvesting, as well as workshops and field days, to minimize soil contamination in the bales and increase overall quality. This category is notched at 50%. *RRI Mitigation (Notch)* An experienced third-party bailing company can significantly offset the quality issues of feedstock, but delivery to the bio-based facility will depend on the transport infrastructure in place, which requires scaling up. Therefore, this category is notched at 50%. The Total Notch (RRL Notch × RRI Notch) is 75%.	**Notch** **75%**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

4.1.2 Capacity of Supply Chain Components & Equipment to Scale

Rationale: Scale-up risk increases if supply chain components, or underlying feedstock infrastructure necessary for these components, cannot scale to handle Issuer feedstock requirements and throughput capacity. Capacity to scale should be demonstrated.

Risk Information: The current corn grain production infrastructure is highly efficient; however, the lack of demand has hindered infrastructure development for large-scale corn stover collection, baling, and transportation. While specialized field equipment exists, farmers would need to invest a significant financial commitment, distributors would need to stock and service it, and transportation companies would need to scale up their capacity, all dependent on a compelling project. Establishing the proper incentives and financing mechanisms is challenging to scale up for an entire region, posing a significant risk.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10.	**Score** **8**
Raw Risk Impact (RRI) The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 64 out of 100.	**Score** **64**
Mitigation/Notching *RRL Mitigation (Notch)* The establishment of a reputable developer in the Supply Zone can influence the expansion of the equipment supply and accelerate scale-up; therefore, this category is notched at 25%. *RRI Mitigation (Notch)* Introducing a third party that owns equipment can significantly reduce the scaling up risk, therefore this category is notched at 50%. The Total Notch (RRL Notch × RRI Notch) is 63%.	**Notch** **63%**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 24 out of 100.	**Score** **24**

CATEGORY 5.0: INFRASTRUCTURE RISKS

5.1 Risk Factor: Physical Infrastructure

5.1.1 Land Parcel/Ind. District

Risk Information: The site selected for this report is a privately owned 40-acre industrial lot located in the Village of New Auburn, WI, available for either lease or purchase. The site sits adjacent to a rail line and US Highway 53. A previous operation that complied with all environmental regulations, including building a stormwater pond, still exists. Outreach has found no restrictions on the land.

Permitting for new buildings should take between 30 and 90 days, given that documentation, plans, and engineering paperwork are provided. All property is annexed into the village of New Auburn, WI.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

5.1.2 Ownership of Land

Risk Information: The land is privately owned by BNL Rail, which is looking to develop.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

5.1.3 Permitting Description

Risk Information: If a bio-based facility were to be built, the Village of New Auburn would require a building permit and potentially an excavation permit. Plans would have to be approved by the planning commission. If all engineering paperwork is in order, it should not take more than 90 days.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

5.1.4 Environmental Issues

Risk Information: The industrial site has no air quality restrictions or flood hazards.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**

Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

5.2 Risk Factor: Utilities

5.2.1 Natural Gas Availability

Risk Information: A large gas line sits at the edge of the parcel and would need to be extended to a potential new facility. Wee Energies supplies natural gas.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10.	**Score** **2**
Raw Risk Impact (RRI) The risk impact is deemed *very low*, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 4 out of 100.	**Score** **4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100.	**Score** **4**

5.2.2 Electric Availability

Risk Information: There is an electrical connection (4000 amps currently), and the site is serviced by Xcel Energy.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10.	**Score** **2**
Raw Risk Impact (RRI) The risk impact is deemed *very low*, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 4 out of 100.	**Score** **4**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100.	**4**

5.2.3 Water Availability

Risk Information: Water is provided by the Village of New Auburn, and there is a water main at the site. Sewage is available both in both septic and piped for the City.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

5.2.4 Waste Disposal

Risk Information: No waste disposal services are available, requiring the bio-based facility to make arrangements for industrial and hazardous waste disposal.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**6**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *medium*, therefore the RRI is 6 out of 10.	**6**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 36 out of 100.	**36**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100.	**36**

5.2.5 Internet Availability

Risk Information: High-speed internet is available on-site.	
Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**16**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

5.3 Risk Factor: Transportation/Logistics

5.3.1 Road/Highway Access

Risk Information: The industrial site is located by US Highway 53, a north-south corridor that runs 404 miles (650 km) from La Crosse, Wisconsin, to International Falls, Minnesota. To the south, the highway crosses Interstate 90 and 94, which are north-south highways that run from Seattle, Washington, to the Canadian border near Sault Ste. Marie, Michigan. Proximity to US Highway 53 makes this category low risk.	
Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

5.3.2 Rail Access

Risk Information: A rail line operated by Progressive Rail runs adjacent to the site, but no spur would allow for direct loading. However, it is possible to transload at the B&L facility within the Village's limits.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 2 out of 10.	**2**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 2 out of 10.	**2**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 4 out of 100.	**4**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100.	**4**

5.3.3 Airport Access

Risk Information: Barron Municipal Airport is 22 miles north of the industrial site and offers general aviation services but no scheduled passengers or cargo. Chippewa Valley Regional Airport, 32 miles south of New Auburn, WI, offers general aviation services, scheduled passenger services, and cargo freight. The closest international airport is the Minneapolis-Saint Paul International Airport, 100 miles west.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

5.3.4 Water Freight Access

Risk Information: The closest water freight access from New Auburn is the Port of Duluth-Superior, 150 miles north. It is the largest, farthest-inland freshwater port in North America. The port is a global gateway for bulk cargo, with main operations transporting commodities such as coal, iron ore, grain, and wind energy components. The breadth of operations and unique inland location make this category an asset for a bio-based project in this BDO Zone.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

5.4 Risk Factor: Social Infrastructure

5.4.1 Healthcare (Local)

Risk Information: 11 miles north of New Auburn, the Marshfield Clinic Chetek Center offers same-day appointments in family medicine along with on-site lab and x-ray services. 10 miles south, the Mayo Clinic Health System — Chippewa Valley in Bloomer offers primary care, comprehensive heart care, and trauma services in the emergency department.

20 miles south, in Chippewa Falls, the St Joseph's Hospital is part of the Mayo Clinic system and provides primary care services as well as heart-related services in preventing, diagnosing, and treating several heart conditions, as well as a wide range of other specialties. The different services and specialties available within 20 miles make this category low risk.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**

Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

5.4.2 Education (Schools)

Risk Information: The New Auburn School District serves students in grades PK-122. The district has three schools: New Auburn Elementary, New Auburn Middle, and New Auburn High School. The student-to-teacher ratio in the district is 10:1. However, compared to the State, the district ranks in the bottom 50% in graduation rate.

Northwood Tech is a public college 26 miles north of New Auburn that offers associate degrees, technical diplomas, and certificates in various fields such as welding, accounting, bookkeeping, occupational therapy, mechatronics, robotics, and others. The College also partners with private companies to develop employee training and industry best practices.

Chippewa Valley Technical College, 33 miles north of Eau Claire, offers vocational and technical education. Students can earn degrees and certificates in 60 different fields, such as Registered Nursing, Business Administration and Management, General and Computer Systems Networking, and Telecommunications.

There are no Universities within the city's boundaries. The closest ones are the University of Wisconsin-Madison, about 40 miles away, and Marquette University, about 50 miles away.

The low school ranking and the required distance to reach secondary-level educational options make this category a medium risk.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**Score** **6**
Raw Risk Impact (RRI) The risk impact is deemed *medium*, therefore the RRI is 6 out of 10.	**Score** **6**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 36 out of 100.	**Score** **36**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100.	**Score** **36**

5.4.3 Local Transportation

Risk Information: There are no public transportation services offered, however most people in New Auburn drive alone to work, with an average commute time of 24 minutes. The average car ownership is 2 cars per household.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

5.4.4 Public Safety (Local)

Risk Information: New Auburn is part of the Chippewa County Sheriff's Dept. where violent crime is 223/100,000 residents, 30% lower than the State average of 297[38] and the National average of 380.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**Score** **16**

5.4.5 Housing/Cost of Living

Risk Information: According to the Federal Reserve Bank of St Louis, as of the second quarter of 2023, the median home price in the U.S. was $416,100. The median list price in Wisconsin was $264,923, around 36% lower. The average

[38] https://cde.ucr.cjis.gov/LATEST/webapp/#

Chippewa Falls (closest averages available for New Auburn) home value is $275,162, up 5.4% over the past year and slightly above the state average. Over the past 3 years, since November 2020, median home prices increased 28%.

The total cost of housing, food, child care, transportation, health care, taxes, and other necessities is around 10% lower than the U.S. average and on par with the State.[39]

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

5.5 Risk Factor: Labor

5.5.1 Workforce

Risk Information: New Auburn, WI, has a population of 486 people with a median age of 32.9. The village sits between Chetek to the north (pop. 2,200) and Bloomer to the south (pop. 3,500). The unemployment[40] rate in November 2023 was 2.5%. The national unemployment rate currently stands at 3.6%, up from 3.4% a year ago.

The Chippewa Falls Area Chamber offers several programs aimed at developing and retaining a skilled workforce.[41] These include a digital marketing campaign to attract skilled workers and relocation services for potential recruitments and new employees.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**

[39] https://www.bestplaces.net/cost_of_living/city/wisconsin/chippewa_falls
[40] https://www.bls.gov/web/metro/laummtrk.htm#laummtrk.f.p
[41] https://www.chippewachamber.org/live-and-work/workforce-development/

Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

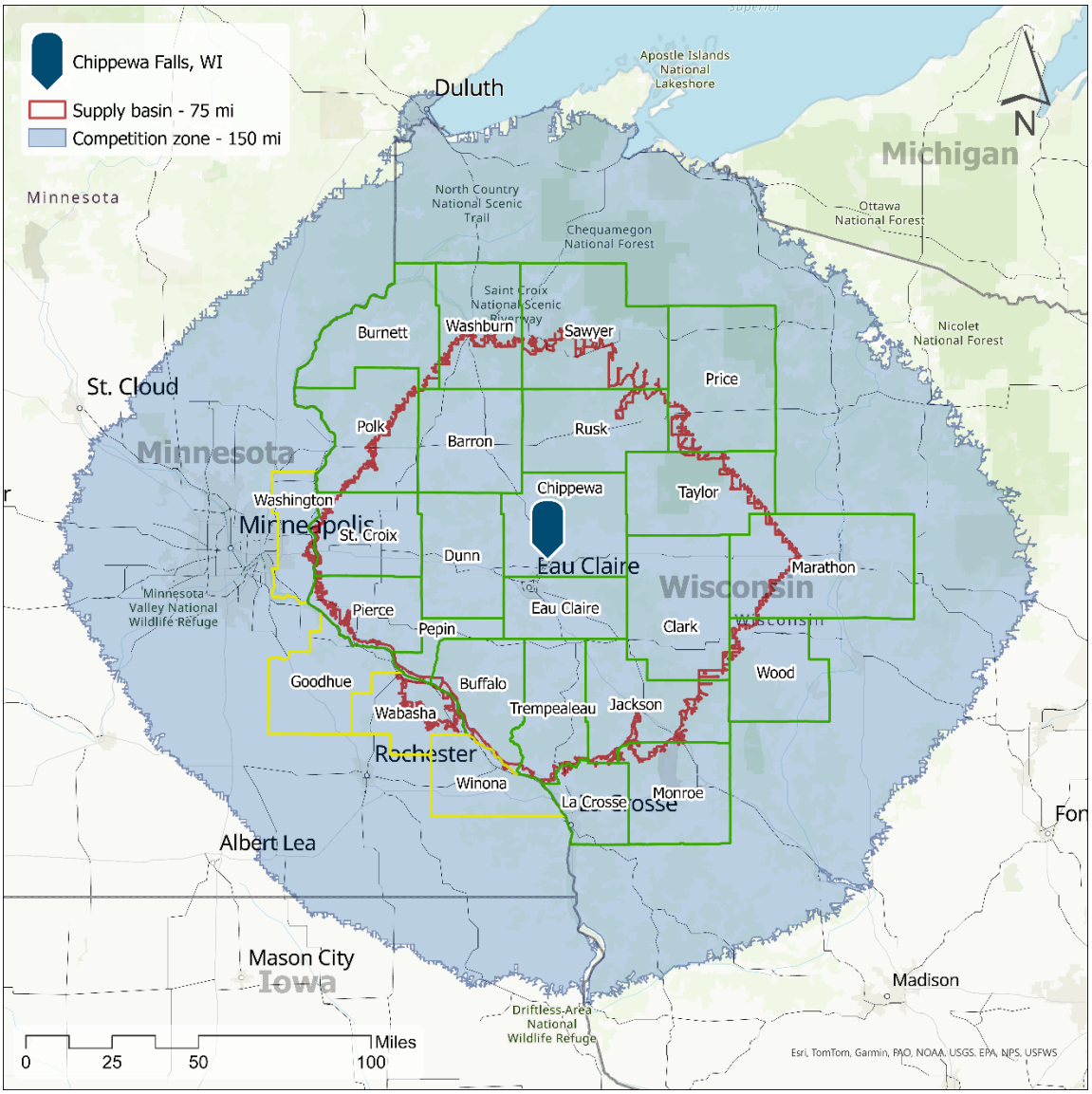
5.5.2 Labor Costs

Risk Information: The median hourly wage in Wisconsin is $21.95/hour, and the mean annual income is $56,000. New Auburn is part of the Eau Claire metro area, where the hourly wage is similar at $20/hour, and the mean annual income is $53,000. Therefore, labor costs in New Auburn are competitive compared to the State averages.

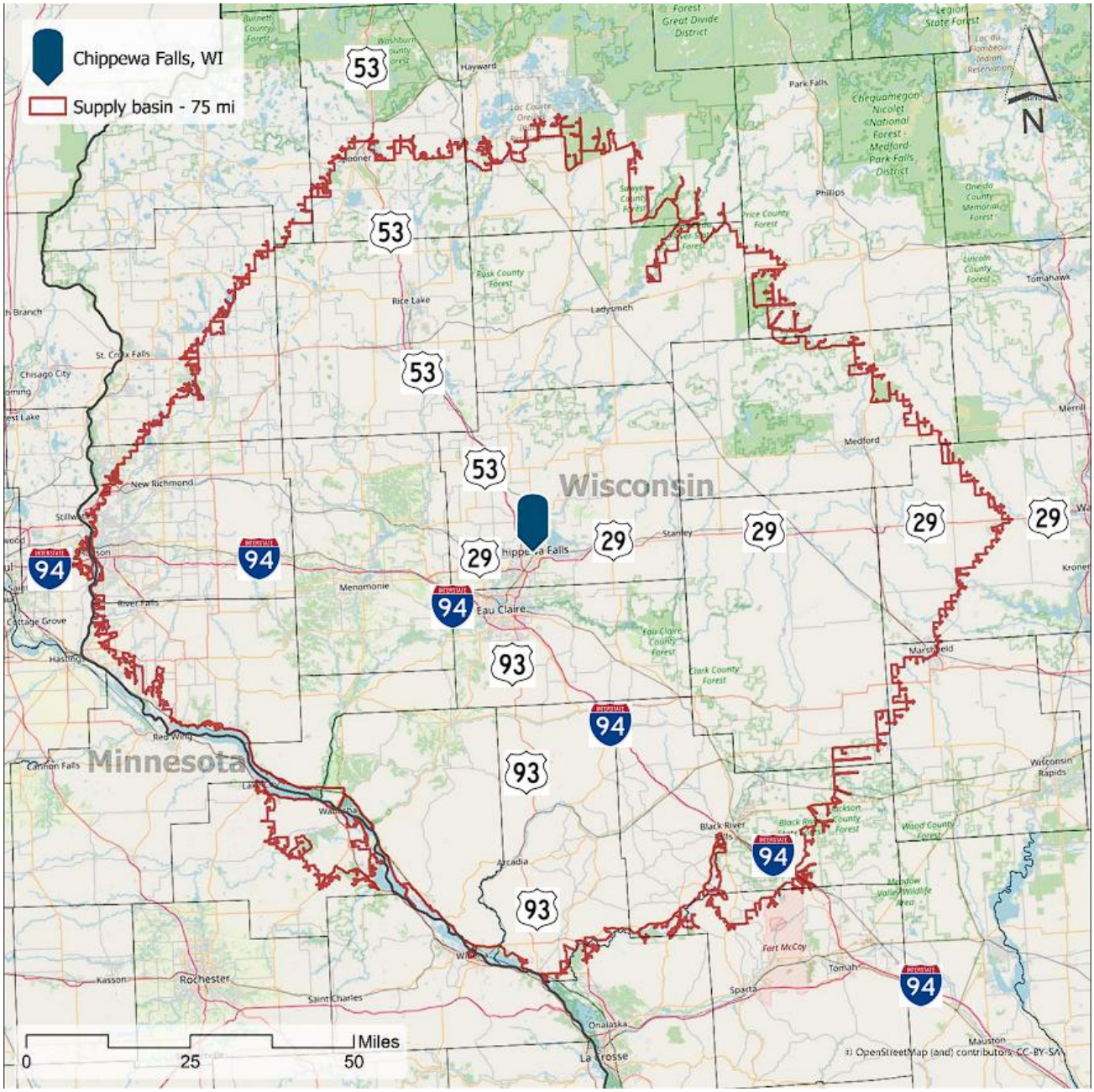
Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100.	**16**

APPENDIX C: TABLES AND FIGURES

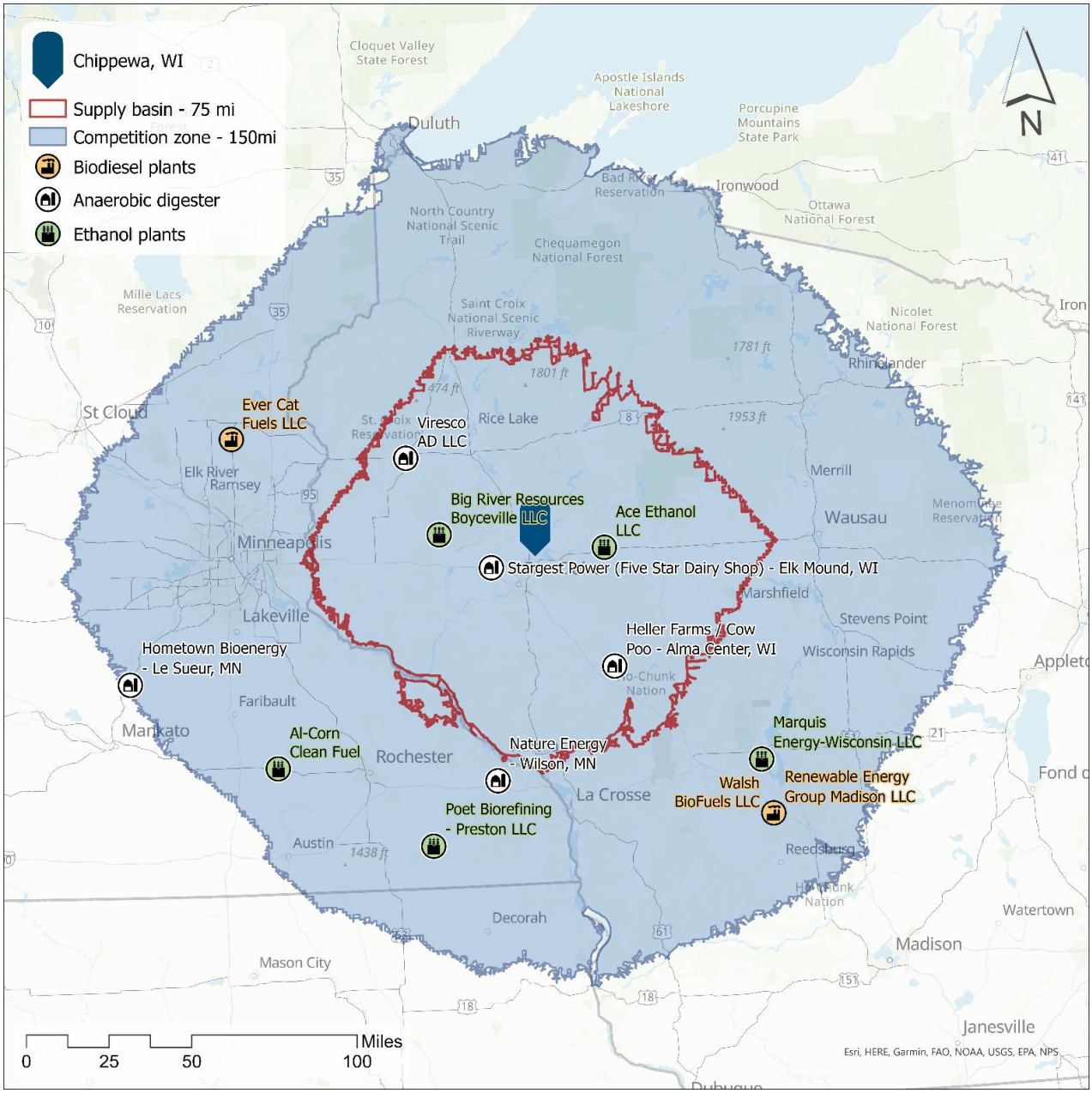
Map C-1. Counties within the Supply Zone. The map also illustrates the outer limits of the competition zone in a 150-mile drive distance, overlayed on top of the counties.



Map C-2. BDO Zone Road Network



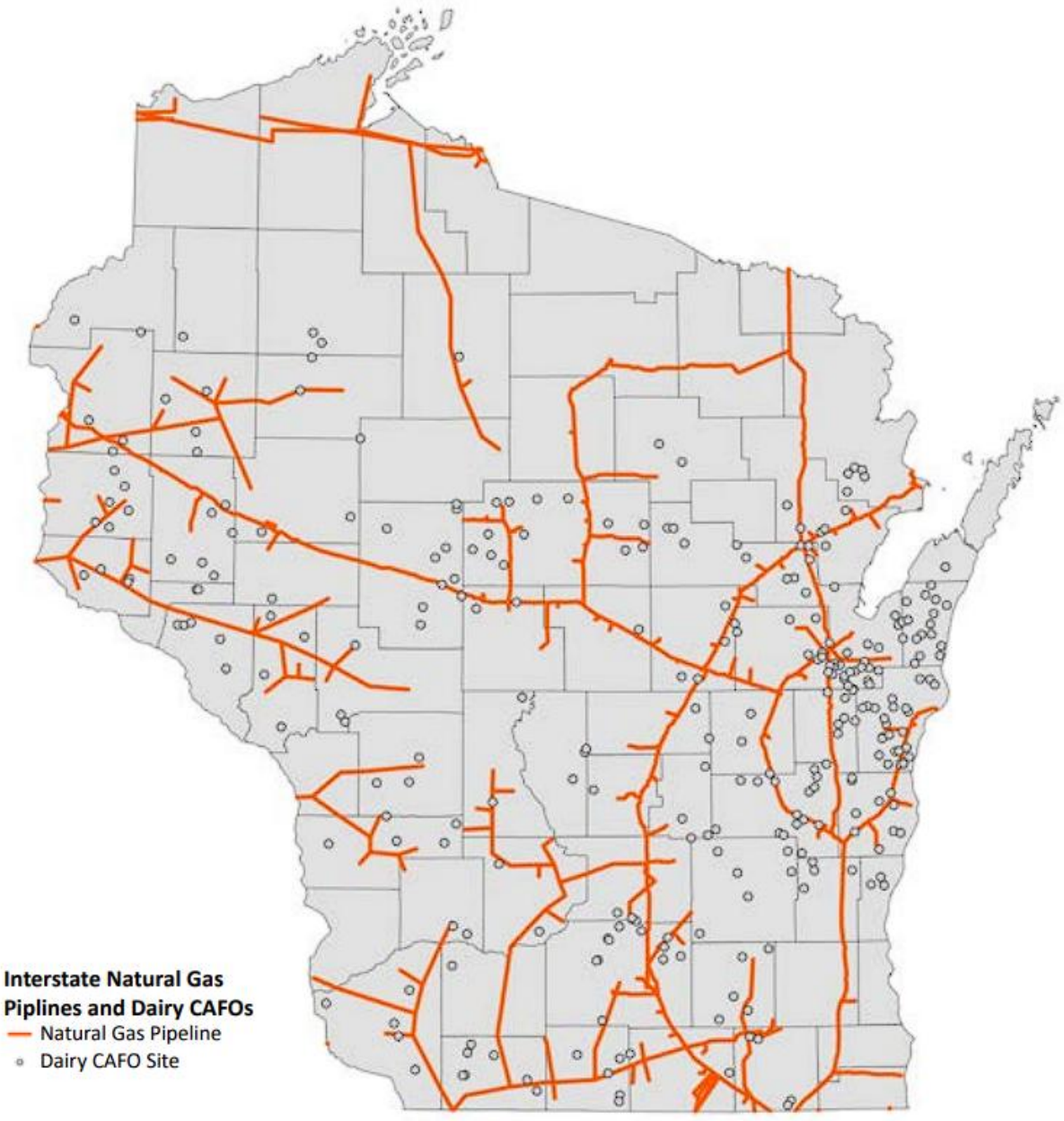
Map C-3. Operating bio-based facilities within the competition zone



There are 136 operating anaerobic digester (AD) systems and 35 landfill sites that capture gas in Wisconsin.[42] The State is one of the early adopters and leading producers of renewable energy from anaerobic digestion systems.

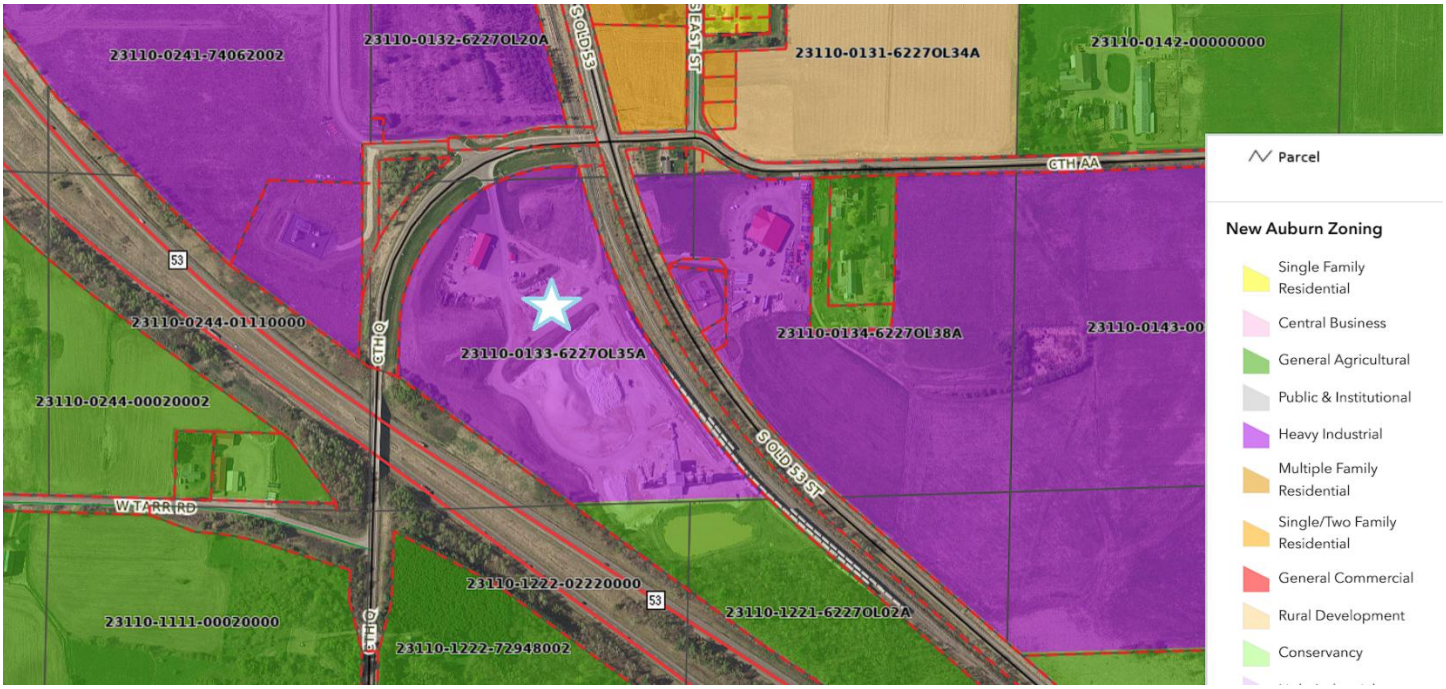
[42] https://psc.wi.gov/Documents/OEI/WisconsinBiogasSurveyReport.pdf

Map C-4. Interstate Natural Gas pipelines and dairy CAFOs[43,44]



[43] Concentrated animal feeding operation.
[44] https://psc.wi.gov/Documents/OEI/Biogas/WI_Biogas_Case_Studies_Report_2022.pdf

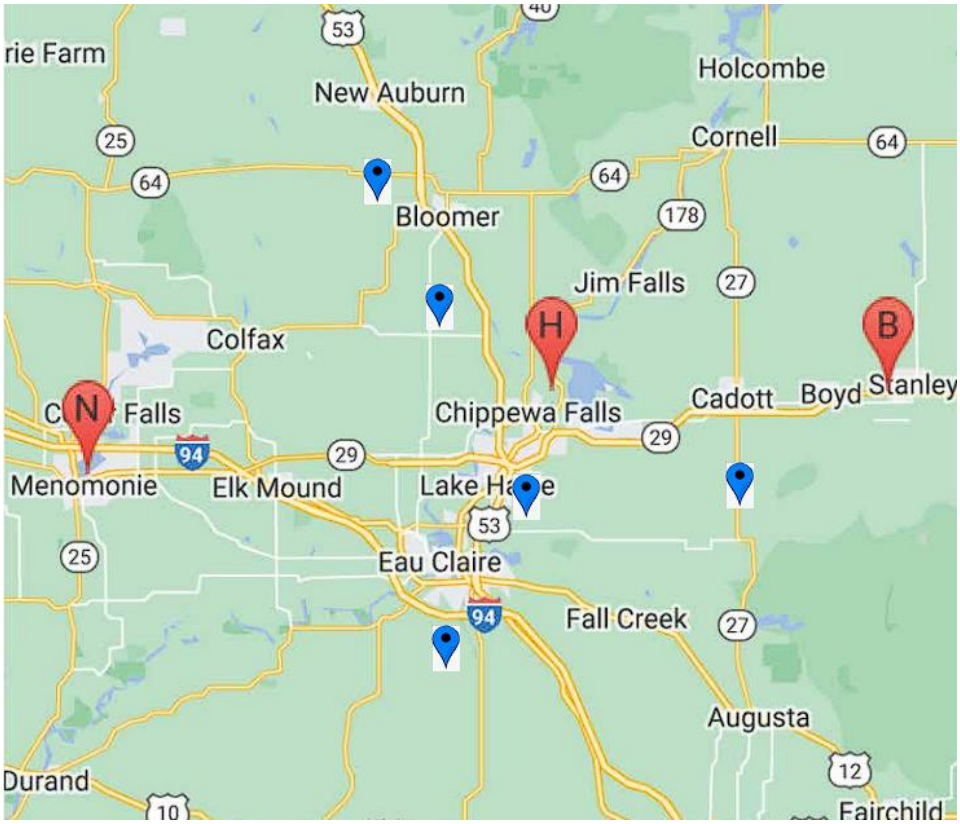
Map C-5. Industrial site zoning



Source: New Auburn Zoning Map[45]

[45] https://experience.arcgis.com/experience/b3552495fc524edcab5751a595cc7452/

Map C-6. Additional shovel-ready industrial sites within the BDO Zone[46]



- N- Menomonie Industrial Park
- H- Lake Wissota Business Park
- B- Stanley West Business Park
- Blue Pins: Regional heavy zoned industrial sites over 30 acres

The Certified in Wisconsin Program designates industrial sites as development-ready, offering comprehensive information necessary for efficient decision-making by developers. This includes details on utility and transportation infrastructure, environmental assessments, and labor quality. Certified sites facilitate faster turnaround times, swift approvals, and reduced risk, enabling developers to commence new development projects promptly when prepared. [47]

[46] Source: Chippewa County Economic Development Corporation (CCEDC) - Wisconsin
[47] Source: Chippewa County Economic Development Corporation (CCEDC) - Wisconsin

Map C-7. Operating Transport facilities within the BDO Zone

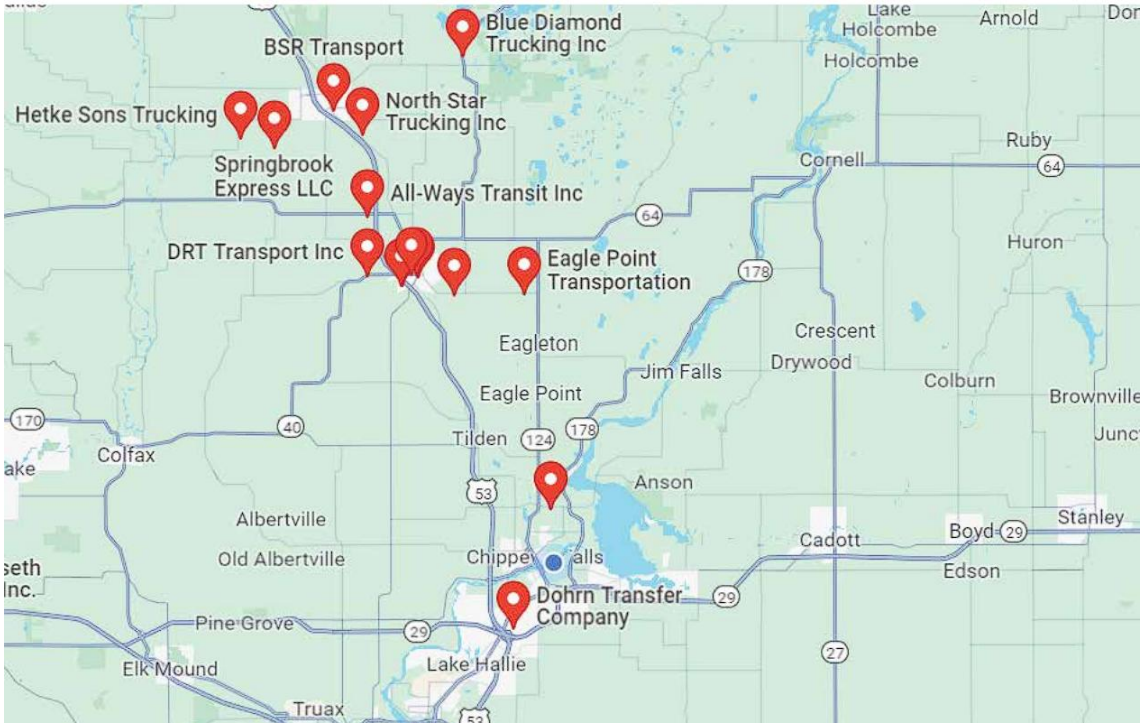


Table C-1. 10-year Corn harvested area in acres within the Supply Zone[48]

Total Production grain - in tons - with overlay										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
BARRON	253,225	224,964	297,546	306,836	267,299	332,130	275,777	300,960	364,700	328,045
BUFFALO	217,380	233,064	218,507	260,551	238,520	253,863	225,379	208,436	249,247	212,842
BURNETT	485	346	571	825	695	637	410	755	751	626
CHIPPEWA	195,496	273,000	272,328	344,120	332,052	316,932	297,024	331,716	341,908	288,932
CLARK	-	179,704	171,321	210,163	132,505	182,562	50,656	198,432	208,584	176,193
DUNN	283,024	352,464	380,940	401,408	387,212	414,876	400,792	415,072	477,680	445,452
EAU CLAIRE	132,468	170,408	175,756	180,488	185,780	162,232	156,828	162,288	207,704	174,720
GOODHUE	46.23	52.56	56.67	54.71	57.90	53.09	55.60	55.06	54.73	58.36
JACKSON	109,838	140,791	127,273	140,812	149,103	138,792	127,418	135,271	151,456	144,041
LA CROSSE	592	728	630	691	679	738	726	655	659	693
MARATHON	35,126	47,827	47,218	65,334	53,369	70,797	-	77,253	83,723	60,601
MONROE	4,678	5,888	6,609	7,481	7,071	6,977	5,384	6,650	6,381	5,784
PEPIN	89,967	80,327	101,236	108,249	100,789	106,043	111,112	98,189	96,140	103,862
PIERCE	246,769	243,737	317,907	360,190	337,328	353,307	276,394	311,770	341,804	284,311
POLK	55,307	48,632	75,301	87,082	77,089	87,300	72,696	82,252	83,716	84,505
PRICE	281	-	-	-	-	-	166	209	323	211
RUSK	39,950	42,534	54,881	73,755	-	44,166	39,896	48,109	82,512	71,715
SAWYER	2,531	4,331	-	5,247	-	4,372	-	4,919	5,802	7,580
ST CROIX	162,659	271,708	380,861	391,866	334,910	372,053	385,200	383,475	346,019	340,399
TAYLOR	-	-	77,983	109,049	60,676	-	-	80,320	108,762	76,925
TREMPEALEAU	233,640	324,064	295,908	362,751	334,758	337,600	321,032	308,010	341,526	351,083
WABASHA	88,590.28	100,543.75	93,172.98	108,049.12	105,914.80	92,903.79	94,788.14	105,184.13	115,112.24	111,984.47
WASHBURN	9,299	7,997	13,499	12,794	16,846	14,575	13,166	12,148	13,675	15,084
WASHINGTON	1,477	1,632	1,755	1,791	1,383	1,811	1,764	1,623	1,331	1,399
WINONA	426.74	490.27	427.08	513.28	482.02	551.85	490.76	480.19	491.62	503.95
WOOD	2,199	3,579	3,893	5,824	1,586	3,805	2,314	4,275	5,304	5,092

Table C-2. 10-year historical corn grain production in tons[49]

Production (tons) - Adjusted for County Overlay										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
BARRON	253,225	224,964	297,546	306,836	267,299	332,130	275,777	300,960	364,700	328,045
BUFFALO	217,380	233,064	218,507	260,551	238,520	253,863	225,379	208,436	249,247	212,842
BURNETT	485	346	571	825	695	637	410	755	751	626
CHIPPEWA	195,496	273,000	272,328	344,120	332,052	316,932	297,024	331,716	341,908	288,932
CLARK	-	179,704	171,321	210,163	132,505	182,562	50,656	198,432	208,584	176,193
DUNN	283,024	352,464	380,940	401,408	387,212	414,876	400,792	415,072	477,680	445,452
EAU CLAIRE	132,468	170,408	175,756	180,488	185,780	162,232	156,828	162,288	207,704	174,720
GOODHUE	46.23	52.56	56.67	54.71	57.90	53.09	55.60	55.06	54.73	58.36
JACKSON	109,838	140,791	127,273	140,812	149,103	138,792	127,418	135,271	151,456	144,041
LA CROSSE	592	728	630	691	679	738	726	655	659	693
MARATHON	35,126	47,827	47,218	65,334	53,369	70,797	-	77,253	83,723	60,601
MONROE	4,678	5,888	6,609	7,481	7,071	6,977	5,384	6,650	6,381	5,784
PEPIN	89,967	80,327	101,236	108,249	100,789	106,043	111,112	98,189	96,140	103,862
PIERCE	246,769	243,737	317,907	360,190	337,328	353,307	276,394	311,770	341,804	284,311
POLK	55,307	48,632	75,301	87,082	77,089	87,300	72,696	82,252	83,716	84,505
PRICE	281	-	-	-	-	-	166	209	323	211
RUSK	39,950	42,534	54,881	73,755	-	44,166	39,896	48,109	82,512	71,715
SAWYER	2,531	4,331	-	5,247	-	4,372	-	4,919	5,802	7,580
ST CROIX	162,659	271,708	380,861	391,866	334,910	372,053	385,200	383,475	346,019	340,399
TAYLOR	-	-	77,983	109,049	60,676	-	-	80,320	108,762	76,925
TREMPEALEAU	233,640	324,064	295,908	362,751	334,758	337,600	321,032	308,010	341,526	351,083
WABASHA	88,590.28	100,543.75	93,172.98	108,049.12	105,914.80	92,903.79	94,788.14	105,184.13	115,112.24	111,984.47
WASHBURN	9,299	7,997	13,499	12,794	16,846	14,575	13,166	12,148	13,675	15,084
WASHINGTON	1,477	1,632	1,755	1,791	1,383	1,811	1,764	1,623	1,331	1,399
WINONA	426.74	490.27	427.08	513.28	482.02	551.85	490.76	480.19	491.62	503.95
WOOD	2,199	3,579	3,893	5,824	1,586	3,805	2,314	4,275	5,304	5,092

[48] https://quickstats.nass.usda.gov/
[49] https://quickstats.nass.usda.gov/

Table C-3. 10-year historical corn grain yields

	Yield bu/ acre										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	10 yr avg
Avg Yield	**123**	**140**	**157**	**167**	**167**	**161**	**157**	**165**	**171**	**164**	**157**
BARRON	110	117	151	164	152	162	133	166	169	156	**148**
BUFFALO	141	148	160	170	168	170	157	171	170	177	**163**
BURNETT	85	95	140	144	149	128	120	144	138	135	**128**
CHIPPEWA	102	127	145	162	163	147	152	163	170	162	**149**
CLARK		134	141	155	145	112	122	167	163	149	**143**
DUNN	112	141	160	169	181	174	177	170	190	171	**165**
EAU CLAIRE	130	149	158	162	163	159	162	169	178	151	**158**
Goodhue	182	182	202	193	211	193	195	198	200	210	**197**
JACKSON	124	150	146	175	167	151	161	164	178	161	**158**
LA CROSSE	149	167	160	172	167	170	171	168	172	172	**167**
MARATHON	127	124	137	148	157	150		136	157	149	**143**
MONROE	121	147	158	162	162	150	157	154	146	162	**152**
PEPIN	135	148	163	170	176	173	174	168	177	172	**166**
PIERCE	140	145	179	189	195	189	174	186	186	181	**176**
POLK	103	113	156	169	159	164	149	170	160	156	**150**
PRICE	105						125	120	127	122	**120**
RUSK	106	99	115	146		144	111	136	161	152	**130**
SAWYER	116	128		139		128		143	151	152	**137**
ST CROIX	85	135	171	179	175	163	179	183	172	166	**161**
TAYLOR			133	153	112			147	174	139	**143**
TREMPEALEAU	122	158	158	170	163	157	158	162	165	167	**158**
Wabasha	174	178	189	194	210	198	186	205	207	203	**194**
WASHBURN	82	97	158	154	152	171	155	158	167	159	**145**
WASHINGTON	133	151	169	179	178	166	167	171	180	175	**167**
Winona	174	176	187	199	196	201	186	197	204	206	**192**
WOOD	99	149	144	157	139	156	141	161	172	168	**148**

Source: USDA
https://quickstats.nass.usda.gov/results/B9D0EF3D-15FC-3C8F-9EF2-D544B2095343

Chart C-1. Harvested area in acres and grain production in tons in the Supply Zone[50]

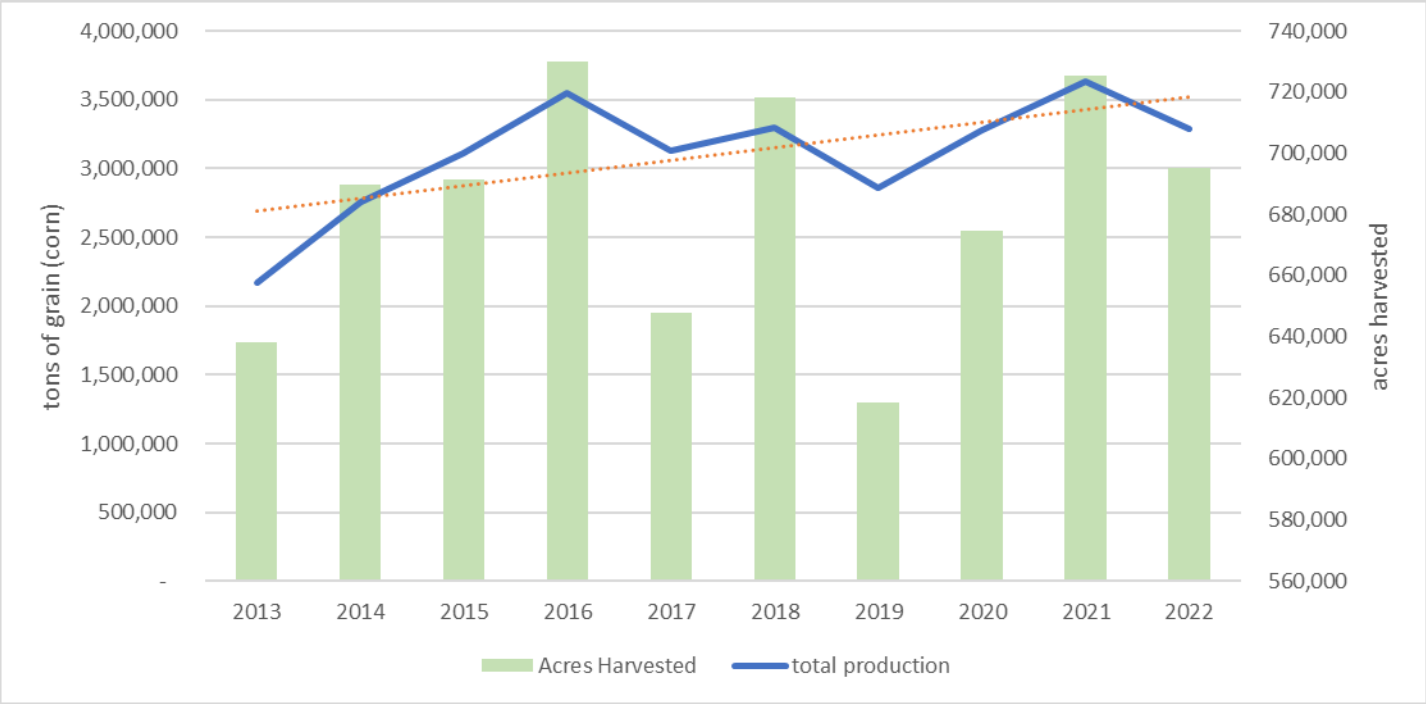
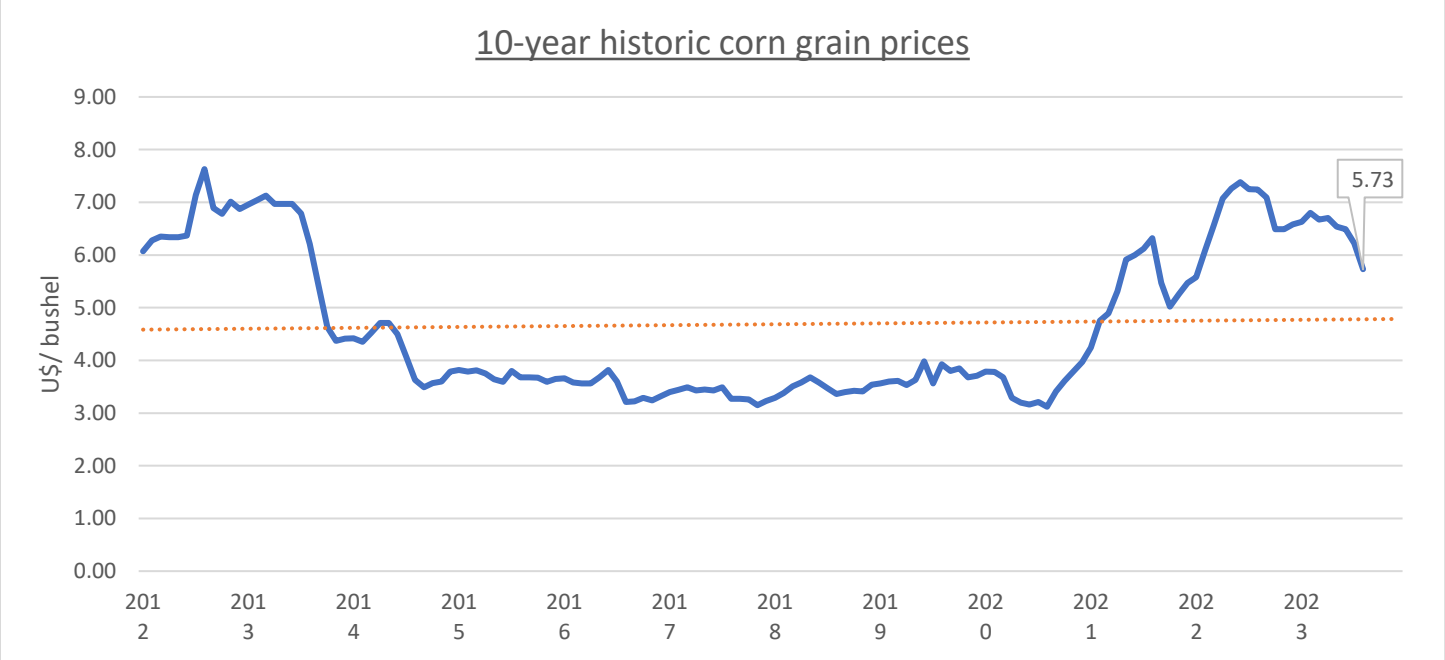
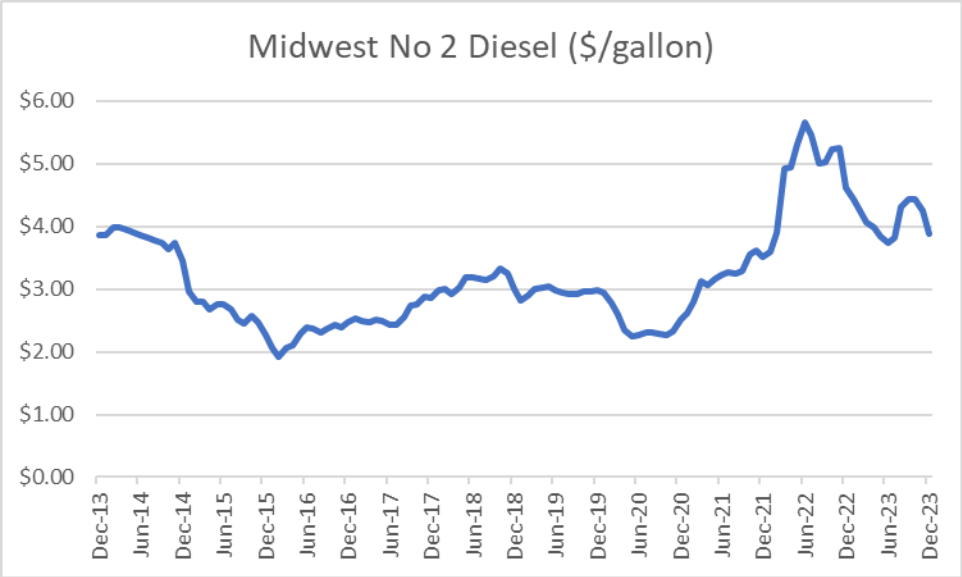


Chart C-2. 10-year historic corn prices[51]



[50] https://quickstats.nass.usda.gov/
[51] https://quickstats.nass.usda.gov/

Chart C-3. 10-year average Midwest Diesel prices



Source: EIA

APPENDIX D: LEGAL DISCLAIMER

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