BDO Zone Rating: **'A'**

Biofuel Development Opportunity Zone Risk Rating

'A'

The Richland Parish, LA, BDO Zone for woody biomass is rated 'A'. Commercial quantities of low-risk woody biomass are available for biobased projects. The infrastructure for woody biomass harvesting and processing are well-established with a large pool of experienced labor.

Rating Parameters:

Category	Rated Quantity	Delivered Price	BDO Zone Size
Pulpwood	460,000 bdt/yr	$59-$74 / bdt	75-mile drive radius
Forest Residuals	78,000 bdt/yr	$44-$74 / bdt	of Rayville, LA
Sawmill Residuals	139,000 bdt/yr	$61-$75 / bdt	

BDO Zone Assets

- **Over 650,000 bdt/yr of low-risk woody biomass available for new bio-economy industries**
- **A highly productive forest products industry guarantees a stable supply of feedstock**
- **Forestry supply chain is well established and efficient**
- **Industrial and transportation infrastructure is compatible with large-scale biofuel projects.**
- **Richland Parish is a pro-business community with low operating costs and attractive quality of life.**

BDO Zone Liabilities

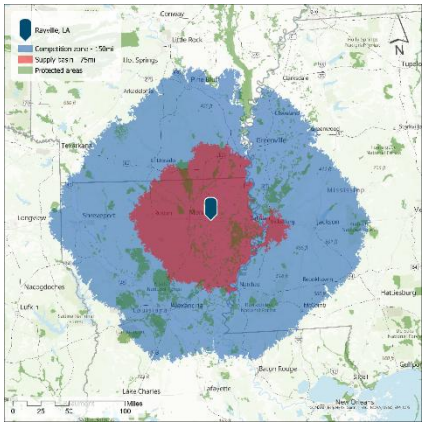
- **Insurance requirements are contributing to a shortage of logging truck drivers and forestry operators**
- **A growing global industrial wood pellet industry may result in increased competition for pulpwood**
- **The BDO Zone supply area is located in a potential flood zone, meaning that during wetter periods of the year there may be access restrictions to areas where logging and residuals collection are occurring**

BDO Zone Risk Rating

The Richland Parish, LA, 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*), and BBB (*low-moderate*), BB (*moderate*), B (*moderate-high*), C (*high*).

Richland Parish, LA, BDO Zone



Scoring & Rating Methodology

In assessing the biomass supply chain risk for the Biofuel Development Opportunity (BDO) Zone, 88 Risk Indicators from the 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 dollars (USD). Maximum transport distance is based on a 75-mile driving distance from the center point (Rayville, LA).

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).

Next, 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 calculated as the product of the RRL and the RRI scores. For example, if the 'Competitor Price and Price Sensitivity' is scored at a RRL of 2 and a RRI of 9, then the GRI for this risk indicator is $2 \times 9 = 18$.

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

Finally, the **Loaded RI** score for each Risk Indicator is calculated as the product of the Total Notch and the GRI score, which is the final score for that indicator.

Loaded RI scores of 4 or less are deemed *very low risk*; scores between 5 and 17 are deemed *low risk*; scores between 18 and 36 are deemed *medium risk*; scores between 37 and 64 are deemed *high risk*; and scores of 65 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 ***17.05 out of 100, resulting in an 'A' designation***.

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

Analyst Notes

The Richland Parish BDO Zone encompasses 11,400 square miles in the center of northern Louisiana. It is defined by a 75-mile drive distance from the center point of Rayville, LA. Biomass feedstock for a new bio-economy facility will be sourced from this area.

The Competition Zone extends to a 150-mile driving distance from the center point. Wood-using facilities within this area will be competing for biomass for any new project.

The forest and wood products industry within the BDO Zone is well established and very extensive. The forests in the region are intensively managed and a major contributor to the local and state economy. The timberlands consist of softwoods (pine) in the western portion of the BDOZ and hardwoods in the eastern section. The mix is about 50% of each species.

The majority of the timberlands in the Zone are privately owned (86%). The size of the tracts average just over one hundred acres. 42% of timberland tracts are between 51-500 acres, and 33% are larger than 500 acres.

BDO Zone Assets

The forest products industry in the area has a rich history. Sawmills have operated in the region for about 170 years, while the pulp and paper industry was established in the 1930s. Modern forestry practices and methods for breeding, planting, growing, harvesting, and collection of biomass have been in place for decades within the Supply Basin.

The US Department of Energy (Billion Ton Report) indicates that the total volume of standing pulpwood inventory in the Supply Zone is approximately 689,000 bdt/yr. Available pulpwood is defined as standing small diameter trees (between 5- and 11-inches diameter at breast height). It is estimated that 67% of this amount, 460,000 bdt/yr, could be available for a new project at low risk for the rated price of $59/bdt to $74/bdt.

The US Department of Energy also estimates that 312,000 bdt/yr of forest residues could also be available. Forest residues include tree branches, bottoms, and tops normally discarded during conventional logging operations. These residues are not widely utilized in the area because of quality considerations. However, it is estimated that 78,000 bdt/yr of forest residues could be made available at low risk for the rated price of $43.80/bdt to $74.14/bdt.

There are 5 operational sawmills within the Supply Zone with a combined annual production capacity of 850 million board feet (MMBF), generating about 823,500 bdt/yr sawmill residuals when running at full capacity. The outreach data shows that about 246,900 bdts are potentially available for future biomass projects at the price range of $61-$75/bdt.

In the BDO Zone, we found that the labor pool for logging operations is not limiting, with over 185 active logging companies in the region.

It is noteworthy that state and county governments provide

support for the forest products industry through tax incentives, consular, trade, or chamber of commerce offices in the state.

BDO Zone Liabilities

A nationwide shortage of truck drivers has made it difficult to recruit log truck drivers. Additionally, log truck insurance in Louisiana has risen, contributing to the log truck driver shortage. The insurance requirements on nearly all facets of the logging industry have made it difficult for marginal businesses to stay in place and has even strained the larger operations.

The median age for owners of logging companies is 57 years, and for logging company managers it is 53 years. Two-thirds of logging company owners predict that their companies would cease to exist upon retirement, as none expect a family member to take over the business. This trend may be offset by increasing consolidation, creating larger logging companies.

Infrastructure Profile

Infrastructure risk was assessed using 20 different metrics (Section 5.0 and Appendix C). The industrial park at Holly Ridge was identified as a representative location for new industries. This 259-acre parcel has access to rail, water, power, and natural gas, and is easily accessible by both Interstate 20 and US Highway 183. These infrastructure risks represent a low concern to new companies.

Overall, a majority of the risks associated with the infrastructure, including physical, logistical, social, workforce, and permitting, are deemed to be low. The low cost of housing within the area is an asset for new industries looking to locate within the BDO Zone.

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Figure 1: Risk Indicators (Sorted by Risk Level)

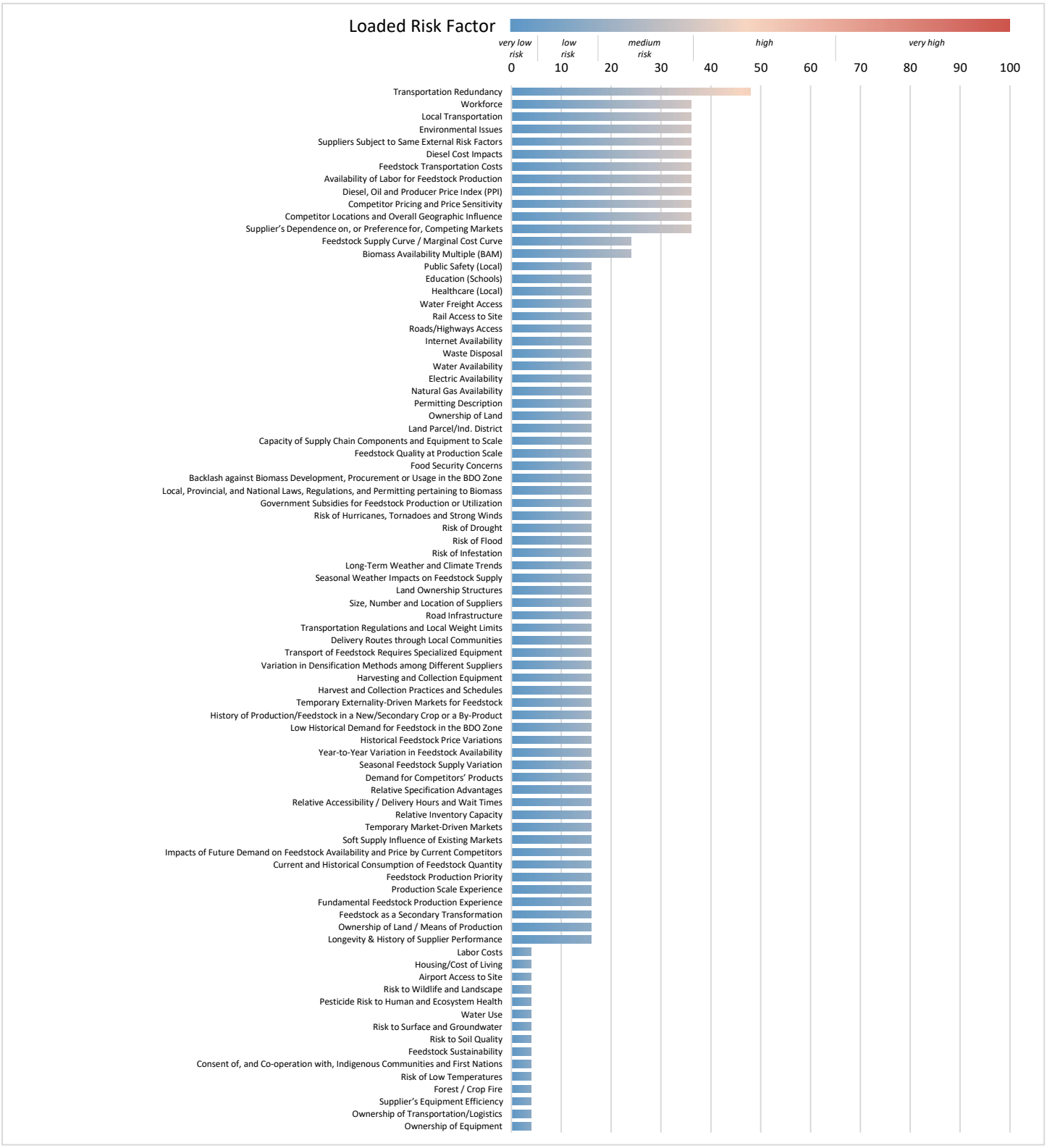


Table 1: Risk Indicators and Associated Scores

	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	6	6	36	NN	36
1.3.1	Ownership of Land / Means of Production	4	4	16	NN	16
1.3.2	Ownership of Equipment	2	2	4	NN	4
1.3.3	Ownership of Transportation/Logistics	2	2	4	NN	4
1.3.4	Feedstock as a Secondary Transformation	4	4	16	NN	16
1.4.1	Fundamental Feedstock Production Experience	4	4	16	NN	16
1.4.2	Production Scale Experience	4	4	16	NN	16
1.5.1	Supplier's Equipment Efficiency	2	2	4	NN	4
1.6.1	Feedstock Production Priority	4	4	16	NN	16
	Category 2.0: Competitor Risk					
2.1.1	Competitor Locations and Overall Geographic Influence	6	6	36	NN	36
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	4	4	16	NN	16
2.2.2	Relative Accessibility / Delivery Hours and Wait Times	4	4	16	NN	16
2.2.3	Relative Specification Advantages	4	4	16	NN	16
2.2.4	Demand for Competitors' Products	4	4	16	NN	16
	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	4	6	24	NN	24
3.1.3	Seasonal Feedstock Supply Variation	4	4	16	NN	16
3.1.4	Year-to-Year Variation in Feedstock Availability	4	4	16	NN	16
3.2.1	Historical Feedstock Price Variations	4	4	16	NN	16
3.2.2	Low Historical Demand for Feedstock in the BDO Zone	4	4	16	NN	16
3.2.3	History of Production/Feedstock in a New/Secondary Crop or a By-Product	4	4	16	NN	16
3.3.1	Diesel, Oil and Producer Price Index (PPI)	6	6	36	NN	36
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	4	4	16	NN	16
3.4.2	Harvesting and Collection Equipment	4	4	16	NN	16
3.4.3	Variation in Densification Methods among Different Suppliers	4	4	16	NN	16
3.4.4	Availability of Labor for Feedstock Production	6	6	36	NN	36
3.5.1	Feedstock Transportation Costs	6	6	36	NN	36
3.5.2	Diesel Cost Impacts	6	6	36	NN	36
3.5.3	Transport of Feedstock Requires Specialized Equipment	4	4	16	NN	16
3.5.4	Delivery Routes through Local Communities	4	4	16	NN	16
3.5.5	Transportation Regulations and Local Weight Limits	4	4	16	NN	16
3.5.6	Road Infrastructure	4	4	16	NN	16
3.5.7	Transportation Redundancy	6	8	48	NN	48
3.6.1	Size, Number and Location of Suppliers	4	4	16	NN	16
3.6.2	Suppliers Subject to Same External Risk Factors	6	6	36	NN	36
3.6.3	Land Ownership Structures	4	4	16	NN	16
3.7.1	Seasonal Weather Impacts on Feedstock Supply	4	4	16	NN	16
3.7.2	Long-Term Weather and Climate Trends	4	4	16	NN	16
3.7.3	Forest / Crop Fire	2	2	4	NN	4
3.7.4	Risk of Infestation	4	4	16	NN	16
3.7.5	Risk of Hail	NR	NR	NR	NR	NR
3.7.6	Risk of Flood	4	4	16	NN	16
3.7.7	Risk of Drought	4	4	16	NN	16
3.7.8	Risk of Hurricanes, Tornadoes and Strong Winds	4	4	16	NN	16
3.7.9	Risk of Low Temperatures	2	2	4	NN	4
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	4	4	16	NN	16
3.8.3	Backlash against Biomass Development, Procurement or Usage in the BDO Zone	4	4	16	NN	16
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	4	4	16	NN	16
3.9.1	Feedstock Sustainability	2	2	4	NN	4
3.9.2	Risk to Soil Quality	2	2	4	NN	4
3.9.3	Risk to Surface and Groundwater	2	2	4	NN	4
3.9.4	Water Use	2	2	4	NN	4
3.9.5	Pesticide Risk to Human and Ecosystem Health	2	2	4	NN	4
3.9.6	Risk to Wildlife and Landscape	2	2	4	NN	4
3.9.7	Biomass Classified as Genetically Modified Organism (GMO)	NR	NR	NR	NR	NR
	Category 4.0: Feedstock Scale-up Risk					
4.1.1	Feedstock Quality at Production Scale	4	4	16	NN	16
4.1.2	Capacity of Supply Chain Components and Equipment to Scale	4	4	16	NN	16
	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	6	6	36	NN	36
5.2.1	Natural Gas Availability	4	4	16	NN	16
5.2.2	Electric Availability	4	4	16	NN	16
5.2.3	Water Availability	4	4	16	NN	16
5.2.4	Waste Disposal	4	4	16	NN	16
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	4	4	16	NN	16
5.3.3	Airport Access to Site	2	2	4	NN	4
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)	4	4	16	NN	16
5.4.3	Local Transportation	6	6	36	NN	36
5.4.4	Public Safety (Local)	4	4	16	NN	16
5.4.5	Housing/Cost of Living	2	2	4	NN	4
5.5.1	Workforce	6	6	36	NN	36
5.5.2	Labor Costs	2	2	4	NN	4
					Average	**17.05**



Rayville, LA, BDO Zone Independent Review Committee (IRC)

Scott Franklin – Richland Parish Chamber of Commerce
Lee Tomason – Richland Parish Chamber of Commerce
Mark Brown – Mark Brown Forestry
Rachel Milam – Office of Congresswoman Julia Letlow
Connor House – Good Hope Timber

APPENDIX A: BIOMASS AVAILABILITY AND PRICING

This section assesses the availability and pricing of woody biomass as feedstock for bioenergy, biofuels, and potentially other bio-based products in the Richland Parish, Louisiana (LA) BDO Zone region. The center point for woody biomass availability assessment is the town of Rayville.

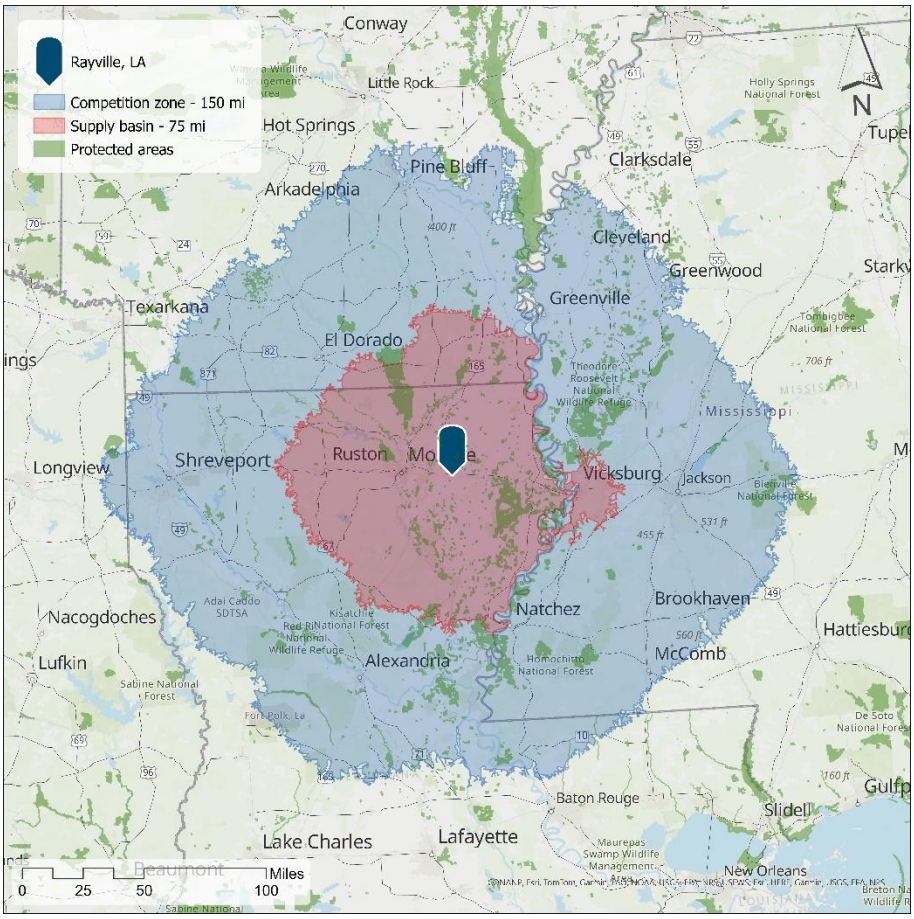
The town of Rayville is in northeastern Louisiana, approximately 37 miles south of the Arkansas State border, and 37 miles east of Mississippi. The surrounding forestland is part of the ecological subregion known as the Lower Mississippi Riverine Forest, which is dominated by bottomland hardwoods and cypress swamps.

Nearly 50% of Louisiana's land area is forested and provides an important raw material that supports a wide range of economic activity throughout the State. The Forest Products industry contributed 3.6 billion dollars directly to the State's economy in 2022 and is its second largest manufacturing employer.

BDO ZONE SUPPLY AND COMPETITION ZONES

The BDO Zone is defined as the area from which feedstock can be economically sourced. The Supply Zone is shown in red in Figure A-1 and encompasses a 75-mile driving radius around Rayville, LA, as the center point. This area includes portions of three states: Louisiana, Arkansas, and Mississippi. The surrounding delineated area shown in blue in Figure A-1 defines the 150-mile Competition Zone, which will be used in evaluating the feedstock utilization.

Figure A-1. Supply and Competition Zones centered on Rayville, LA



Woody Biomass Types in the Supply Zone

Three types of woody biomass are produced and available in the Supply Zone, including pulpwood, forest residues, and sawmill residues.

Pulpwood is defined as standing small diameter trees between 5 and 11 inches in diameter at breast height. Pulpwood is traditionally used to make paper, paperboard, oriented strand board (OSB), and medium-density fiberboard (MDF). Pulpwood is also used to produce wood pellets.

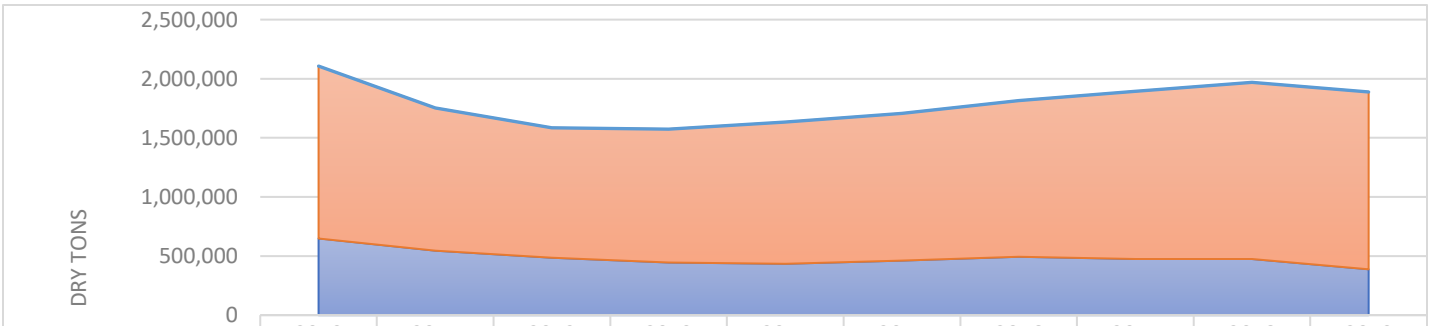
Forest residues refer to the by-products or leftover materials resulting from forestry operations, such as timber harvesting and thinning. These residues typically consist of branches, tops, stumps, bark, and other woody debris that remain on-site after the sawtimber has been harvested. Forest residues differ from whole tree chip, as the roundwood, or log, portion of the tree is not included.

Sawmill residues are the byproducts of sawmill operations, produced from conversion of sawlogs into finished wood products, such as lumber and engineered wood. About half of sawlogs are converted to finished wood products, and the remaining portion is sawmill residues, which are comprised of wood chip, sawdust, shavings, and bark (also known as hog fuel).

Woody Biomass Demand in the Competition Zone

To understand the historical demand and net growth of pulpwood in the Competition Zone, we first estimated historical pulpwood harvest levels using USFS Forest Inventory and Analysis (FIA).[1] FIA data was queried for a 75-mile radius around Rayville, LA using the online EVALIDator tool. Data on total removals indicate that average pulpwood removals in the area between 2010 and 2019 were approx. 1,792,230 dry ton/yr (Figure A-2) with stable harvest levels over the period of 2010-2019. Most of the harvest level is softwood (70-80%). Hardwood removals accounted for 30% of the annual removal in 2010 but have trended down to only 20% in 2019.

Figure A-2. FIA annual harvest removal data for pulpwood in the 75-mile radius around Rayville, LA

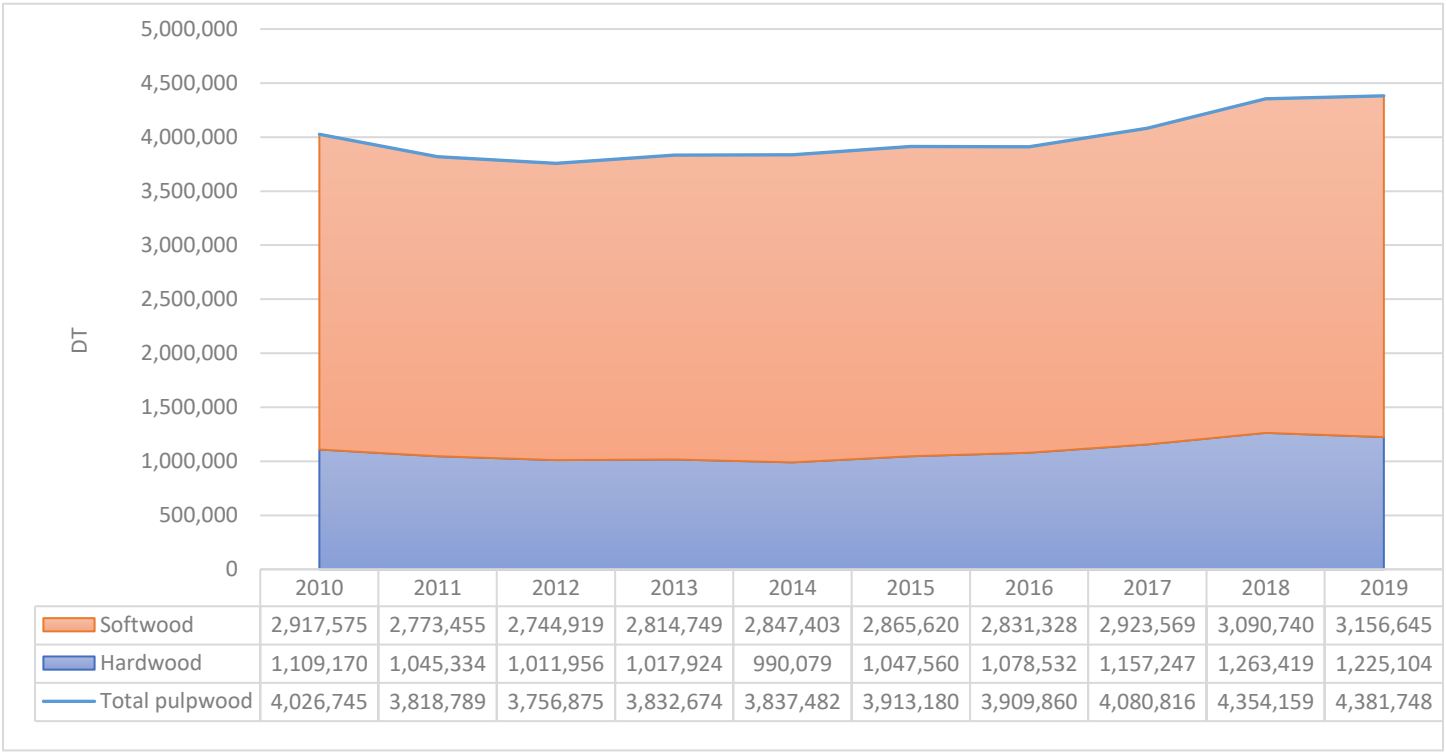


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Softwood	1,457,763	1,207,142	1,099,907	1,127,154	1,198,295	1,244,040	1,320,360	1,416,845	1,493,874	1,500,578
Hardwood	649,162	544,256	486,074	446,114	435,633	462,425	493,654	476,064	475,031	387,933
Total pulpwood	2,106,925	1,751,397	1,585,981	1,573,268	1,633,927	1,706,465	1,814,015	1,892,909	1,968,905	1,888,511

[1] https://apps.fs.usda.gov/fiadb-api/evalidator

Annual pulpwood net growth data (Figure A-3) indicates an average growth of 3,991,233 bdt/yr between 2010-2019, with minor change in the softwood-hardwood composition, which remains around 73% softwood to 27% hardwood.

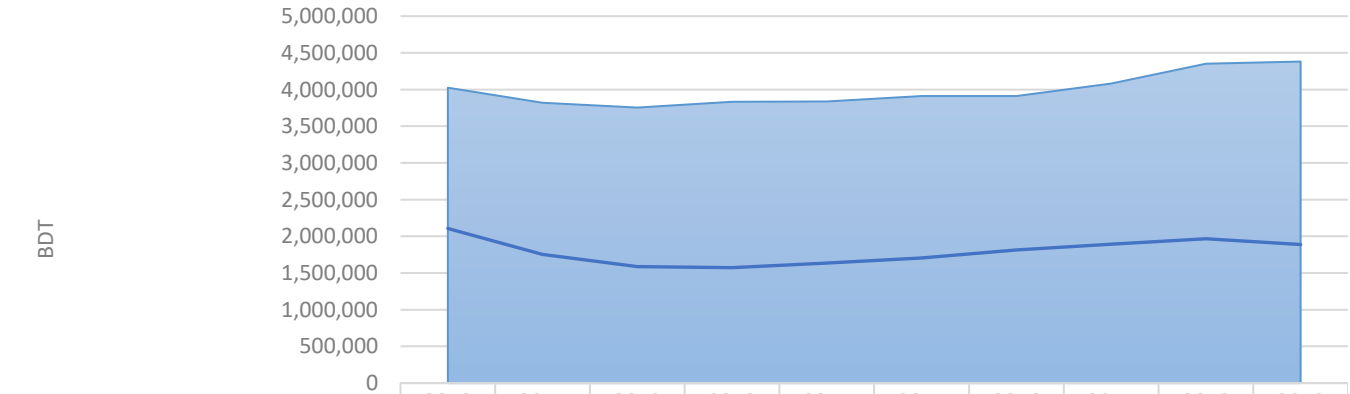
Figure A-3. FIA annual net growth data for pulpwood in the 75-mile radius around Rayville, LA



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Softwood	2,917,575	2,773,455	2,744,919	2,814,749	2,847,403	2,865,620	2,831,328	2,923,569	3,090,740	3,156,645
Hardwood	1,109,170	1,045,334	1,011,956	1,017,924	990,079	1,047,560	1,078,532	1,157,247	1,263,419	1,225,104
Total pulpwood	4,026,745	3,818,789	3,756,875	3,832,674	3,837,482	3,913,180	3,909,860	4,080,816	4,354,159	4,381,748

Figure A-4 illustrates that the growth-to-removals ratio for pulpwood is substantial (2.2), indicating that the regional pulpwood resource can support new biomass project development without creating implications for the health of the forest in the region.

Figure A-4. FIA growth-to-removal data for pulpwood in the 75-mile radius around Rayville, LA



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Average annual net growth	4,026,745	3,818,789	3,756,875	3,832,674	3,837,482	3,913,180	3,909,860	4,080,816	4,354,159	4,381,748
Average annual harvest removals	2,106,925	1,751,397	1,585,981	1,573,268	1,633,927	1,706,465	1,814,015	1,892,909	1,968,905	1,888,511

Woody Biomass Consumption / Demand

The major wood processing facilities in the Competition Zone are 10 pulp and paper plants, 9 wood pellet facilities, and 3 OSB mills operating in the 150-mile Competition Zone (see Figure A-5). These facilities are the main consumers of pulpwood and sawmill residues. These twenty-two mills are estimated to consume about 16 million bdt/yr based on their nominal operating capacity. However, given the large distance of some of these facilities from the center point, they are not meeting their entire feedstock demand from the Supply Zone. Our estimation shows that about 2.5 million tons of feedstock are consumed by these facilities from the Supply Zone.

Figure A-5. Location of the current consumers of woody biomass in the Competition Zone

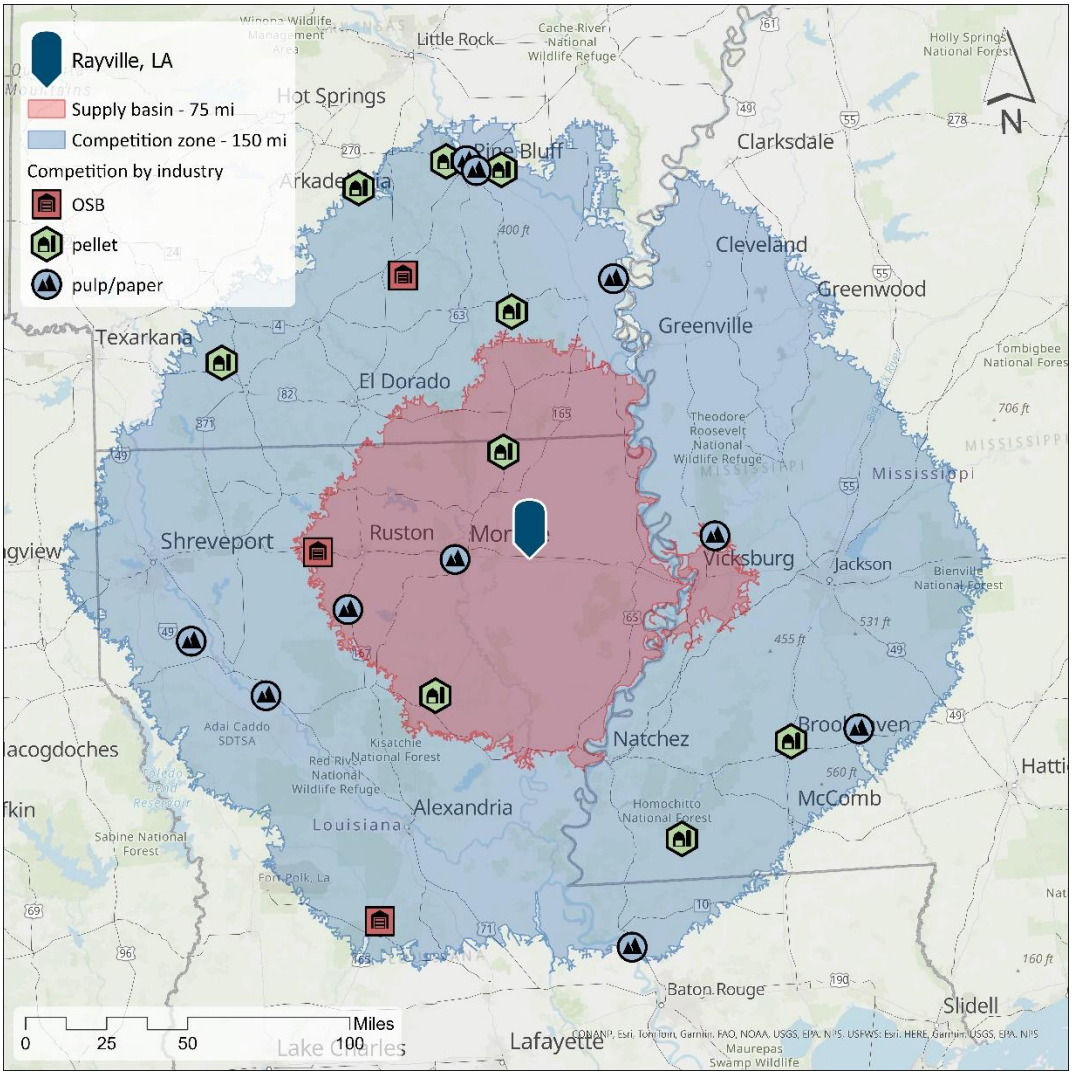
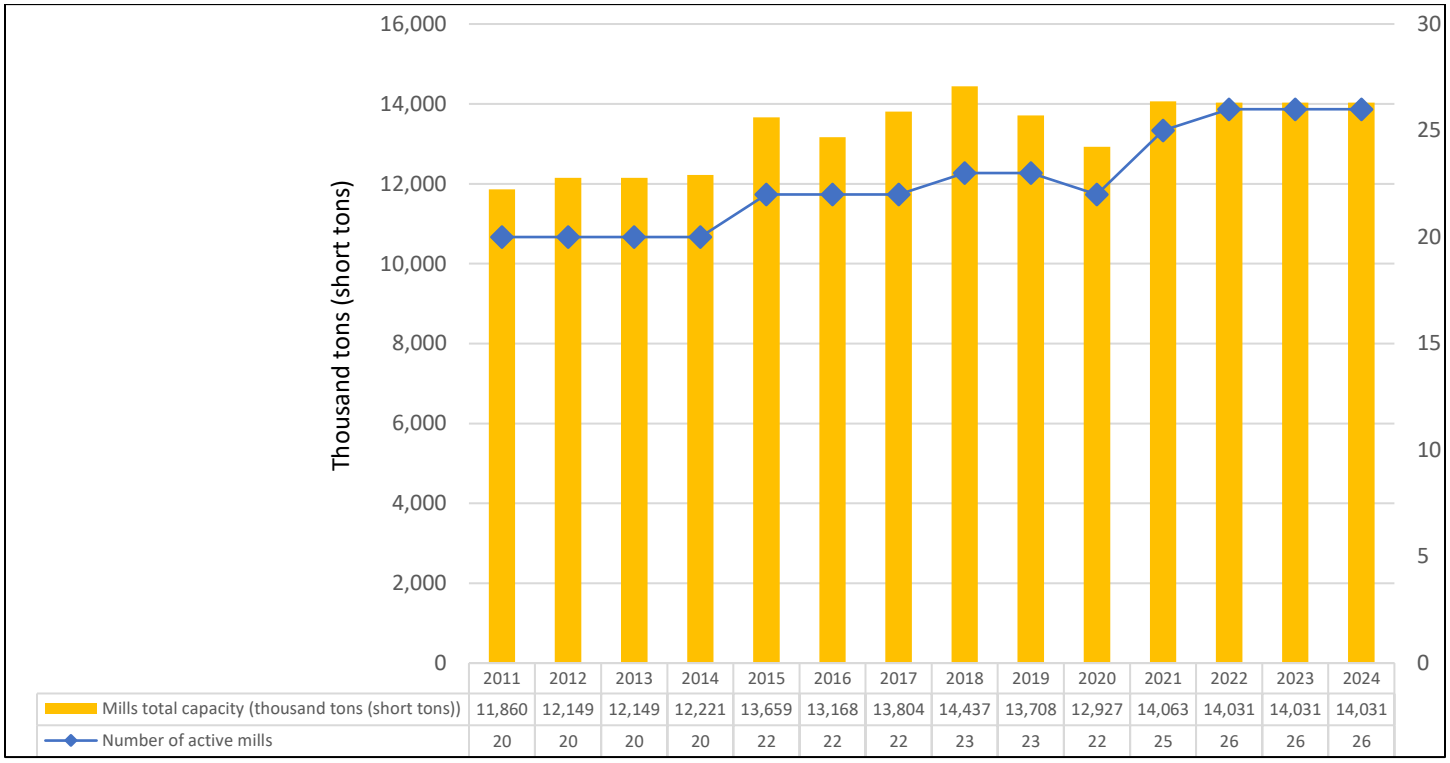


Figure A-6 shows the number of operational wood processing facilities and their historic woody biomass consumption over the period of 2011-2023 within a 150-mile Competition Zone. In 2018, Georgia-Pacific closed its tissue mill in Crossett, AR, which consumed 1,310,350 bdt/yr of hardwood and softwood at capacity. The closure of the paper mill resulted in further closure of 3 chip mills between 2018-2019, with a combined operating capacity of 417,000 bdt/yr.

Figure A-6. Number of operational wood processing facilities and their historic biomass consumption (bdt/yr)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Mills total capacity (thousand tons (short tons))	11,860	12,149	12,149	12,221	13,659	13,168	13,804	14,437	13,708	12,927	14,063	14,031	14,031	14,031
Number of active mills	20	20	20	20	22	22	22	23	23	22	25	26	26	26

It is noted that SunGas Renewables announced a biofuel plant in Pineville, LA in July 2023.[2] The facility is estimated to consume 1 million bdt/yr once operating at full capacity, and is expected to begin construction in late 2024, with commercial operations commencing in 2027. This facility is outside the BDO Zone area (150-mile radius) of Rayville. Therefore, its operational impact is minimized and is not considered in this report's feedstock usage numbers.

Pulpwood and Forest Residue Availability in the Supply Zone

The annual quantity of unharvested, standing pulpwood and forest residue in the Supply Zone that could be made available to a new project was estimated using datasets available from the US Department of Energy (DOE) 2016 Billion-Ton Report. The 2016 billion-Ton Report projects biomass availability up to the year 2040 using several assumptions, constraints, and market demand projections (Table A-7). County-level estimates of the availability of pulpwood (logs produced from trees between 5-11 inches DBH) for all available years (2015, 2020, 2025, 2030, 2040) were downloaded using the Vol. 1 Data Download Tool for the 2016 billion-Ton Report. Using GIS software, a polygon for the Supply Zone (75-mile maximum transport distance) was developed and used to estimate the percentage area of each county included in the Supply Zone (percentage overlap value). For each county, the percentage overlap value was then multiplied by the average annual pulpwood and forest residue availability for 2015-2040 to estimate the total quantities of standing pulpwood and forest residue in the Supply Zone available for a new entrant.

[2] https://sungasrenewables.com/sungas-renewables-announces-beaver-lake-renewable-energy/

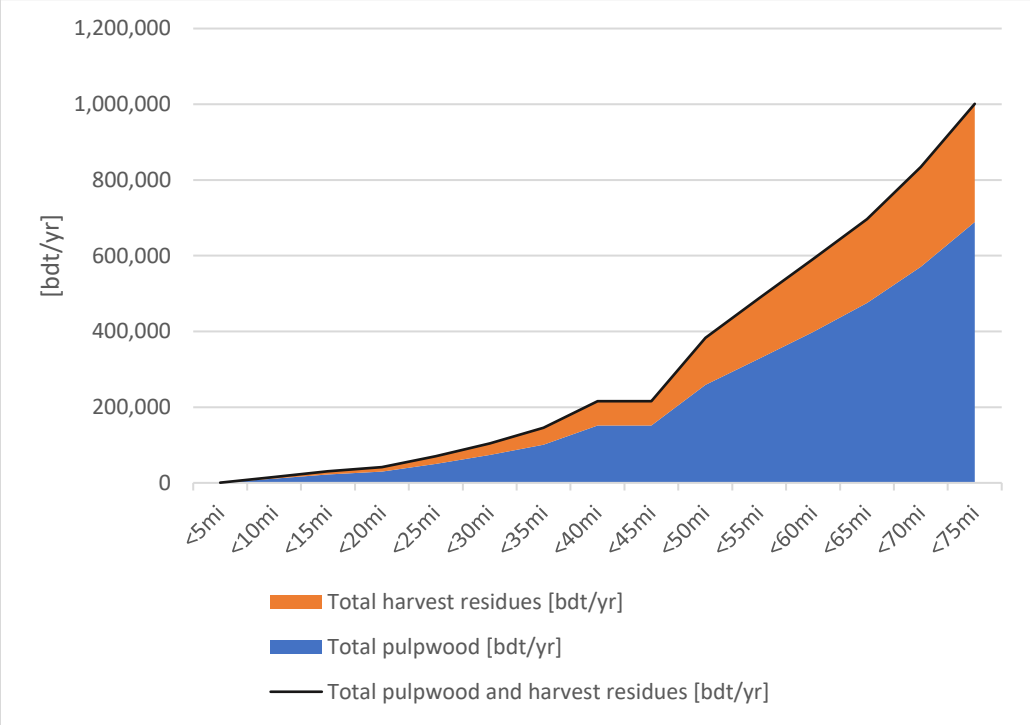
Figure A-7. Billion-Ton Report assumptions and parameters included in analysis

Bioenergy – Knowledge Discovery Framework, US Department of Energy **Billion-Ton Report – 2016 Vol. 1 Data Download Tool (https://bioenergykdf.net/2016-billion-ton-report)**		
Data retrieval		County level
		Year 2015, 2020, 2025, 2030, 2035, 2040
Data presented as		Bone dry tons per year (bdt/yr)
		Average of years 2015 to 2040, with 5-year increments
Resource Category	**Forestry**	All biomass resources modeled on forestland timberland, i.e., forest residues and small-diameter trees.
Demand for feedstock		Based on 2016
Scenario	**Medium housing, medium energy demands**	**1.)** Growth in housing starts returns to long-term average by 2025. The long-term average of housing starts from 1959 through 2011 is slightly less than 1.1 million per year. **2.)** Growth in wood biomass demand for energy increases by 86% by 2040. Actual wood biomass production in 2010 was 58.2 million dry tons for all scenarios. **3.)** New plantation management intensity in the South - Based on current FIA pine plantation growth rate. Current average FIA growth rate on pine plantations across the South (all owners, all ages) is approximately 108 cubic feet/acre per year (1.6 dry ton/acre per year). Increasing management intensity by 50% only on new plantations results in an increase in the average South-wide growth rate over time up to 140 cubic feet/ac per year in 2040 (2.1 dry tons/acre per year).
Biomass price	Specified biomass price after harvest cost as applicable but before transportation costs, in 2014 dollars per dry ton equivalent. *If these prices are used within the report, they will include inflation rates and newest transportation costs.*	
Resources	Hardwood, lowland forest residues, Hardwood, lowland whole trees, Hardwood, upland forest residues, Hardwood, upland whole trees, Mixed wood forest residues, Mixed wood whole trees, Softwood, natural forest residues, Softwood, natural whole trees, Softwood, planted forest residues, Softwood, planted whole trees – logging resides = harvest/forest residues; whole trees = only small diameter trees = pulpwood	
Class	**RSDF**	Residues, forestry (i.e., forest residues)
	TREE	Small-diameter trees
Section	**PFRS**	Primary forestland resources including forest residues (i.e., Class RSDF) and small-diameter trees (i.e., class TREE).
Diameter class	**1**	Timberland trees with diameter at breast height >11 inches
	2	Timberland trees with diameter at breast height 5-11 inches
	3	Timberland trees with diameter at breast height <5 inches
Operation Type	**Clear Cut**	Clearcut harvest of small-diameter trees or production of forest residues.
	Thinning	Thinning harvest of small-diameter trees or production of forest residues.
Supply Class	**LE40**	Timberland resources harvested from slopes less than or equal to 40 degrees.

According to the Billion Ton report, the average quantity of standing **pulpwood** available for future bio-economy projects within the 75-mile BDO Zone is estimated to be **689,000 bdt/yr.** In addition, the average quantity of **forest residues** available for future bio-economy projects within the 75-mile BDO Zone is estimated to be **312,000 bdt/yr.**

Figure A-8 shows the availability of these two types of woody biomass in 5-mile incremental driving distance from Rayville, LA, as the center point. About half of the pulpwood and forest residues supply is available within a 55-mile supply radius.

Figure A-8. Biomass supply curve showing the average total standing pulpwood and forest residues potentially available for future biomass projects within 75-mile drive distance



In reality, not all produced biomass will be available for future biomass projects for various reasons, such as unwillingness of private landowners to sell their wood fibers for future biomass projects, lack of established road and logistics networks, lack of access to labor for harvesting and transportation operations, and unfavorable weather conditions during the harvest season. In addition, assumptions are made to estimate total potential biomass availability, which may not reflect the real situations.

To reflect such uncertainties in our woody biomass availability assessment, we apply the Biomass Availability Multiple (BAM) to the total potential biomass available shown in Figure A-8. 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. The higher the uncertainty on biomass available for a project, the higher the BAM factor.

In this project, BAM is applied to the total estimated quantity to ensure adequate feedstock redundancy for each feedstock type. Specifically, a BAM of **1.5 is applied to pulpwood**, resulting in a rated quantity of 460,000 bdt/yr, while a BAM of **4 is applied to forest residues**, resulting in a rated quantity of 78,000 bdt/yr.

In summary, we estimate that the low-risk quantity of pulpwood and forest residues available for future biomass projects in the Supply Zone is 460,000 bdt/yr for pulpwood and 78,000 bdt/yr for forest residues, as shown in Table A-9.

Table A-2. Estimate of Average Annual Pulpwood and Forest Residues Availability through 2040

Biomass Type	Average Annual Availability (bdt/yr)	Low Risk Quantity after incorporating BAM factor (bdt/yr)
Pulpwood	689,051	460,000
Forest Residues	312,095	78,000

Sawmill Residual Availability in the Supply Zone

There are 5 operational sawmills within the Supply Zone, each with a combined annual production capacity of 871 MMBF (Figure A-9). Figure A-10 shows the historical lumber production capacity (MMBF) and operational sawmill count over the period of 2011-2023. Since 2011, the sawmill production capacity in the Supply Zone has increased from 550 MMBF to 871 MMBF, while the number of operating sawmills has decreased from 7 to 5. Tolko opened their LaSalle Lumber mill in Urania, LA, increasing the annual production capacity by 200 MMBF. Shortly after, in 2020, Barnes Harwood closed their 12 MMBF mill located in Simsboro, LA. Based on the current annual production capacity in the Supply Zone, we estimate a combined total generation of about 700,000 bdt/yr sawmill residuals, with the breakdown of each type of sawmill residue in Table A-1.

Figure A-9. Operating sawmills within 75-mile drive distance from Rayville,

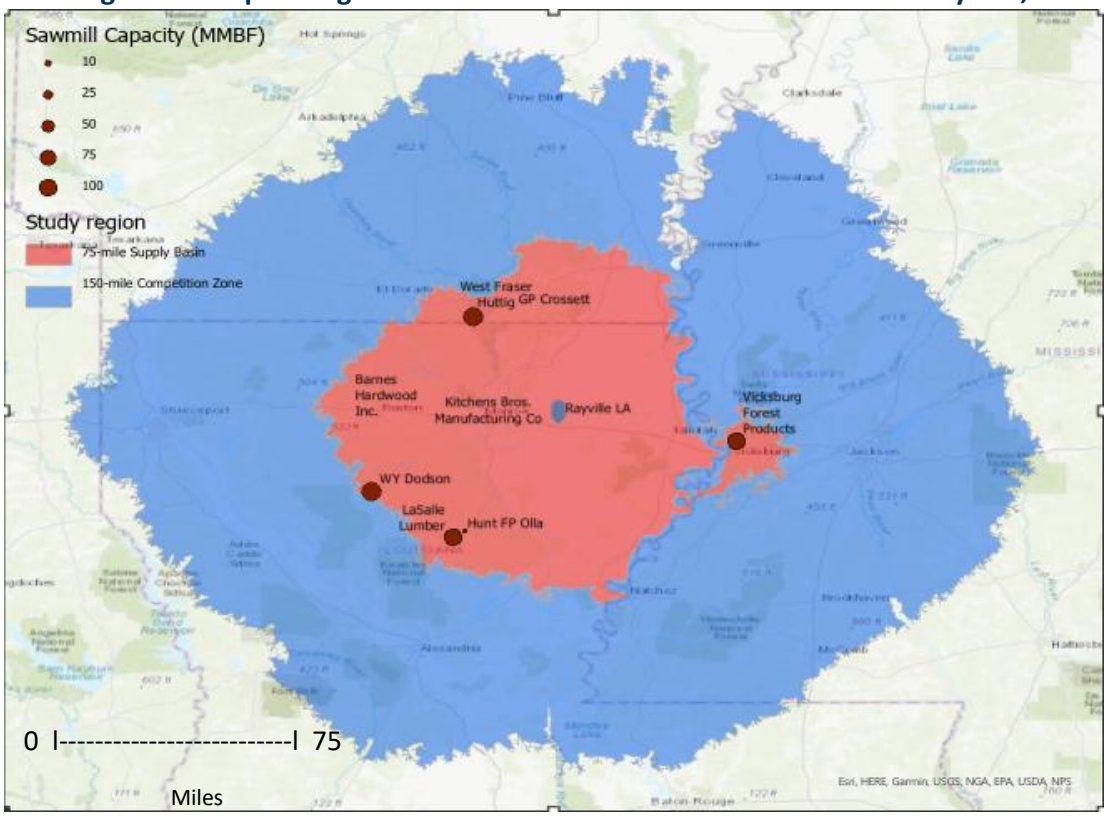
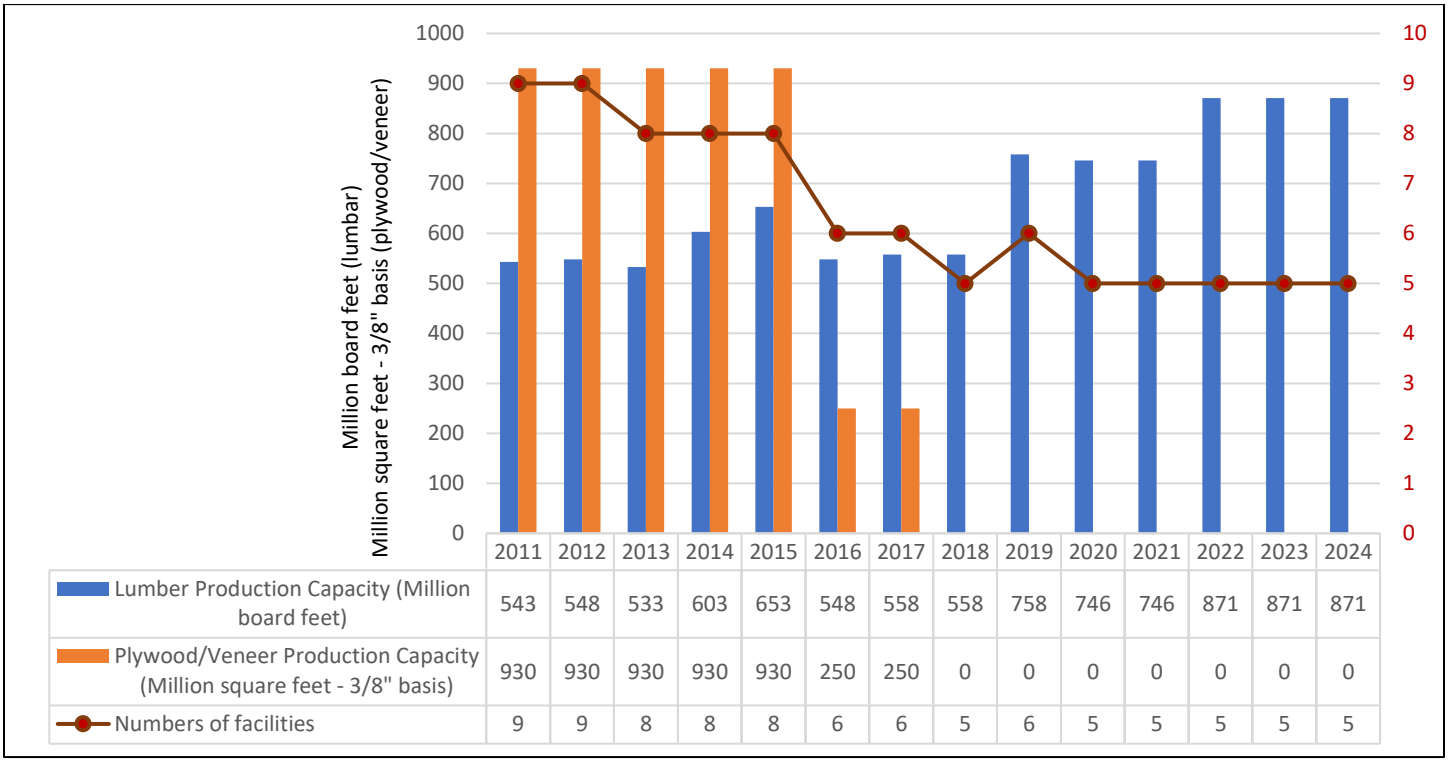


Figure A-10. Lumber production capacity (MMBF) and operational sawmill count (2011-2023)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Lumber Production Capacity (Million board feet)	543	548	533	603	653	548	558	558	758	746	746	871	871	871
Plywood/Veneer Production Capacity (Million square feet - 3/8" basis)	930	930	930	930	930	250	250	0	0	0	0	0	0	0
Numbers of facilities	9	9	8	8	8	6	6	5	6	5	5	5	5	5

It should be noted that sawmill residuals production in the Supply Zone, including wood chips, sawdust, wood shavings, and bark, was estimated using our internal model, given the nominal production capacity of the sawmills in the Supply Zone. In addition to the modeling tools, we reached out to all the sawmills in the Supply Zone, as well as local experts, to better understand the availability of woody biomass for future biomass projects (project-ready availability), in particular sawmill residues, and their current pricing. We conducted direct outreach to 3 sawmills located in the project's 75-mile Supply Zone. We also contacted several forestry experts in the area. Based on our outreach results, we expect that the sawmill residues that will be available for future biomass projects include 74,000 bdt/yr of wood chips, 15,000 bdt/yr of sawdust, 24,000 bdt/yr of wood shavings and 26,000 bdt/yr of hog fuels/bark

Table A-3. Sawmill residual model estimates and rated available quantities

Type of sawmill residue	Estimated total generation (bdt/yr)	Project-ready availability (bdt/yr)
Wood chips	372,000	74,000
Sawdust	75,000	15,000
Wood Shavings	118,000	24,000
Fuels/Bark	130,000	26,000
Total	**695,000**	**139,000**

Woody Biomass Pricing

Woody biomass pricing data for this project was collected from three sources, including direct outreach to sawmills and local experts in the Supply Zone, Timber Mart South,[3] which provides average historical pricing for both pulpwood and sawmill residuals on a quarterly basis, and the published documents and literature.

In this section, we first discuss the current delivered price of sawmill residues, pulpwood, and forest residues provided by local sawmills and other local experts, and then the recent and historical price of pulpwood sawmill residues reported by TimberMart.

Five sawmills were contacted, but none disclosed pricing information. However, we were able to collect 2 pricing data points from timber brokers in the region.

It is noted that pricing data was typically acquired in dollars per green ton, and was converted to dollars per bone dry ton, assuming 50% moisture content for all types of woody biomass feedstock.

Table A-4. Recent and Historical Average Regional Price (delivered) of woody biomass

Woody Biomass Type	Recent Price in Q2 2023 (Delivered)	Historical Price Range (Delivered) (2014-2023)	Comments/Assumptions
Softwood Pulpwood	$59.54/bdt	$49.54-78.2/bdt	Louisiana North
Hardwood Pulpwood	$65.76/bdt	$55.76-85.06/bdt	Louisiana North
Hardwood Chips	$43.14/bdt	$33.14-72.64/bdt	Tri-State (AR, LA, TX)
Softwood Chips	$60.28/bdt	$50.28-76.14/bdt	Tri-State (AR, LA, TX)
Sawdust	$80.30/bdt	$69.50-82.40/bdt	Louisiana North
Wood Shavings	$90.76/bdt	$72.8-105.22/bdt	Southeast USA
Hog fuel/bark	$48.84/bdt	$34.86-52.96/bdt	South-wide
Forest Residue*	$59.54/bdt	$43.80-74.14/bdt	Louisiana North

* Tops and branches are left in the forest. Mobile chipping equipment is very limited, and forest residues are not being utilized.

[3] TimberMart-South (TMS) is a trusted source of current and long-term trend data for stumpage and delivered wood prices and other fundamental forestry business information for the Southeastern USA. TMS publishes quarterly and annual reports used by private companies, consultants, landowners, and others to assess market prices in 11 states in the US South.

APPENDIX B: RISK INDICATOR SCORING METRICS

CATEGORY 1.0: SUPPLIER RISK

1.1 Risk Factor: Creditworthiness/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 forestry industry in Louisiana has been in place for generations. The State is one of the nation's leading producers of lumber-related products. From loggers, to haulers, to processing facilities, the industry has survived dramatic fluctuations in operations. Weather-related slowdowns like hurricanes and rising insurance costs, have challenged the stability of the industry. However, it continues to operate effectively due to its strong history. There is low risk of suppliers continuing to provide residual biomass material from operations.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**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 suppliers' dependence 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: There are 9 pulp and paper plants, 10 wood pellet facilities, and 3 OSB mills operating in the 150-mile Competition Zone (see Figure A-5). These facilities are the main consumers of pulpwood and sawmill residues. These 20 mills are estimated to consume 14,188,760 bdt/yr based on their nominal operating capacity. Most suppliers have contracts with one or more of these mills. Outreach studies indicate that 70-80% of the pulpwood and sawmill residuals are committed via these contracts. This represents a medium risk to new incoming industries to secure feedstock, in particular sawmill residues. However, this dynamic could change if a new biomass project can offer a higher, long-term feedstock price.

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 ((1-Total Notch) × GRI Score) is 36 out of 100.	**Score** **36**

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: The timberland in the supply basin is overwhelmingly privately owned (82%). The high level of private ownership brings stability to the supply of residuals. The supply of forest residue does not carry significant land ownership risks. All landowners in the region (private and public) are interested in the prospect of having slash piles removed free of charge or for a modest payment. Without markets for forest residue, that fraction of slash piles that are not salvaged for firewood is either left to decompose at the roadside, burned, or hauled for disposal. Land ownership risk does not apply to the supply of sawmill residuals.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **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: There are approximately 180 independent logging/trucking companies in the BDO Zone. Change in equipment ownership status is unlikely to occur across most of these companies. Logging is a major industry and is likely to continue regardless of equipment ownership status. Loggers in the BDO Zone are mostly independent contractors that own their own equipment, typically cutting machines, skidders, and loaders. When loggers require additional equipment, they will hire other contractors to provide the equipment and labor on a temporary basis.

Some mills will operate logging operations, although this is becoming less common. The equipment for these crews is owned by the mill.

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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

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: Trucks and trailers used to transport biomass are generally owned by the logging and trucking companies. Biomass transport is a major employer in the BDO Zone, with over 180 logging/trucking companies certified by the state.

Biomass transport is a well-established and integral part of the local economy. A change in ownership status of trucks is unlikely to cause a meaningful impact on the industry.

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 *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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

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 the 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: It is expected that significant quantities of forests residue accumulate in piles at roadside and on landings because of processing and sawlog production. Recovering pulp logs would require minor increases in processing and loading time, inconsequential to the efficiency of sawlog production. Forest residue recovery is most likely to occur once logging operations have been completed, and once all sawlogs and pulp logs have been transported off site. Therefore, there is no risk that pulpwood and residue production will reduce the productivity of sawlog operations. Sawmill residuals are by-products of lumber production and therefore do not constitute a risk to the production of lumber.

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)* 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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **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: Forestry is a long-established industry in Louisiana and in the supply basin, with over 175 years for sawmills and over 80 years for pulp and paper. The forest supply chains are well-established for pulpwood and sawmill residues. Modern forestry practices and methods for breeding, planting, growing, harvesting, and collection of biomass have been in place for decades within the supply basin. This history represents a low risk of production experience for operations within the BDO 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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

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: Pulpwood and sawmill residuals production is conventional for the industry and occurs at scale. For decades, the Supply Basin has historically maintained high levels of log processing. Data on total removals indicate that average pulpwood removals in the area between 2010 and 2019 were approx. 1,792,230 dry ton/yr (Figure A-2) with relatively stable harvest levels over the period of 2010-2019. The industry is very mature in the BDO Zone, reducing the risk of delay or loss if a scale up is required for new industries entering the area.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

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: Logging and trucking are well established in the BDO Zone, as the forest products industry has been active for over 175 years and the suppliers have well-established knowledge of harvesting, handling, and transporting wood fibers. The efficiency of this equipment has a low-risk impact on the overall production of residual biomass**.**

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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

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: Sawmill residues are a by-product of the sawmill industry**,** and their production is part of the wood processing operations. Forest residues are a by-product of pulpwood and sawtimber harvesting and are usually piled at the harvest site. The production of both sawmill and forest residues is linked to normal operations**.**

Sawmill residues are produced in high volume and are a desired feedstock by the industrial pellet industry. Forest residues are not widely harvested, but the suppliers experience in other forestry operations could make this fairly simple transition.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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: Within the 150-mile Competition Zone from Rayville, LA, there are 20 competitors for woody biomass feedstock. Six of these are within 75-mile driving distance from the center of the BDO Zone. Included are nine pulp and paper mills, 10 wood pellet mills, and 3 OSB/MDF mills. These facilities are the main consumers of pulpwood and sawmill residuals. The 20 mills are estimated to consume 14,200,000 bdt/yr of this material. However, there are large quantities of industrialized woody biomass resources in the Supply Zone. This represents a medium risk to new biofuel industries to the area due to the number of competitors for feedstock.

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 *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 ((1-Total Notch) × GRI Score) is 36 out of 100.	**36**

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: Removals of pulpwood is down about 13% in the past ten years. This trend is due to decreasing demand for print media and increased competition from foreign mills. The supply of pulpwood remains high and is expected to remain high until a new competitor moves into the BDO Zone. The rated volume of pulpwood in the BDO Zone is 480,000 bdt/yr.

The market for sawmill residues is becoming more competitive with increasing demand for industrial wood pellets in Europe. Sawmill residues, particularly shavings, sawdust, and residual chips are preferred feedstocks for pellet production. This demand for sawmill residues is expected to increase as at least one more pellet mill is being constructed in the Competition Zone and another is expanding their capacity. The rated volume of sawmill residues in the BDO Zone is 246,900 bdt/yr.

Forest residues have historically been an underutilized resource, with only about 5% of the total available biomass being harvested. This trend is unlikely to change soon, as this feedstock is more expensive to harvest than pulpwood and tends to be lower quality given the harvest methods. The rated volume of forest residues in the BDO Zone is 78,000 bdt/yr.

The risk likelihood and impact are deemed low for pulpwood.
The risk likelihood and impact are deemed low for sawmill mill residues.
The risk likelihood and impact are deemed low for forest residues

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**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: Pulpwood actively harvested, and sawmill residues are completely used in the BDO Zone. Forest residues are not widely used, with an estimate of only five percent of the total available being harvested. For the past decade, delivered softwood pulpwood has averaged about $69/bdt varying between a low of about $60 and a high of about $78. Hardwood pulpwood has averaged $75/bdt ($65-85). Wood shavings delivered prices have averaged about $81/bdt with a low of about $72 and a high of $105. Bark/hog fuel delivered prices have averaged about $44/bdt.

Price fluctuations reflect both economic indices such as CPI and the price of diesel fuel. There are also price fluctuations that arise from competitive situations, such as lower-priced sawmill residues that can be brought in via rail from areas with a surplus. Sawmill residues generated in the BDO Zone are also in short supply because of the robust export wood pellet market. A large proportion of sawmill residues are sold under contract to pellet producers.

Pulpwood prices, adjusted for inflation, have changed little over the past ten years and the associated risk is rated low. However, with the shortfall of sawmill residues in the BDO Zone region, the demand for pulpwood may increase, resulting in higher prices.

Sawmill residues are in short supply given vertical integration and existing purchase agreements, and thus they do not have an impact on the risk score.

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 ((1-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 Zone 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: It is noted that a new biofuel plant (SAF) has been announced for construction in Pineville, LA.[4] The facility is estimated to consume 1 million bdt/yr of woody biomass once operating at full capacity and is expected to begin construction in late 2024 with commercial operations commencing in 2027, which is the indication of the suitability of the region to accommodate future biomass projects. Research and conversations with local experts did not discover any other new planned facilities or expansions of existing facilities.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

[4] https://sungasrenewables.com/sungas-renewables-announces-beaver-lake-renewable-energy/

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:

Pulpwood: Landowners and forestry contractors commonly engage in the practice of selling their products or services to the bidder offering the highest price. A small proportion of the wood supply is currently allocated to long-term supply contracts or vertical integration arrangements (e.g., sawmill ownership and timberland use). This is not expected to affect the rated pulpwood quantity for new projects. Therefore, the rated amount of pulpwood is not likely to become unavailable for new projects for reasons related to contracting or previous relationships.

Forest residue: Current markets for forest residue are limited, and historical markets have been temporary. Markets have generally been constrained to utilization in boilers of pulp and paper mills, characterized by uncertain demand patterns and relatively low prices (less than $40/bdt). Considering the price range of $44-$74/bdt, the preference for rivals is not deemed to pose a significant risk.

Sawmill residuals: It is anticipated that owners and operators of sawmills will endeavor to sustain relationships with current purchasers of sawmill residuals. The rated quantity of 246,900 bdt/yr was determined by considering the sawmill's commitment to maintaining customer loyalty.

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 ((1-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.[5]

[5] Bergtold, 2018.

Risk Information: A review and analysis of the quarterly feedstock prices for pulpwood, shavings, hog fuel, and whole tree chip does not indicate any seasonal variation in pricing. In addition, no temporary markets were found for the woody biomass in the BDO Zone region.	
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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

2.2 Risk Factor: Specific Competitors' Competitive Advantage

2.2.1 Relative Inventory Capacity

Rationale: The more inventory a competing biomass facility can store, the more competitively pressure it can exert on supply. The 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.	
Risk Information: According to outreach with local experts, biomass users are cutting back on the amount of feedstock they are storing on site. This is being done to minimize the amount of feedstock maintenance required, and inventory carry costs. Typical storage volumes being carried are for two to three weeks of production needs. This does little to affect availability and price of residuals.	
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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

2.2.2 Relative Accessibility/Delivery Hours and Wait Times

Rationale: The value attributed by suppliers to local competing markets for biomass is often related to the degree of flexibility the market provides in terms of delivery hours, and the more efficiently discharge can occur.

Risk Information: There were no identified facilities with significant wait times for unloading other than normal processing. Most biomass-using facilities have delivery quotas to the contracted loggers that are appropriate for their need and unloading capacity.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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: The specifications of available feedstock are uniform across pulpwood, sawmill residues, and forest residues. Biomass production methods and processing of that biomass have been following standardized techniques for many years.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**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: Industrial wood pellet production is projected to increase due to worldwide demand. One of the pellet mills in the Supply Basin plans to increase capacity. This situation will further increase demand and competition for sawmill residues in the BDO Zone. It is possible that as the sawmill residue market tightens, pellet mills will start sourcing pulpwood if pellet demand continues to increase. However, we believe the amount of underutilized woody biomass in the Supply Zone can support both the existing end users and a future commercial biomass 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**
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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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 signals of lower feedstock risk for new projects in BDO Zones.

Risk Information: In this project, BAM is applied to the total estimated quantity to ensure adequate feedstock redundancy for each feedstock type. Specifically, a BAM of 1.5 is applied to pulpwood, resulting in a rated quantity of 460,000 bdt/yr, while a BAM of 4 is applied to forest residues, resulting in a rated quantity of 78,000 bdt/yr.

To summarize this multiple, we estimate that the low-risk quantity of pulpwood and forest residues available for future biomass projects in the Supply Zone is 460,000 bdt/yr for pulpwood and 78,000 bdt/yr for forest residues, as shown in Table A-9. This represents a low risk to available supply.

However, assumptions of future biomass supply and demands are part of the BAM factors. Unforeseen supply and market factors such as new competitors, weather events and economic conditions can have high levels of impact on our assumptions and thus biomass availability.

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 *medium*, therefore the RRI is 6 out of 10.	**6**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 24 out of 100.	**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 ((1-Total Notch) × GRI Score) is 24 out of 100.	**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 located further away than core supplier.

Risk Information: The supply of pulpwood and forest residues is roughly linear, with more biomass available with increasing distance from the center point (Figure A-8). Sawmill residues, on the other hand, are only available at a limited number of sawmills, thus the availability increases in a stairstep manner. The majority of biomass is available from 50-75 miles from the center point (Rayville, LA).

Pulpwood – Available amounts	Forest Residues – Available amounts	Sawmill Residuals – Available amounts
25 miles – 8% (86,000 bdt)	25 miles – 7% (21,000 bdt)	25 miles – 3% (7,200 bdt)
50 miles – 36% (360,000 bdt)	50 miles – 31% (115,000 bdt)	50 miles – 18% (54,000 bdt)
75 miles – 71% (710,000 bdt)	75 miles – 75% (234,000 bdt)	75 miles – 89% (230,000 bdt)

These curves are representative of a low-risk supply area scenario.

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 *medium*, therefore the RRI is 6 out of 10.	**6**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 24 out of 100.	**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 ((1-Total Notch) × GRI Score) is 24 out of 100.	**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[6] and can manifest in shortages and higher costs for Issuers.

Risk Information: Timber harvests occur throughout the year, indicating a continuous operation. Winter and spring are typically wetter months, posing a challenge for loggers to move wood to mills. This limitation is temporary and does not last for an extended period. During wetter periods, loggers may be relocated to "wet weather" tracts, usually on higher ground or with soils that resist moisture better (sandy/sandy loam). This suggests an initiative-taking approach to managing weather-related challenges. To prepare for the upcoming winter and spring, mills focus on building up inventory during the drier fall months. This strategic planning helps mitigate potential disruptions caused by adverse weather conditions. The management of seasonal limitations in timber harvesting has been practiced for decades, indicating a well-established and experienced approach to handling challenges. Low risk of seasonal feedstock variation.

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**

[6] Golecha & Gan 2016.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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: Year-to-year availability for pulpwood has been consistent over the past decade. Historic pulpwood removals in the BDO Zone have shown a slight drop over the past ten years, reflecting changes in the pulp and paper market. The growth-to-harvest ratio for pulpwood has remained consistent, with 42% more pulpwood being grown than harvested. This suggests a sustainable and surplus growth in pulpwood resources. Sawmill residues have maintained reasonable levels of availability year over year.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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: 10-year feedstock price variations are summarized in Table A-4 for pulpwood, whole tree chip, wood shavings, and hog fuel. The historic high price for all these feedstocks occurred in 2022, paralleling inflation rates. Pulpwood prices displayed the lowest degree of price fluctuation, with pine pulpwood average price trending slightly downward (-8% since 2022). Shavings, whole tree chip, and hog fuel, show an upward trend over the past decade of

over 40% increase. Overall, given the commercial availability of woody biomass resources in the region, the price variations are not significant.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

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 typically the infrastructure for collection, processing and delivery is 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: Forestry has been a major industry in the BDO Zone for decades, and the supply chains for timber and sawmill residues are well established. Forest residues have not been harvested in large quantities. The methods used for their harvest is varied and could increase the risk if that material is critical to a new industry.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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: There is an extensive history of forestry and use of forest products in the region. Pulp and paper mills were established 70+ years ago, with sawmills dating back to the 1800s. Harvesting of forest residues, while feasible, is practiced only rarely. Forestry-related residuals are not new to the local economy.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

3.3 Risk Factor: Non-Weather Based Externalities

3.3.1 Consumer Price Index (CPI) and Producer Price Index (PPI)

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

Risk Information: General economic trends can influence the price of delivered feedstock. Economic indicators such as the Producer Price Index or the Consumer Price Index can be used to track trends in prices that can affect the biomass logistics operations and their associated costs such as the cost of fuel, labor, equipment parts, and administration. Figure C-1 shows the change in CPI over the past four years for the South Region of the US and reflects rising inflation between September 2020 and July 2022. At that point, the rate of inflation decreases until the present time.

Diesel fuel is a major component of biomass harvesting and delivery. Comparing diesel prices (Figure C-2) to the trend in CPI between 2020 and 2023 shows that fuel prices have a strong response to the general economic trends. The price of delivered pulpwood also tracks the CPI. This fluctuation represents a medium risk to new industries.

Raw Risk Likelihood (RRL)	**Score**

The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**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 ((1-Total Notch) × GRI Score) is 36 out of 100.	**Score** **36**

3.3.2 Currency Risk

Rationale: Where feedstock is purchased in a currency different than that which a new bio-based plant with 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: This item is not rated for this report**.**

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 ((1-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. This risk item is not rated for this report.

Risk Information: There is no border risk associated with this BDO Zone.

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	**Notch**

The Total Notch (RRL Notch × RRI Notch) is not rated.	**NR**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is not rated.	**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.[7]

Risk Information: There is no history of alternative, non-traditional, externality-driven competitors for feedstock within the BDO Zone region. The feedstock supply chains, and manufacturing processes are well established in the area.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**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.

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: Harvesting occurs year-round with few slowdowns or shutdowns. Forest operations in the BDO Zone are fully mechanized and involve conventional harvesting practices. Crews operate feller-bunchers, grapple skidders,

[7] Bergtold, 2018.

and processors to recover merchantable roundwood and pile residue, but this is not expected to present significant problems to feedstock quality as most processing involves the use of grinders.
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 ((1-Total Notch) × GRI Score) is 16 out of 100. **16**

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: Virtually all forest operational activity in the Supply Zone is mechanized, involving feller-bunchers and grapple skidders. The advanced level of operational mechanization in the region reduces risks associated with harvesting and collection equipment**.**
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 ((1-Total Notch) × GRI Score) is 16 out of 100. **16**

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.[8]

Risk Information: The pulpwood and sawmill residues are delivered either in the form of logs (pulpwood), chipped, or ground, depending on the end users' biomass quality specifications. The existing suppliers have the capability to provide either form.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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: A harvesting crew typically consists of one feller-buncher, two grapple-skidders, and one knuckle boom loader. Each crew can produce a minimum of 75 truckloads per week. Each load contains 12 to 14 bdt of wood, and the number of logging trucks required depends on the distance travelled to the mill. According to Timber Mart South, the average haul distance is 49 miles. Published analyses of trucking logistics indicate an average of 17.5 loads per week per truck.

For a new biomass facility in the BDO Zone, using the rated volume of 460,000 bdt per year, additional logging crews, truck drivers, logging equipment, and trucks are required. Given the productivity statistics for the Louisiana area, an additional 13 logging crews (39 people) and 32 logging truck drivers would be required. A total of 71 people would be needed.

The likelihood of problems hiring new logging crew members is very low. However, logging truck driver recruitment has been identified as a bottleneck. A nationwide shortage of truck drivers has made it difficult to recruit log truck drivers.

[8] Huhnke, 2018.

Additionally, log truck insurance in Louisiana has risen, contributing to the log truck driver shortage. Difficulty in hiring logging truck drivers would have a direct impact on biomass deliveries.

The median age for owners of logging companies is 57 and for logging company managers is 53 years.[9] Two-thirds of logging company owners predict that their companies would cease to exist upon retirement, as none expect a family member to take over the business. This trend may be offset by increasing consolidation, creating larger logging companies.

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 ((1-Total Notch) × GRI Score) is 36 out of 100.	**Score** **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: Biomass transport is priced by the ton per mile in the BDO Zone. According to TimberMart South, the average haul distance is 49 miles. Haul rates for bdt average $0.42 per mile for a minimum of 41 miles. Hauls of over 41 miles incur an additional charge of $0.38 per bdt per mile. The biggest impact on haul rates is fuel cost. Each $/gal increase in fuel costs for an average logging truck haul increases biomass cost by about $0.74/ton.[10]

Throughout North America, the costs of owning and operating transportation equipment have increased significantly in recent years. Forestry professionals contacted by Ecostrat who regularly operate within the Supply Zone noted a 30%

[9] Conrad IV, J. L., Greene, W. D., & Hiesl, P. (2018). The evolution of logging businesses in Georgia 1987–2017 and South Carolina 2012–2017. Forest Science, 64(6), 671-681.

[10] How to Calculate a Fuel Cost Adjustment. J. Conrad. 2022. https://www.amloggers.com/news/how-to-calculate-a-fuel-cost-adjustment-virginia-loggers-association

increase in prices for tires and occasional diesel prices of more than $6/gallon over the past three years. The purchase price of trucks was also observed to have increased more than inflation. The exit of independents from the trucking business is partly attributed to the excessive costs of ownership and maintenance. These factors represent a medium risk to new industries.
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 ((1-Total Notch) × GRI Score) is 36 out of 100. **36**

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: Diesel fuel is used through all aspects of forestry biomass harvesting. Tree harvesting equipment and logging trucks require diesel fuel. Fluctuation in diesel price is directly tied to the delivered cost of biomass. One study suggests that each increase of $2.00 in diesel price leads to an increase of approximately $2.43 per green ton of logs.[11] Increases in fuel costs get passed on to the end user of biomass through either fuel surcharges or escalators built into the contract. Diesel fuel price in the US South has tracked upward for the past decade (Appendix C, Figure C-9) with a low point of just below $2.00 per gallon in 2016 and a high of $5.73 in 2022. These price fluctuations closely parallel the national average price of diesel. Changes in diesel prices could have a significant effect on the delivered cost of biomass.
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**

[11] Reflections on the current state of fuel prices in logging and transport. https://bellwetherfp.com/reflections-on-the-current-state-of-fuel-prices-in-logging-and-transport/

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 ((1-Total Notch) × GRI Score) is 36 out of 100.	**36**

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: Overall, no specialized equipment is needed for harvesting and transporting forest-based biomass, including pulpwood, sawmill and forest residues, and the equipment needed for harvesting these biomass sources are readily available. Although forest residues are less commonly used of biomass with less developed logistics, when collected, do not require any specialized equipment. Three methods are employed in the BDO Zone. 1) Tops of 20' minimum are picked up with a knuckle boom and double bunked onto standard logging trucks**.** 2) Tops and branches are picked up with a knuckle boom or other grapple and loaded into chip vans. 3) Tops and branches are chipped on site and blown into a chip van.

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 ((1-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 many 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: Pulpwood is the most likely biomass to be transported in the BDO Zone, as forest residues are not being actively harvested and acquiring sawmill residues will face competition. For the rated volume of 460,000 bdt per year, a facility will need to accommodate approximately 70 deliveries by logging truck per day. Local experts in the

industry state that given how important forestry and biomass are to the community, it is unlikely that there will be major opposition. Additionally, the center point of the BDO Zone is the Holly Ridge East Industrial Park, which is serviced by an Interstate Highway (I-20). Also, truckers are aware of nuisance areas and have been trained to avoid them.

The community is supportive of biomass-based industries, and companies in Louisiana have collaborated with local communities to mitigate nuisance issues in the past.

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)* 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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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: Regardless of the number and type of axles, the maximum legal gross weight of any combination of vehicles which has a triduum or quadrium axle is 83,400 pounds (Interstate Highways); 88,000 pounds (Non-Interstate Highways). This is common weight restriction and represents a low risk for transporting biomass**.**

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)* 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 ((1-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: Generally, road access within the lumbering and forestry sections is not an issue for most timber tracts in Louisiana. Since a large portion of timberland in Louisiana has experienced at least one harvest in the past century, there is at minimum an old roadbed that the logger can work with. Sometimes the roads may be maintained to varying degrees, but loggers typically have a bulldozer used to improve roads and/or build new ones if needed**.** The road system to move residual forestry biomass represents a low risk for new industries.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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: For a new biomass facility in the BDO Zone using the rated volume of 460,000 bdt of pulpwood per year, additional logging crews, truck drivers, logging equipment, and trucks would be required. This infrastructure means more trucks need to be mobilized. Insurance costs in the State are some of the highest in the country. This is prohibitive to scaling up for new transportation. Since there is always a massive semi-truck driver shortage in the US, most drivers coming into the market are inexperienced, and insurance companies view them as risky investments. Another issue is that those working in the industry must work more hours due to driver shortages. Combine these factors with the history of weather-related claims in the State due to hurricanes, and it is understandable why Louisiana commercial insurance is so excessive. This is a medium high risk to new industries.

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 ((1-Total Notch) × GRI Score) is 48 out of 100.	**48**

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 many 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: There are 5 operational sawmills within the Supply Zone, each with an annual production capacity exceeding 1 million board feet (MMBF). There are over 100 logging and timber operations within the BDO Zone providing both sawtimber and pulp wood. This represents a low-risk rating for new industries as the supplier base for material is broad and well established.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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: New projects that rely on pulpwood but are not related to the paper industry should be able to source pulpwood, but if there is a large decrease in the paper industry, there may be large numbers of logging companies that go out of business. This represents a medium risk.

Harvesting sawtimber and pulpwood have both followed a distinct trend over the past 10-12 years. Pulpwood removals have followed a steady decrease that parallels the downturn in paper use. Sawtimber removal increases have followed the increase in housing starts in the US South, which resulted in higher sawmill and forest residues.

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 ((1-Total Notch) × GRI Score) is 36 out of 100.	**Score** **36**

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: The USDA Forest Inventory and Analysis database indicates that the land base for pulpwood and forest residues in the BDO Zone is primarily (84%) under private ownership. High levels of private timberland ownership reduces risk, as the biomass contracts are not subject to government programs.

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 ((1-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 Zone. Such estimates are important in assessing feedstock risk and enable accurate assessment of the efficacy of Issuer's mitigation methods.

Risk Information: Timber harvests occur year-round, with the winter and spring typically being wetter months. This can limit loggers' ability to move wood to the mills, though this is usually temporary and does not last for an extended period. During the winter and spring months, loggers sometimes are moved to "wet weather" tracts, which are usually on higher ground and/or have sandy/sandy loam soils that stand up better when wet. Fall is usually drier and that is when mills try to build up inventory for the coming winter/spring months.

Overall, procedures are in place to avoid harvesting stoppages due to seasonal weather patterns. In addition, the amount of available timber is more than demand and the terrain is varied enough to avoid harvest areas subject to seasonal moisture issues. Minimal risk to new industries.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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 local experts, climate change is not a significant factor currently. While the effects of climate change are hard to predict for any specific region, Louisiana's agriculture and forestry is taking measures to mitigate large scale impacts.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **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 be especially affected by this change.

Other climate change impacts that could add damaged or dead wood to the forest fuel load (e.g., because 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**s**. 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: On average over the past decade, only 8,217 acres of land in Louisiana is burned per year, which is a relatively insignificant amount. The wildfire season starts in late summer and typically ends in December. This is also a period of high humidity. This, combined with an average rainfall of 56" in the BDO Zone, mitigates any relative fire danger**.**

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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

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: The southern pine beetle (SPB) and other pine bark beetles continue to represent the largest threat to pine timber in Louisiana and the South. The most significantly impacted areas of the State are to the west of the BDO Zone. However**,** a significant outbreak of infestation could inflict widespread damage to the timberlands, impacting the biomass availability and price. The Louisiana Forestry Commission is mandated to monitor our forests for the presence of insect and disease outbreaks and is charged with acting if warranted to suppress or limit the damage to these pests.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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 not a relevant risk in the BDO Zone.

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 NN (No Notch).	**Notch** **NR**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is not rated.	**Score** **NR**

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: Flooding can affect the ability to harvest standing timber as the vehicles needed can sink into saturated soil, becoming stuck or causing soil compaction. The risk of flooding is very low according to the Louisiana Department of Natural Resources Flood Map. Standing timber is flood resistant to a high degree. Users of timber typically stockpile several weeks or months of feedstock as a mitigating measure against harvesting disruptions.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **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: The risk of drought is low according to the US National Integrated Drought Information System. There are regular seasonal periods of dry conditions. Historically, severe drought events occurred in 2011-2012 and also in 2002. Trees are not as susceptible to drought conditions as agricultural crops in terms of mortality. Rather, standing timber will slow its growth rate until more favorable conditions are present.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

3.7.8 Risk of Hurricanes, Tornadoes and Strong Winds

Rationale: Hurricanes, tornadoes, and intense wind**s** 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: A major hurricane or tornado in the BDO Zone is most likely to cause damaged trees. If the damaged trees can be salvaged, then they can be sold to mills, usually at a lower price because of the sudden glut of feedstock available. If damaged trees cannot be salvaged, then landowners will be forced to absorb the loss of standing timber and replanting costs.

According to statistics, the southern part of Louisiana is the place where tornadic storms are most likely to form. In other words, the I-10 corridor is more likely to experience tornadoes in Louisiana than the I-20 corridor (where the BDO Zone is located).

Tornados occur in Louisiana, with the most likely months being March to May. On average, Louisiana experiences five days a year with at least one tornado.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **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: For woody biomass, this is not a problem unless exotic species are planted in the hopes of achieving especially high growth rates. The timber species in the BDO Zone are native to the area.

For the center point of the BDO Zone over the course of a year, the temperature typically varies from 41°F to 93°F and is rarely below 28°F or above 98°F. Very low risk of low temperatures impacting the collection of biomass.

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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

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: There have been no instances in recent history of feedstock subsidies in the region. The forest residue supply chains that have been temporarily established since the 1990s have been driven largely by subsidies for renewable electricity, not for feedstock**.**

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 ((1-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: Permitting and regulations are established and clear. There is nothing required specifically for biomass, other than existing logging permitting. Louisiana has many biomass projects, so the process has been developed over time. Consulting firms that specialize in permitting new projects are available. This represents a low risk to new developers.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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: There has been no public reaction to biomass-based industries looking to locate in Louisiana. Based on Louisiana's Economic Opportunity Department, there have been over thirty carbon-capture related projects announced in the last several years. These have met with stiff public and political push back. Minimal risk for woody biomass related 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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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: The United States recognizes four Native American tribes in Louisiana: the Chitimacha Tribe of Louisiana, the Coushatta Tribe of Louisiana, the Jena Band of Choctaw Indians, and the Tunica Biloxi Indian Tribe of Louisiana. These are primarily located in the southern half of the State, not in the BDO Zone. This does not represent a risk to new development.

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 *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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**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: Cotton, sugarcane, rice, soybeans, corn (maize), and feed grains are the main agricultural crops produced in the state. Poultry and eggs, beef cattle, and dairy products are also important. Tree farming, catalyzed by conservation efforts, is now the most valuable agricultural activity. A small area of forest operations has reduced in size in recent years because of population growth and conversion to food production in parts of the BDO Zone. It is not expected that the increasing demand for biomass would result in land use change and the conversion of agricultural lands to timberlands.

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)* 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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

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 timberlands and forests in the BDO Zone are professionally managed and subject to regular audits for Best Management Practices (BMP) compliance. The state of Louisiana issued a recommended BMP for forestry in 2022 which has attained 95% compliance in the industry. BMPs are guidelines for maintaining forest health, with a focus on soil and water during forest management and harvesting. Adhering to these guidelines assures the sustainability of the forests. The future of the forests in Louisiana are considered to be a strong asset to new development.

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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

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: See 3.9.1 above. BMPs include soil-related guidelines for sustainability.

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 *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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

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: Mitigation of risk to water because of forestry operations is one of the primary goals of BMPs. A 2022 report on BMP compliance within Louisiana indicated a statewide implementation of BMPs overall was 95%. About water-related issues, BMP compliance was 88% for stream crossings and 93% for streamside management zones. Many of the other BMPs, such as fertilization and timber harvesting procedures, have an indirect effect on water quality.

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 *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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

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: Forestry species in Louisiana are not exceptionally large users of water.

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) 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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **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: Pesticides are rarely used in timber production. The use of pesticides in timberlands is regulated by the state of Louisiana and requires a permit and adherence to Best Management Practices.

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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

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: Forestry in Louisiana is practiced according to Best Management Practices (BMPs) prepared by the Louisiana Department of Natural Resources. These are a set of guidelines that dictate methods to be used in all aspects of forestry operations to protect water and soil quality, minimize impact to wildlife and landscape and to maintain diversity.

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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

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: There is no recent history or activity involving the planting or use of GMO trees in Louisiana.

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 ((1-Total Notch) × GRI Score) is not rated.	**Score** **NR**

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: Production, harvesting, transport, and processing of sawmill residues and pulpwood have been well established in the BDO Zone for decades. Consistent production quality is engrained in the system.

Forest residues, while not widely collected, are a by-product of sawtimber and pulpwood harvesting. Forest residue harvest begins with piling the residues at the loading site, a practice already in place. Loading and transporting the forest residues uses established methods and standard logging equipment. If the demand for forest residues increases, it is expected that the existing forest industry will have the capability and experience in managing the quality of forest residues delivered to future 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)* **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 ((1-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 manage Issuer feedstock requirements and throughput capacity. Capacity to scale should be demonstrated.
Risk Information: Forestry supply chains are well-established in the BDO Zone and have been operating at a professional level for decades. Scale-up to meet the demands of a new project has occurred in the BDO Zone. An example of this process is the establishment of a large-scale industrial wood pellet industry, which has grown to be a major component of the BDO Zone economy.
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 ((1-Total Notch) × GRI Score) is 16 out of 100. **16**

CATEGORY 5.0: INFRASTRUCTURE RISKS

5.1 Risk Factor: Physical Infrastructure

5.1.1 Land Parcel/Ind. District

Risk Information: The development parcel chosen for this analysis is a 256-acre industrial-zoned site – Holly Ridge East. Circular in nature, it is located twenty-four miles east of Monroe, Louisiana along Interstate 20. Easy access to the site is via US 183 (1/2 mile off Interstate). There are no restrictive obstacles to new bio-industry development. A complete set of site maps are in Appendix C.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

5.1.2 Ownership of Land

Risk Information: Holly Ridge East industrial park is privately owned, is acceptable to long-term lease or purchase options, and can be subdivided as needed. The development parcel chosen for this analysis is a 256-acre industrial-zoned site – Holly Ridge East. Circular in nature, it is located twenty-four miles east of Monroe, Louisiana along Interstate 20. Easy access to the site is via US 183 (1/2 mile off Interstate). There are no restrictive obstacles to new bio-industry development.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.1.3 Permitting Description

Risk Information: The permitting process in Richland Parish is normally a 2–3-month time for new industrial development. This would include building, air, water, sewer, and fire permitting from the Parish. The Parish is pro-new development and welcomes new biofuel industries.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.1.4 Environmental Issues

Risk Information: The property has a low-moderate risk of flood to a depth of one inch. It has a minimal risk of wildfire and an elevated risk of seasonal winds, possibly exceeding 90 MPH. There are no existing environmental influences on the site that would represent a further risk to new development. The air quality is rated as "good" based on the ambient air quality target (set by World Health Organization) of <35 mg/m3. The local industrial park scored readings of 12, 10 and 9.9 mg/m3 in 2021, 2022, and 2023. This is considered an air attainment zone with low pollution ratings. Flood plain is a moderate risk factor for new development.

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 ((1-Total Notch) × GRI Score) is 36 out of 100.	**36**

5.2 Risk Factor: Utilities

5.2.1 Natural Gas Availability

Risk Information: Louisiana is the second-largest producer and exporter of natural gas behind Texas. It has the highest storage capacity in the county. Natural gas pipelines cover over 80% of the state. The Holly Ridge East site has multiple twelve-inch pipelines running along two borders provided by Atmos (local distributor). Prices within Louisiana are some of the lowest in the country at $3.52/MCF.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.2.2 Electric Availability

Risk Information: Five investor-owned utilities serve the State, producing over 55% of Louisiana's electric power with natural gas and nuclear energy. Entergy Louisiana is the provider to the Holly Ridge industrial district and has several three-phase services available from 12.5KV up to transmission voltage of 115KV. The average industrial electric cost in Rayville is $11.44 cents / kWh, below the national average of $12.15 cents / kWh. An electric connection to the site (less than two hundred yards) is not currently in place, but has been approved in the general plan for Holly Ridge and will include a dedicated substation.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.2.3 Water Availability

Risk Information: The primary freshwater-bearing aquifer in Richland Parish is the Mississippi River alluvial aquifer. This is present underneath virtually all of Richland Parish at depths of 100-200 feet. This provides nearly 40% of water requirements to the Parish, with the remaining sources being surface waterways**.**

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.2.4 Waste Disposal / Stormwater Drainage

Risk Information: Sewer and storm drain maintenance is managed by the City of Rayville Public Works department. The capacity of solid waste processing has increased in the past 5 years and is adequate for future growth of new industries in the area. Storm drainage is adequate away from site during normal precipitation events**.**

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.2.5 Internet Availability

Risk Information: AT&T is the primary provider of both wireless and cabled internet and data connection industries in the area. They provide a full complement of services and speeds to the area with competitive pricing and terms.

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 ((1-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 primary access from the site to major cities to the east and west is Interstate 20. US Highway 183 exits off the Interstate at the Holly Ridge industrial district. Monroe is twenty-four miles to the west; Rayville is eight miles to the east. Road access in all directions from the site is paved and well maintained, with 88,000 weight limits for commercial trucking traffic. Surface access is no risk to new development**.**

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.3.2 Rail Access

Risk Information: Kansas City Southern (KCS) has a primary rail line along the northern edge of the Holly Ridge development site. There is a plan by KCS to construct a general spur and loading facility specifically for industrial clients in the district. This will come within two years of permanent industries being in operation. This could be sooner if industry wants to participate in the cost. KSC connects to the east into Mississippi and to the west at Shreveport. There is a primary Union Pacific rail line as well at Monroe (24 miles west) that runs the entire length of the State.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.3.3 Airport Access

Risk Information: The primary commercial air service for the development site is Monroe Regional Airport, twenty-four miles to the west. Both Delta and American Airlines have daily flights to Atlanta and Dallas/Ft Worth from Monroe. The airport provides private aviation terminals for business and commercial jet service, including maintenance and storage. There are no restrictions for airspace or military issues. The proximity of the site to a commercial airport is an asset to new development.

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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

5.3.4 Water Freight Access

Risk Information: The Ouachita River flows through Monroe, LA, 30 miles west of Rayville. It has commercial river freight access with a port at Madison Parish. The Mississippi River is twenty-eight miles to the east and provides full commercial shipping services. Transportation to either of these ports would be intermodal, using trucking from the development 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).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.4 Risk Factor: Social Infrastructure

5.4.1 Healthcare (Local)

Risk Information: There is no significant hospital in Rayville, but there are several medical and health clinics. Northeast Louisiana Health Center operates with a full medical staff and surgical capabilities. St Francis Medical Center and Monroe Community Hospital are both less than 30 miles from the site in Monroe, LA, and provide full emergency and medical services. Ambulance response time to the Holly Ridge site is 20-25 minutes.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.4.2 Education (Schools in the Area)

Risk Information: Richland Parish public Schools provide education for K-12 in and around Rayville for over 2,700 students. To the west, in Monroe, several specialty and vocational schools are available for advanced training. Louisiana Community and Technical College offers business, energy management, computer, and equipment repair courses. Unitech Training Academy offers extensive medical-based training up to Registered Nurse. Sixty-two percent of the population around Rayville have a high school education, with 10% having a bachelor's degree. This is just slightly below the national average. Education availability and quality is a non-risk to newly developing industries in the area.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.4.3 Local Transportation

Risk Information: There is no public bus or rail service to the Holly Ridge site. Monroe Transit has operated to the Monroe city limits, twenty-five miles from the site. Taxis are available from Rayville or Monroe; average fair is $36 one way to the site. Greyhound offers passenger services from Rayville to Shreveport and into Mississippi. This lack of ground transportation options within 25 miles for prospective employees is a medium risk to new development

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 ((1-Total Notch) × GRI Score) is 36 out of 100.	**36**

5.4.4 Public Safety (Local)

Risk Information: The total crime index for Rayville, LA, is fifty-eight, so it is considered safer than 58% of similar sized population centers in the country. The Richland Parish Sheriffs office is the primary authority in the area, with over seven hundred uniformed officers on force.

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 ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

5.4.5 Housing/Cost of Living

Risk Information: The cost of living in Rayville is below the national average. Rayville scores a 75.6 based on average of one hundred for living expenses. The average home price is between $110,000 and $150,000 or 34% of the national average. There is medium availability of both rental and purchase housing. These indices along with lower food and utility costs provide an attractive view for new employees moving in from other areas. This is considered an asset to industries considering locating to Richland Parish**.**

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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

5.5 Risk Factor: Labor

5.5.1 Workforce

Risk Information: Richland Parish has an unemployment rate of 3.5% which is just below the national average of 3.9% as of September 2023. The workforce is currently 8,400, down from 9,000 in 2010 but trending upward over the last three years. Seventy-eight percent of the workforce has at least a high school education, with 15% having an advanced degree. Much of the workforce has a history in forest industries, logging, and wood processing. The average age of the workforce is forty-two, a low-moderate risk.

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 ((1-Total Notch) × GRI Score) is 36 out of 100.	**36**

5.5.2 Labor Costs

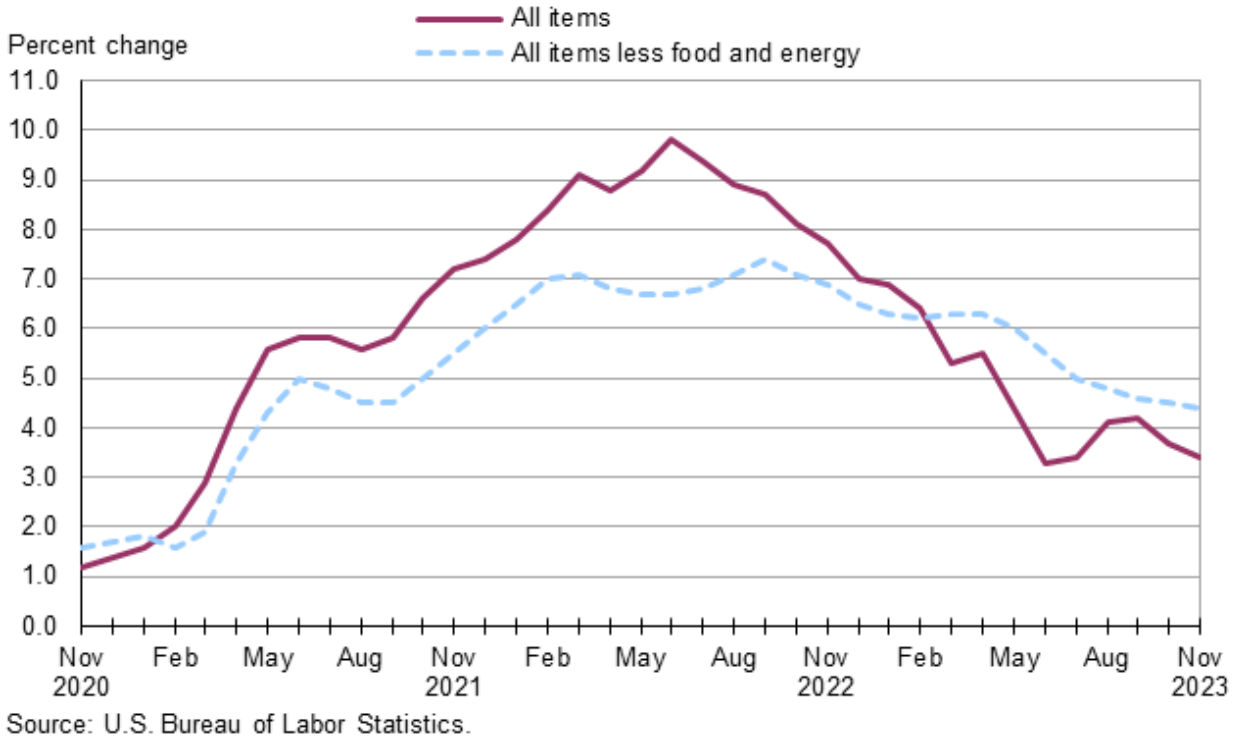
Risk Information: Louisiana does not have its own minimum wage law. Therefore, employees in Louisiana are entitled to earn at least the federal minimum of $7.25/hr. This is lower than the national average minimum wage of $9.40/hr. The average construction position in the area pays $26,000 annually, with education positions paying $22,700. Overall, this is a low-cost workforce opportunity for new industry development in the area. Employers would see this area as an asset for workforce.

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 ((1-Total Notch) × GRI Score) is 4 out of 100.	**4**

APPENDIX C: TABLES, FIGURES AND MAPS

Figure C-1. Over-the-year percent change in CPI-U, South Region, 2020-2023



Source: U.S. Bureau of Labor Statistics.

Figure C-2. Diesel Price Fluctuations, 2014-2023

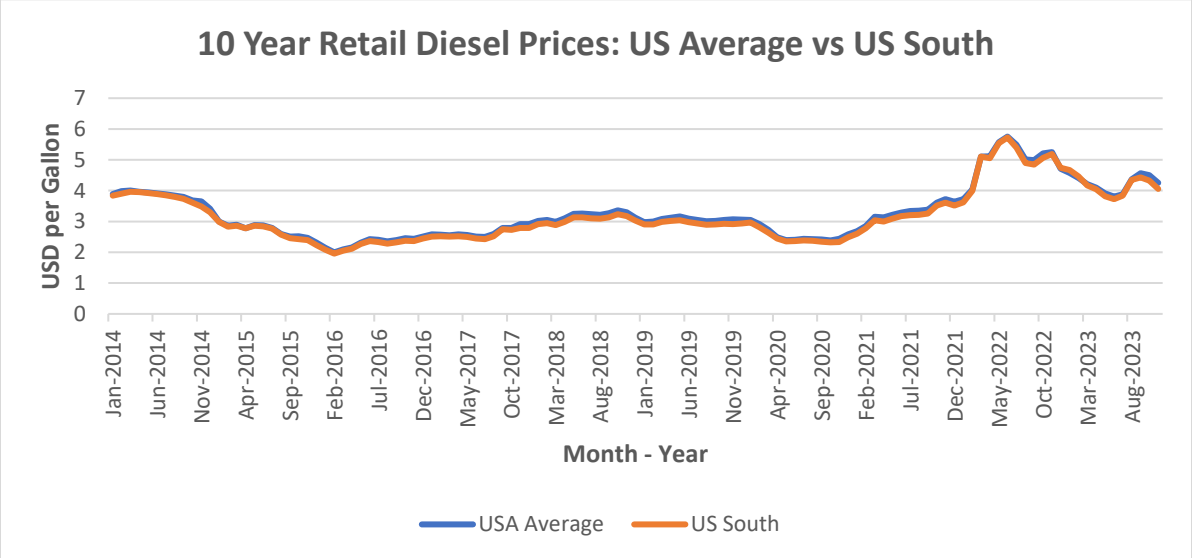


Figure C-3. Holly Ridge East Industrial Site, 256 Acres, Zoned Industrial



APPENDIX D: LEGAL DISCLAIMER

This BDO Zone Rating (the "Rating") is prepared for, and provided to, Richland Parish / Rayville, LA, and is intended to be read and used in its entirety and not in parts. Separation or alteration of any section or page from the main body of this Rating is expressly forbidden. In preparing this Rating, Ecostrat has used information obtained from third parties or otherwise publicly available. All such information has not been independently validated, verified, or confirmed by Ecostrat (except where otherwise specifically indicated) and Ecostrat makes no representation or warranty as to the accuracy or completeness of any information provided by third parties or otherwise publicly available.

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