Biofuel Development Opportunity Zone Rating Conecuh County, AL
Date of Issue: May 1, 2024
Rating Grade: **'A'**

A
High Quality

Rating Parameters:

Category	Rated Quantity	Delivered Cost	BDO Zone Size
Pulpwood	470,000 bdt/yr	$60-$77 (bdt)	75-mi drive distance
Forest Residues	80,000 bdt/yr	$59-$72 (bdt)	from Evergreen, AL
Sawmill Residues	419,000 bdt/yr	$70-$103 (bdt)	

BDO Zone Assets

- **Over 470,000 bdt of pulpwood available at low risk.**
- **Annual availability of 419,000 bdt of sawmill residues with a low-risk profile.**
- **Well-established history of forestry operations in the region, supported by a mature supply chain.**
- **Robust rail and highway infrastructure providing convenient access to timberlands and deep-water ports.**
- **Availability of industrial sites suitable for accommodating large-scale biofuel projects.**
- **Pro-business community conducive to economic development.**

BDO Zone Liabilities

- **Challenging labor market for log truck drivers, impacting the smooth functioning of the supply chain.**
- **Aging ownership and management within logging companies, potentially posing challenges in ownership transfer upon retirement.**

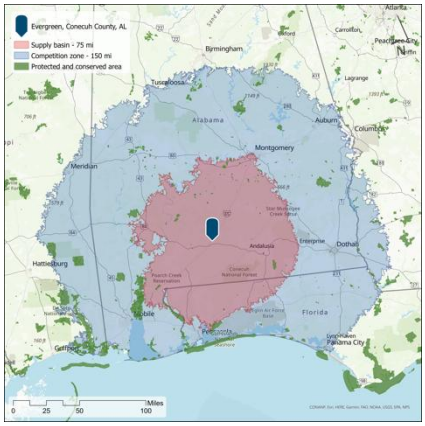
Rating Grade

The Conecuh County, AL, Biofuel Development Opportunity Zone is rated 'A,' or 'low' risk.

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

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

Conecuh County, AL, BDO Zone



Scoring & Rating Methodology

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

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

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

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

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

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 8, then the GRI for this risk indicator is $2 \times 8 = 16$.

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.

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

Loaded RI scores of 4 or less are deemed *very low risk*; scores between 5 and 16 are deemed *low risk*; scores between 17 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 ***19.86 out of 100, resulting in an 'A' designation***.

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

Analyst Notes

The BDO Zone, located within the Alabama Lower Coastal Plain and spanning 11,416 square miles, is centered around Evergreen, AL. It extends to a 75-mile driving distance from this central point and encompasses parts of 18 Alabama counties and five Florida counties. The Zone serves as a potential location to accommodate large-scale biomass projects due to the commercial availability of sustainable woody biomass resources.

The Competition Zone extends to a 150-mile driving distance from the center point, covering an expansive area of 43,613 square miles. Wood-using facilities within this region may compete for biomass resources with new projects, extending into Alabama, Florida, Mississippi, and Georgia.

The Evergreen, Alabama region is situated within a significant timberland covering 75% of the land area, dominated by loblolly and longleaf pine. This locale is part of the thriving forestry industry in Alabama. Overall forestry contributes over $28 billion to the state's economy.

Timberland ownership is predominantly private, comprising approximately 89% of the total, with 6% held by the federal government and 5% by state and local governments.

BDO Zone Assets

The forestry industry in southern Alabama has a longstanding history, with large-scale logging and lumbering activities gaining prominence in the late 19th century. The first pulp and paper mill in the area was established in 1929, and the industry has evolved, embracing professional forestry practices and sustainable management since the mid-20th century. Modern methods and sustainable practices are integral to Alabama's forestry sector, contributing significantly to the economy.

The Supply Zone, a vital component of the BDO Zone, boasts a history of robust timber production and log processing. Since 2010, the region has consistently increased annual timber production from approximately 7 to 10.3 million bone dry tons (bdt), reflecting a notable 47% increase. Notably, the growth-to-drain ratio indicates that wood production exceeds consumption by more than two-fold, highlighting ample wood availability.

The U.S. Department of Energy's Billion-Ton Report indicates a standing pulpwood inventory of approximately 704,000 bdt/yr within the Supply Zone. It is estimated that a significant portion of this inventory, about 67% or 470,000 bdt/yr, could be available for new projects at low risk, within a price range of $60/bdt to $77/bdt. The Department of Energy also estimates that forest residues, including tree branches, bottoms, and tops typically discarded during conventional logging operations, could offer approximately 318,000 bdt/yr. While not actively collected in the

Supply Zone presently, market availability and willingness to pay reasonable prices could potentially make 80,000 bdt/yr of forest residues available at low risk, within a rated price range of $59/bdt to $72/bdt.

Within the Supply Zone, sixteen major sawmills operate, boasting a collective production capacity of approximately 1,200 million board feet of lumber and 600 million square feet of veneer/plywood per year. These mills have the potential to generate approximately 1,682,700 bdt of sawmill residues annually. However, the market for sawmill residues is highly competitive, with 11 pulp & paper mills, six wood pellet mills, and 13 biomass energy facilities vying for this resource. It is estimated that around 419,000 bdt/yr of sawmill residues could be available at low risk, with a weighted price range of $70-$103/bdt. Note that because of the high level of competition, a premium price would be needed to win a contract over an established customer. The composition of available sawmill residues is predominantly wood chips (73%), bark/hog fuels (17%), sawdust (less than 1%), and wood shavings (9%).

The BDO Zone offers an attractive business climate for the forest industry, featuring numerous advantages. These include a robust transportation infrastructure, well-developed site locations, access to ports, streamlined environmental permitting processes, competitive tax rates, comprehensive industrial training programs, and a right-to-work environment.

The Alabama Department of Commerce has recognized the forest industry as a significant strategic target for economic development, underscoring its significance in the state's growth plans.

BDO Zone Liabilities

The region faces certain liabilities. A shortage of logging truck drivers (a nationwide challenge) has already begun impacting supply chains, posing a risk to biomass deliveries. While not as severe as the driver shortage, a shortage of logging crews has been identified locally, which can impact productivity.

The average age of logging company owners in Alabama is 56, with an average employee age of 48. Approximately 35% of owners anticipate exiting the industry within five years, with one-third expecting business closure. However, this trend may be counterbalanced by increasing consolidation, potentially leading to the formation of larger logging companies in the sector.

Infrastructure Profile

The infrastructure profile assessment is centered on a 122-acre site, which features 65 buildable acres, one mile north of Evergreen, AL. Historically, this site served as a Louisiana Pacific Sawmill and currently boasts two existing buildings: one measuring 100,000 sq ft and the other 12,000 sq ft. Key assets at this site encompass a 6" water main, a 4" natural gas main, and a 6" sewer main. Electric service is provided by Southern Pine Electric Coop, supplemented by AT&T telecom service.

This site's strategic advantage lies in its access to vital transportation routes, including Interstate 65, US Highways 31 and 84, and CSX rail service, with direct links to major ports, including Mobile, Pensacola, Gulfport, and New Orleans. Its proximity to major highways, railways, ports, airports, and markets enhances its appeal, facilitating cost-efficient access to local, regional, and international markets.

Overall, the assessment of infrastructure risks, encompassing physical, logistical, social, workforce, and permitting considerations, yields a verdict of low risk for this site.

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Figure 1: Risk Indicators (Sorted by Risk Level)

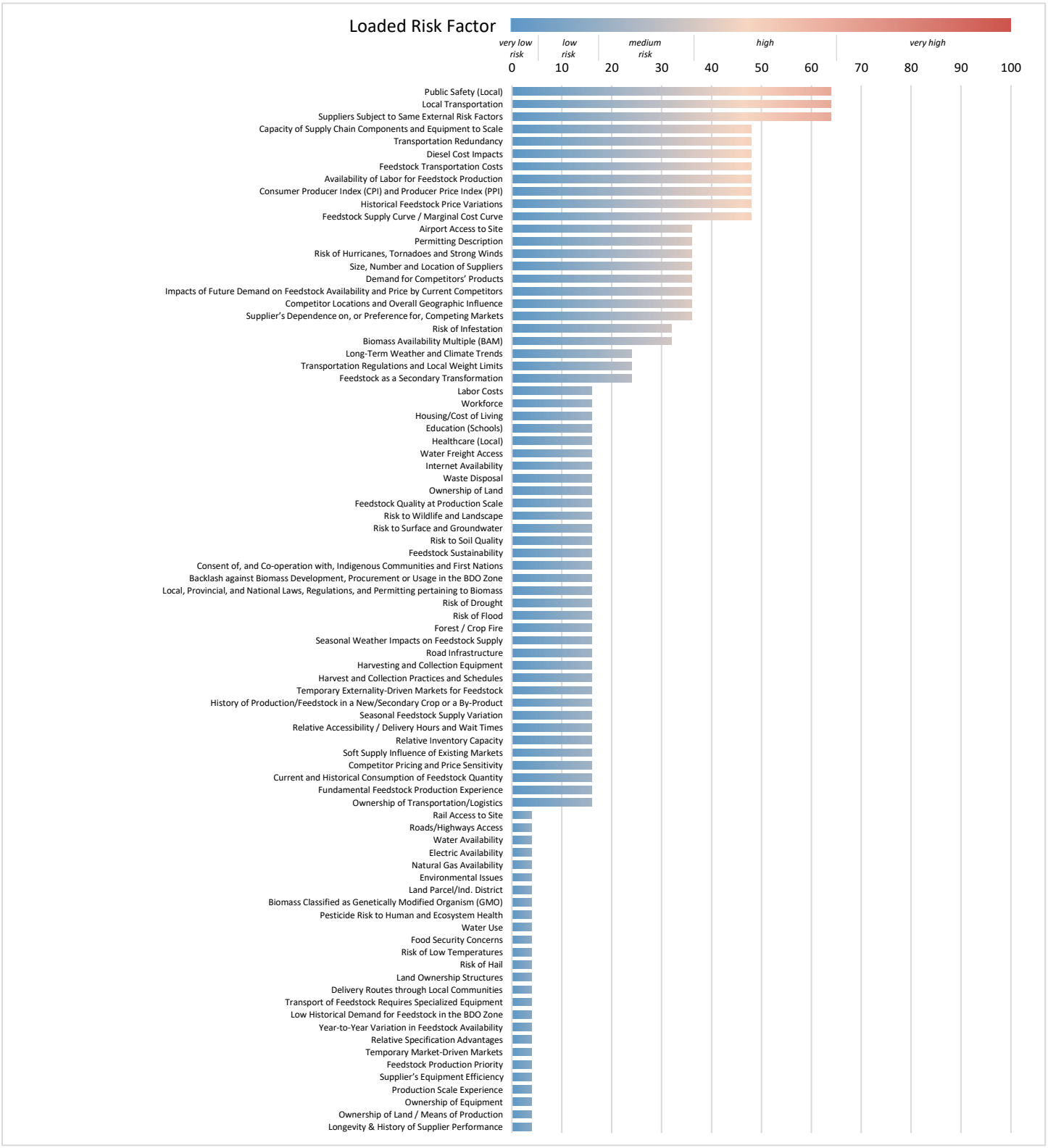


Table 1: Risk Indicators and Associated Scores

	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	2	2	4	NN	4
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	2	2	4	NN	4
1.3.2	Ownership of Equipment	2	2	4	NN	4
1.3.3	Ownership of Transportation/Logistics	4	4	16	NN	16
1.3.4	Feedstock as a Secondary Transformation	6	4	24	NN	24
1.4.1	Fundamental Feedstock Production Experience	4	4	16	NN	16
1.4.2	Production Scale Experience	2	2	4	NN	4
1.5.1	Supplier's Equipment Efficiency	2	2	4	NN	4
1.6.1	Feedstock Production Priority	2	2	4	NN	4
	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	4	4	16	NN	16
2.1.4	Impacts of Future Demand on Feedstock Availability and Price by Current Competitors	6	6	36	NN	36
2.1.5	Soft Supply Influence of Existing Markets	4	4	16	NN	16
2.1.6	Temporary Market-Driven Markets	2	2	4	NN	4
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	2	2	4	NN	4
2.2.4	Demand for Competitors' Products	6	6	36	NN	36
	Category 3.0: Supply Chain Risk					
3.1.1	Biomass Availability Multiple (BAM)	4	8	32	NN	32
3.1.2	Feedstock Supply Curve / Marginal Cost Curve	6	8	48	NN	48
3.1.3	Seasonal Feedstock Supply Variation	4	4	16	NN	16
3.1.4	Year-to-Year Variation in Feedstock Availability	2	2	4	NN	4
3.2.1	Historical Feedstock Price Variations	6	8	48	NN	48
3.2.2	Low Historical Demand for Feedstock in the BDO Zone	2	2	4	NN	4
3.2.3	History of Production/Feedstock in a New/Secondary Crop or a By-Product	4	4	16	NN	16
3.3.1	Consumer Price Index (CPI) and Producer Price Index (PPI)	6	8	48	NN	48
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	NR	NR	NR	NR	NR
3.4.4	Availability of Labor for Feedstock Production	8	8	64	25%	48
3.5.1	Feedstock Transportation Costs	6	8	48	NN	48
3.5.2	Diesel Cost Impacts	6	8	48	NN	48
3.5.3	Transport of Feedstock Requires Specialized Equipment	2	2	4	NN	4
3.5.4	Delivery Routes through Local Communities	2	2	4	NN	4
3.5.5	Transportation Regulations and Local Weight Limits	4	6	24	NN	24
3.5.6	Road Infrastructure	4	4	16	NN	16
3.5.7	Transportation Redundancy	8	8	64	25%	48
3.6.1	Size, Number and Location of Suppliers	6	6	36	NN	36
3.6.2	Suppliers Subject to Same External Risk Factors	8	8	64	NN	64
3.6.3	Land Ownership Structures	2	2	4	NN	4
3.7.1	Seasonal Weather Impacts on Feedstock Supply	4	4	16	NN	16
3.7.2	Long-Term Weather and Climate Trends	4	6	24	NN	24
3.7.3	Forest / Crop Fire	4	4	16	NN	16
3.7.4	Risk of Infestation	4	8	32	NN	32
3.7.5	Risk of Hail	2	2	4	NN	4
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	6	6	36	NN	36
3.7.9	Risk of Low Temperatures	2	2	4	NN	4
3.8.1	Government Subsidies for Feedstock Production or Utilization	NR	NR	NR	NR	NR
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	4	4	16	NN	16
3.8.5	Food Security Concerns	2	2	4	NN	4

3.9.1	Feedstock Sustainability	4	4	16	NN	16
3.9.2	Risk to Soil Quality	4	4	16	NN	16
3.9.3	Risk to Surface and Groundwater	4	4	16	NN	16
3.9.4	Water Use	2	2	4	NN	4
3.9.5	Pesticide Risk to Human and Ecosystem Health	2	2	4	NN	4
3.9.6	Risk to Wildlife and Landscape	4	4	16	NN	16
3.9.7	Biomass Classified as Genetically Modified Organism (GMO)	2	2	4	NN	4
	Category 4.0: Feedstock Scale-up Risk					
4.1.1	Feedstock Quality at Production Scale	4	4	16	NN	16
4.1.2	Capacity of Supply Chain Components and Equipment to Scale	6	8	4	NN	48
	Category 5.0: Infrastructure					
5.1.1	Land Parcel/Ind. District	2	2	4	NN	4
5.1.2	Ownership of Land	4	4	16	NN	16
5.1.3	Permitting Description	6	6	36	NN	36
5.1.4	Environmental Issues	2	2	4	NN	4
5.2.1	Natural Gas Availability	2	2	4	NN	4
5.2.2	Electric Availability	2	2	4	NN	4
5.2.3	Water Availability	2	2	4	NN	4
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	2	2	4	NN	4
5.3.2	Rail Access to Site	2	2	4	NN	4
5.3.3	Airport Access to Site	6	6	36	NN	36
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	8	8	64	NN	64
5.4.4	Public Safety (Local)	8	8	64	NN	64
5.4.5	Housing/Cost of Living	4	4	16	NN	16
5.5.1	Workforce	6	8	48	NN	36
5.5.2	Labor Costs	4	4	16	NN	16
					Average	**19.86**



Conecuh County, AL, BDO Zone Independent Review Committee (IRC)

Veronica Crock – Senior Project Manager, Alabama Department of Commerce
Dan Chappell – Forestry Assistant Division Director, Alabama Forestry Commission
Al Jones – Senior Economic Development Representative, Alabama Forestry Commission
Rosalyn Sales – Economic Development, Clark Mobile Gas
Andy Callahan – Director of Business Development and Operations, Soterra
Ken Kelley – Regional Extension Agent, Auburn Regional Extension
Will Daniels – President, Webb Taylor Timber
Clint Flowers – Land Management, National Land
Jerry Calhoun – Forestry Specialist, Alabama Forestry Commission
Ryan Holland – Forester, Alabama Forestry Commission
Benji Elmore – Regional Forester, Alabama Forestry Commission
Douglas Ziebach – Owner, Zieback and Webb Timber
Cassandra Stallworth – Business Development, Weyerhauser
David Hutchinson – Economic Development, Butler County Commission for Economic Development
Jess Nicholas – Economic Development, CenterFire Economic Development
Steve Dunn – Conecuh County Farmers Association
Tim Covin – Local Authority, Simplot

APPENDIX A: BIOMASS AVAILABILITY AND PRICING

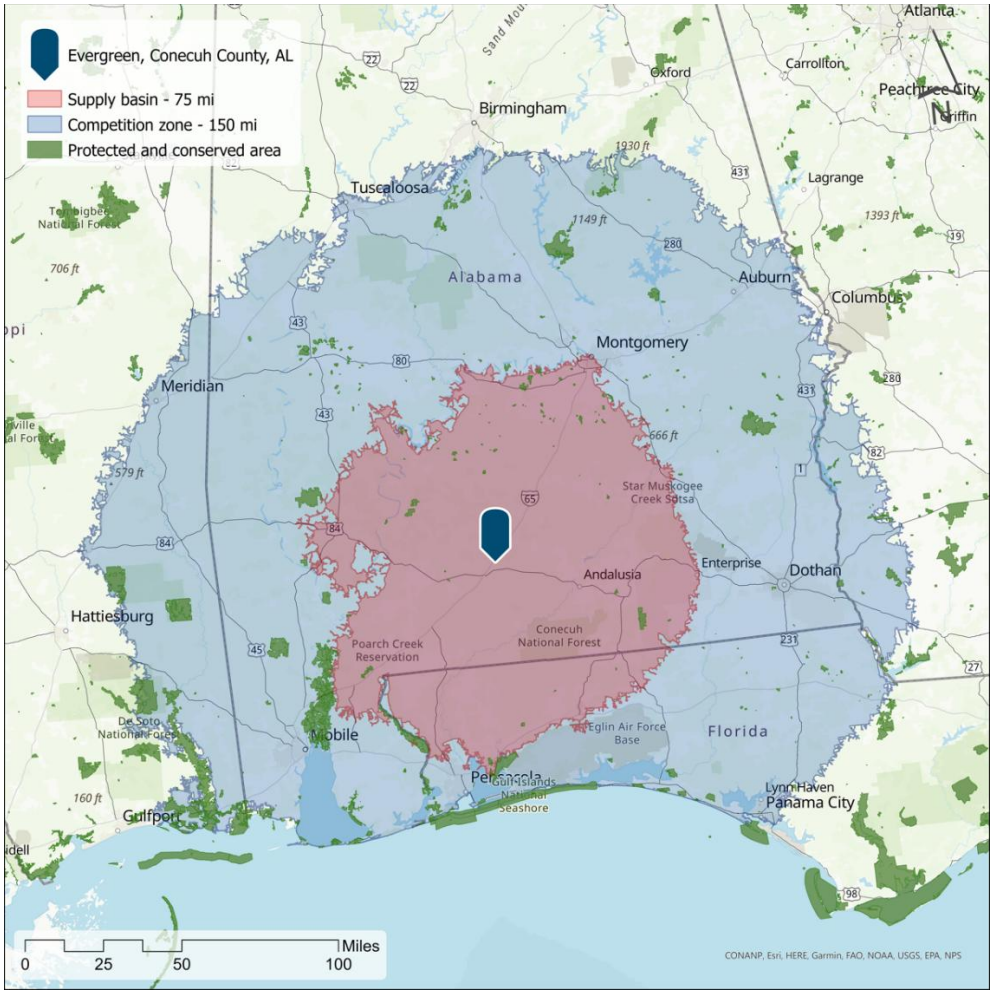
This section assesses the availability and pricing of woody biomass as feedstock for bioenergy, biofuels, and potentially other bio-based products in Conecuh County, AL, as a BDO Zone region. The center point for the woody biomass availability assessment is Evergreen, AL.

SUPPLY ZONE AND COMPETITION ZONE

The Supply Zone and the Competition Zone define the areas of interest for this BDO Zone rating (Figure A-1). The Supply Zone defines a driving distance of 75 mi from the center point of the BDO Zone. This is where biomass will most likely be sourced for a new project. The Competition Zone is defined as a driving distance of 150 mi from the BDO Zone center point. This is where other biomass users who could compete for available biomass may be located.

The Supply Zone is 11.28 million acres and encompasses all, or part, of 18 counties in Alabama and five counties in Florida. The detailed list of counties in the Supply Zone is shown in Appendix C, Table C-1.

Figure A-1. Supply Zone and Competition Zone – Conecuh County AL BDO Zone



Woody Biomass Types in the Supply Zone

The available woody biomass in the Supply Zone comprises pulpwood, forest residues, and sawmill residues.

Pulpwood is defined as standing small-diameter trees ranging from 5 to 11 inches in diameter at breast height. It is conventionally utilized in the production of paper, paperboard, oriented strand board (OSB), medium-density fiberboard (MDF), and wood pellets.

Forest residues denote by-products or residual materials resulting from forestry operations, such as timber harvesting and thinning. These residuals typically include branches, tops, stumps, bark, and other woody debris left on-site after the sawtimber has been harvested. Notably, forest residues exclude the roundwood or log portion of the tree, distinguishing them from whole tree chips.

Sawmill residues constitute the by-products of sawmill operations, originating from the conversion of sawlogs into finalized wood products like lumber and engineered wood. Approximately half of the sawlogs are transformed into finished wood products, while the remaining portion comprises sawmill residues, comprising wood chips, sawdust, shavings, and bark (commonly referred to as hog fuel).

Woody Biomass Demand in the Competition Zone

The Competition Zone is characterized by vigorous timber growth and a thriving forest products industry.[1] Presently, 34 competitors are vying for biomass in the Competition Zone, specifically for high-quality pulpwood timber. These competing entities operate in various sectors, including mills dedicated to the production of oriented strand board (OSB), medium-density fiberboard (MDF), engineered wood products, wood pellets, and pulp & paper. For a detailed breakdown, please refer to Table A-1, which illustrates the number of competitors in each category and their current total production capacity and wood demand. Additionally, Figure A-2 provides a visual representation of the geographic distribution of competitors within the Competition Zone.

Table A-1. Summary of Competitors in the Competition Zone and Annual Wood Demand

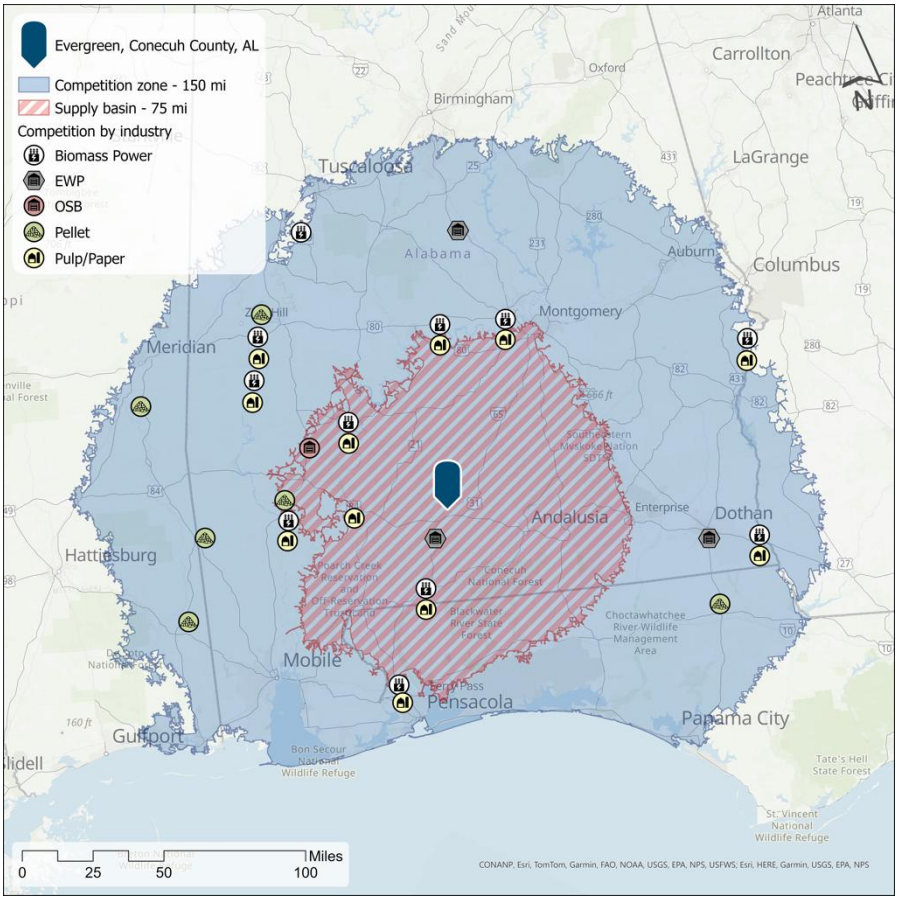
Category	Number of Companies	Production Capacity	Annual Wood Demand (bdt)	Estimated Wood Demand Met from the Supply Zone (bdt)
Pulp & Paper	11	9.1 million tons	14,706,000	4,143,000
Wood Pellets	6	2.3 million tons	2,476,000	254,000
OSB/MDF	1	725 MMSF[2]	663,000	239,000
Engineered Wood Products	3	15 MMCF[3]	416,000	150,000
Biomass Energy	11	454 MW	2,545,000	733,000
Totals	32		20,806,000	5,519,000

- 32 competitors currently consume about 20.8 million bdt of woody biomass.
- These competitors draw about 5.5 million bdt of woody biomass from the Supply Zone
- Note that Table A-1 provides data for the entire Competition Zone, which overlaps with the Supply Zone.

Also of note is that there are six wood-chipping facilities within the Competition Zone with a combined production capacity of 2.1 million bdt/yr, which supply wood chips to some competitors, mainly pulp and paper mills and pellet plants.

[1] Alabama Forest Facts. https://www.forestry.alabama.gov/Pages/Education/PDFs/ForestFacts.pdf
[2] MMSF stands for million square feet
[3] MMCF stands for million cubic feet

Figure A-2. Competitors for Feedstock in the Competition Zone



New Projects and Expansions

Newly announced projects are listed in Table A-2. Two new pellet mill projects have been announced that are expected to start production in 2024. These mills will have a combined production capacity of 1.63 million tons and a biomass demand of 2,604,000 bdt/yr. Three facilities are planning to expand, two pellet mills and one pulp & paper mill, increasing wood demand by 632,000 bdt/yr. These expansions will increase total demand in the Competition Zone by 3,236,000 bdt/yr.

Note that not all new projects and planned expansions are public knowledge. It is possible that some of these additional demands on the biomass supply have not been accounted for.

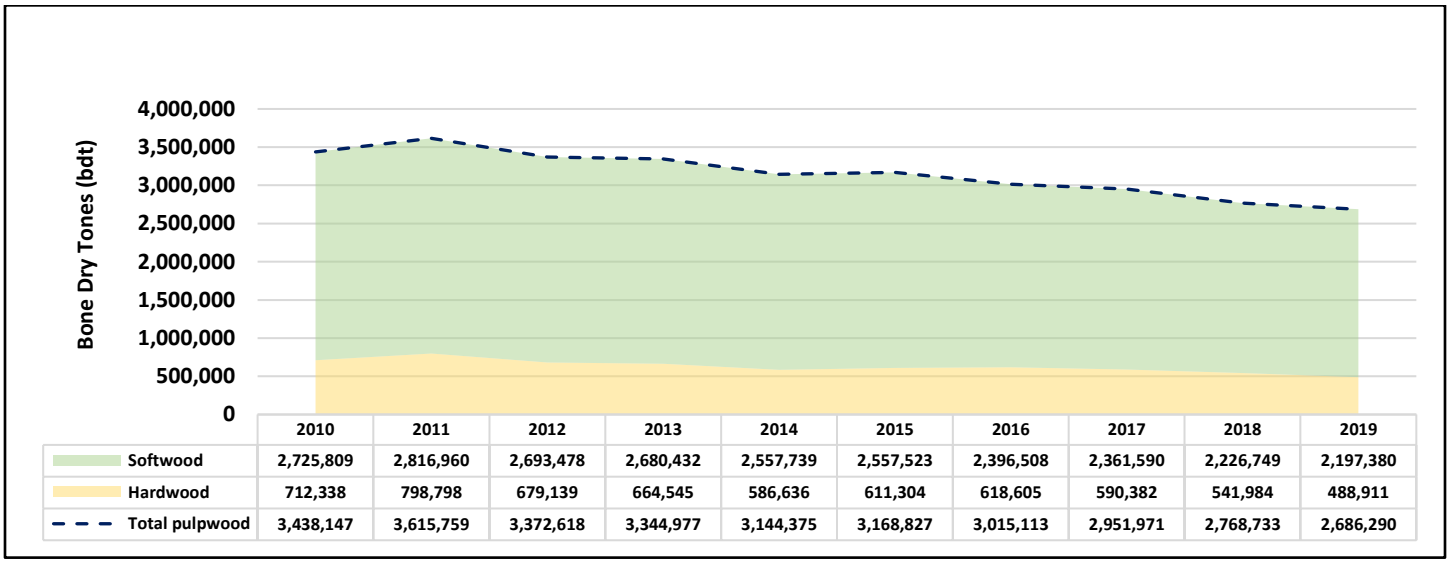
Table A-2. Announced New Competitors in the Competition Zone

Industry	Category	Number of Companies	Production Capacity (million tons)	Biomass Demand (bdt)
Wood Pellets	New Facility	2	1.63	2,604,000
Wood Pellets	Expansion	2	1.36	191,000
Pulp & Paper	Expansion	1	0.24	441,000
Totals		5	3.23	3,236,000

Pulpwood and Forest Residue Harvest in the Supply Zone

Pulpwood and Forest Residue harvest (removals) within the Supply Zone affect the available woody biomass. Unlike demand in the Competition Zone, removals in the Supply Zone directly affect biomass availability to new projects. Figure A-3 graphs the data from 2012 to 2021, showing the removals for total pulpwood broken down by softwood and hardwood species.

Figure A-3: Pulpwood- Average Annual Harvest Removal in the Supply Zone



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Softwood	2,725,809	2,816,960	2,693,478	2,680,432	2,557,739	2,557,523	2,396,508	2,361,590	2,226,749	2,197,380
Hardwood	712,338	798,798	679,139	664,545	586,636	611,304	618,605	590,382	541,984	488,911
Total pulpwood	3,438,147	3,615,759	3,372,618	3,344,977	3,144,375	3,168,827	3,015,113	2,951,971	2,768,733	2,686,290

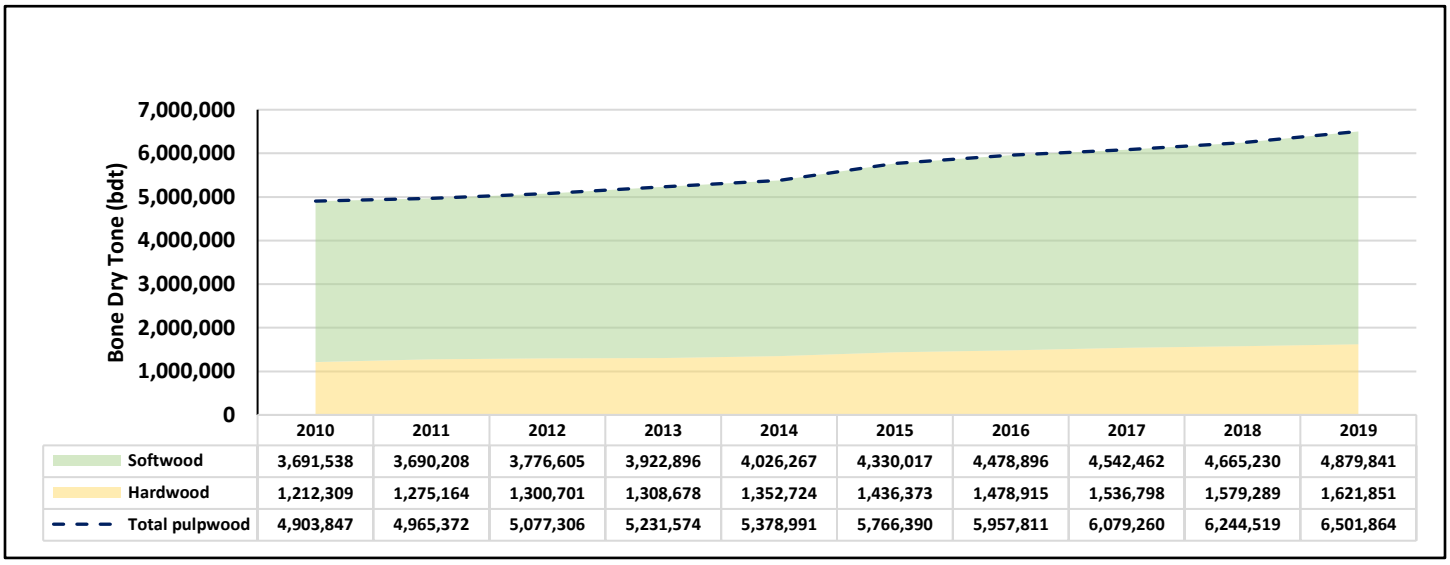
Pulpwood removals have steadily declined between 2011 and 2019 by about 26%, 930,000 bdt.

- Softwood removals have declined about 22% over this time period.
- Softwood removals have declined about 39% over this time period.
- Some of this decline can be attributed to a decreasing demand for paper and competition from foreign pulp producers, notably Brazil.[4]
- If this trend continues, the supply of standing pulpwood is expected to increase.

[4] Personal communication. Dru Preston. Georgia Forestry Commission. Oct 2023.

Figure A-4 shows the average annual net growth of pulpwood in the Supply Zone.

Figure A-4. Average Annual Net Growth and Harvest Removal in the Supply Zone



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Softwood	3,691,538	3,690,208	3,776,605	3,922,896	4,026,267	4,330,017	4,478,896	4,542,462	4,665,230	4,879,841
Hardwood	1,212,309	1,275,164	1,300,701	1,308,678	1,352,724	1,436,373	1,478,915	1,536,798	1,579,289	1,621,851
Total pulpwood	4,903,847	4,965,372	5,077,306	5,231,574	5,378,991	5,766,390	5,957,811	6,079,260	6,244,519	6,501,864

- New growth of pulpwood has steadily increased between 2010 and 2019 by about 32%, adding 1.6 million bdt to the timberland over this time period.

Comparing net growth of pulpwood (Figure A-4) to harvest removals (Figure A-3) allows calculation of the growth-to-drain ratio. This indicator increased from 1.4 to 2.4 between 2010 to 2019, demonstrating a significant increase in standing pulpwood availability. A growth-to-drain ratio of 2.4 means that 2.4 times more pulpwood was produced in the Supply Zone than was harvested, an indication of sustainable forest practices in the supply zone.

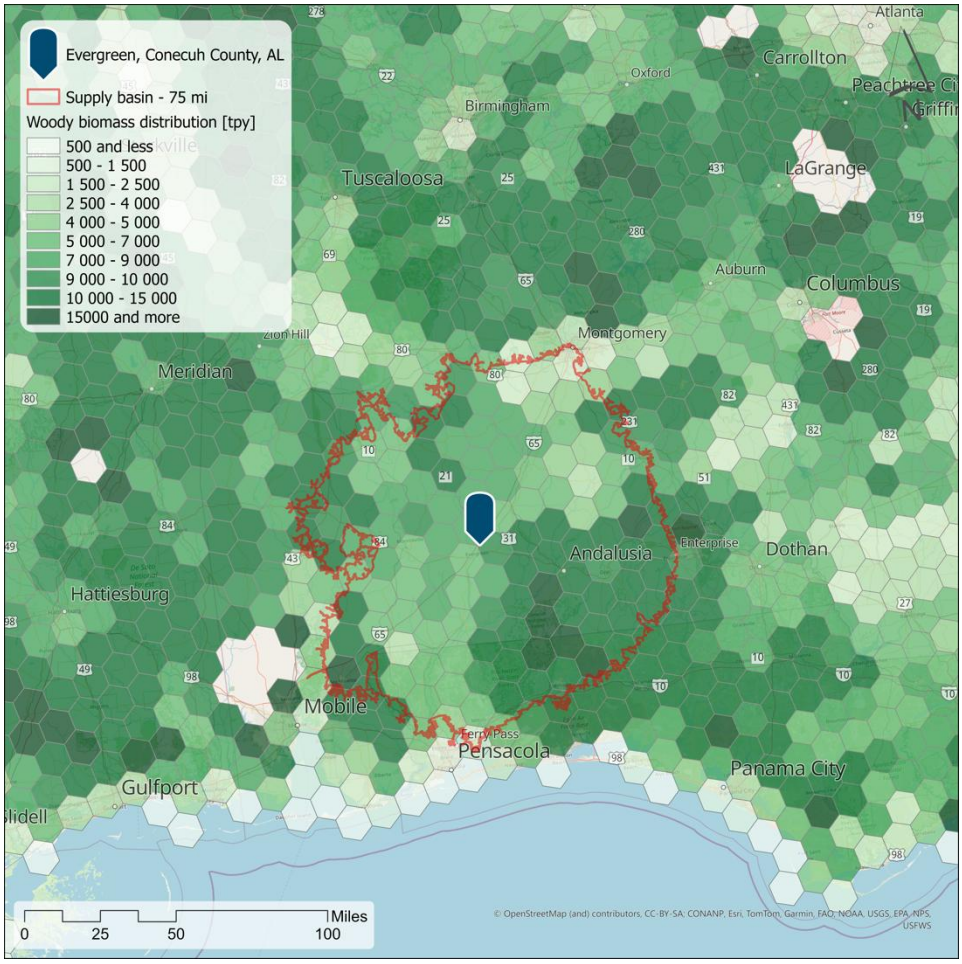
Pulpwood and Forest Residue Availability in the Supply Zone

The high-level estimates of pulpwood and forest residue availability in the Supply Zone were sourced from the US Department of Energy's Billion-Ton Report.[5] This report offers projections on biomass availability until 2040, grounded in assumptions regarding market and logistical conditions, as detailed in Table C-2 (Appendix C).

County-level estimates for the years 2020, 2025, 2030, and 2040 were acquired and processed utilizing GIS software. A Supply Zone polygon, representing a 75-mile maximum transport distance was created, allowing an estimate of the woody biomass in the Supply Zone. Figure A-5 shows a representation of woody biomass estimates within a 75-mile driving distance from Evergreen, AL, the center point of the BDO Zone.

[5] https://bioenergykdf.net/2016-billion-ton-report

Figure A-5. Woody Biomass Distribution in the Supply Zone



The algorithm assesses the percentage area of each county within the Supply Zone (percentage overlap value). The resulting values were multiplied by the average annual pulpwood and forest residue availability for 2020-2040, providing an estimate of the total quantity available in the Supply Zone for potential new entrants. Supply curves were then developed using the Supply Zone polygon to estimate the quantity of pulpwood and forest residue available in 5-mile transport distance segments, up to the 75-mile maximum transport distance.

The BDO Zone rating process, initiated from the Billion-Ton Study estimates, determines the quantity of low-risk biomass available in the Supply Zone. It is essential to recognize that this quantity is typically less than the total estimated availability. Various factors, such as private landowner reluctance, inadequate infrastructure, labor accessibility, and adverse weather conditions during harvest season, contribute to not all produced biomass being available for future projects. Furthermore, assumptions made to estimate total potential biomass availability may not fully capture real-world scenarios.

To account for uncertainties in the woody biomass availability assessment, the Biomass Availability Multiple (BAM) is applied to the total potential biomass available. BAM serves as an indicator of supply chain resilience in the face of shortages or supplier breaches, with a higher BAM factor reflecting higher uncertainty in biomass availability for a project.

Given that the forest products industry is well established in the BDO Zone, a BAM of 1.5 reflects a low risk of pulpwood availability. A higher BAM of 4 is being applied to forest residues, given that there is little active harvesting of this resource in the area.

Table A-3 displays biomass availability estimates for pulpwood and forest residues based on the Billion-Ton Study. These figures represent the total potential availability in the Supply Zone, considering the excess biomass after accounting for current and projected biomass use until 2040.

Table A-3. Estimate of Average Annual and Low-risk Quantities of Pulpwood and Forest Residues through 2040

Biomass Type	Average Annual Availability (bdt/yr)	Low-Risk Quantity after incorporating BAM factor (bdt/yr)
Pulpwood	704,000	470,000
Forest Residues	318,000	80,000

Table A-3 indicates that the average total volume of pulpwood in the Supply Zone is estimated to be 704,179 bdt/yr, assuming current timber growth rates, continuing economic conditions, and level of competition. After applying BAM, it is estimated that approximately 67% of this amount, 470,000 bdt/yr, could be available for a new project at low risk.

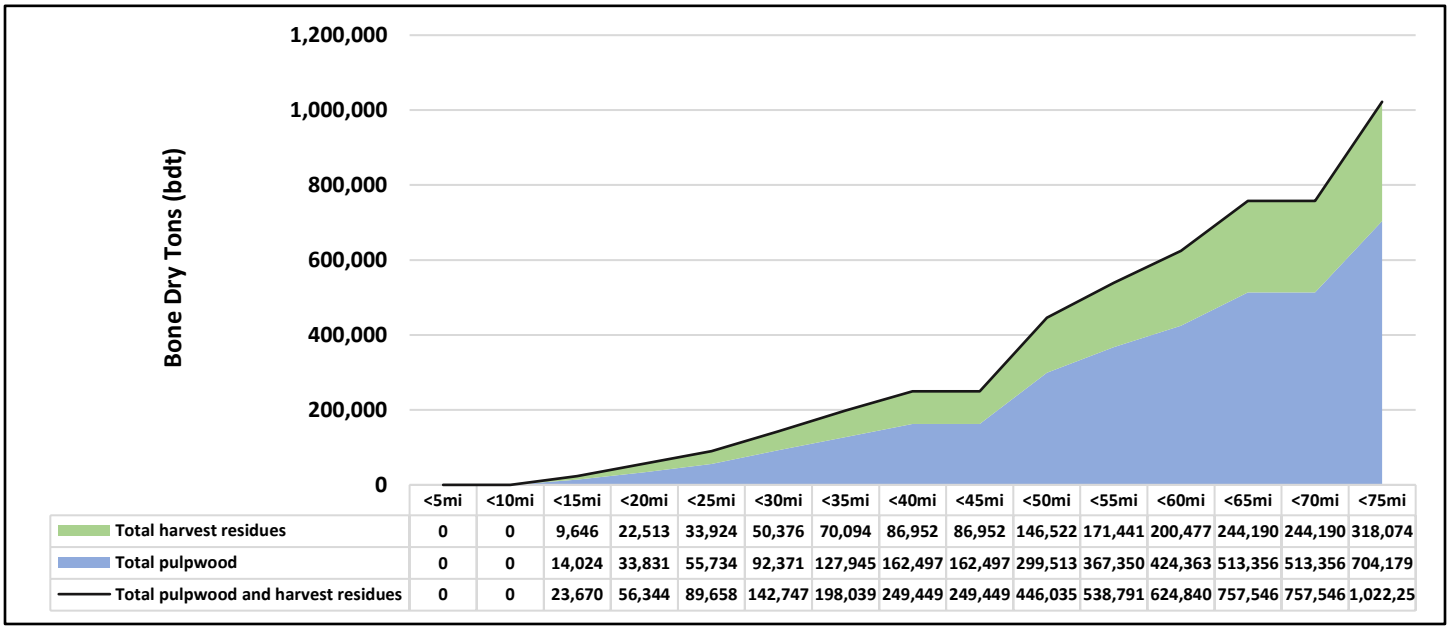
Likewise, the total volume of forest residues in the Supply Zone is estimated at 318,000 bdt/yr. Applying BAM, it is estimated that approximately 25% of this amount, 80,000 bdt/yr, could be available for a new project at low risk. This low percentage of recoverable forest residues reflects that this biomass resource is not currently being harvested in the Supply Zone because other biomass types are high quality and readily available[6]. The US Forest Service reports that forest residues were being harvested in Alabama as recently as 2020 and constituted as much as 16 to 19% of the total removals between the 2015 and 2020 period[7]. While the equipment and expertise needed to harvest forest residues are present, it would take some time to develop a market and ramp up the collection of this available resource.

The volume available and price are affected by the distance of the biomass from the center point of the BDO Zone in Evergreen, AL. Figure A-6 shows the effect of distance on biomass availability. Note that the availability of both pulpwood and forest residues increases with increasing distance. The price of biomass will also rise with increasing distance, as the cost of transportation is a significant component of the total price.

Further breakdown of available pulpwood and/or harvest residues by driving distance is shown in Figures A-7 and A-8.

[6] Personal Communication. Johnny Grace, US Forest Service, Florida A&M University; Benji Elmore, Alabama Forestry Commission.
[7] Alabama's Forests, 2020. USDA Forest Service. Southern Research Station. Resource Bulletin SRS-235. July 2023. Accesses March 1, 2024.

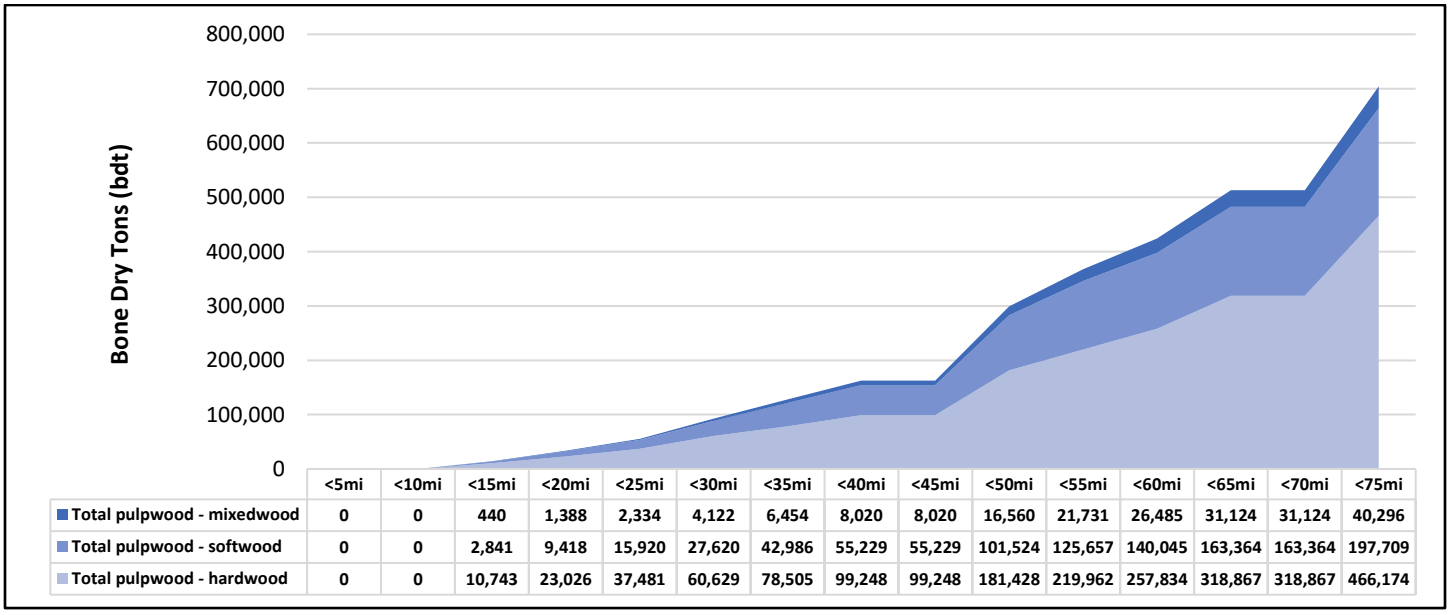
Figure A-6. Estimated Annual Average Pulpwood and Forest Residues Availability by Driving Distance



	<5mi	<10mi	<15mi	<20mi	<25mi	<30mi	<35mi	<40mi	<45mi	<50mi	<55mi	<60mi	<65mi	<70mi	<75mi
Total harvest residues	0	0	9,646	22,513	33,924	50,376	70,094	86,952	86,952	146,522	171,441	200,477	244,190	244,190	318,074
Total pulpwood	0	0	14,024	33,831	55,734	92,371	127,945	162,497	162,497	299,513	367,350	424,363	513,356	513,356	704,179
Total pulpwood and harvest residues	0	0	23,670	56,344	89,658	142,747	198,039	249,449	249,449	446,035	538,791	624,840	757,546	757,546	1,022,25

- At 40 mi from the center point, about 24% of the total pulpwood supply is available
- About 53% of the total available biomass in the Supply Zone is within 55 miles of Evergreen, AL.
- Pulpwood accounts for about 69% of the available biomass from timberlands

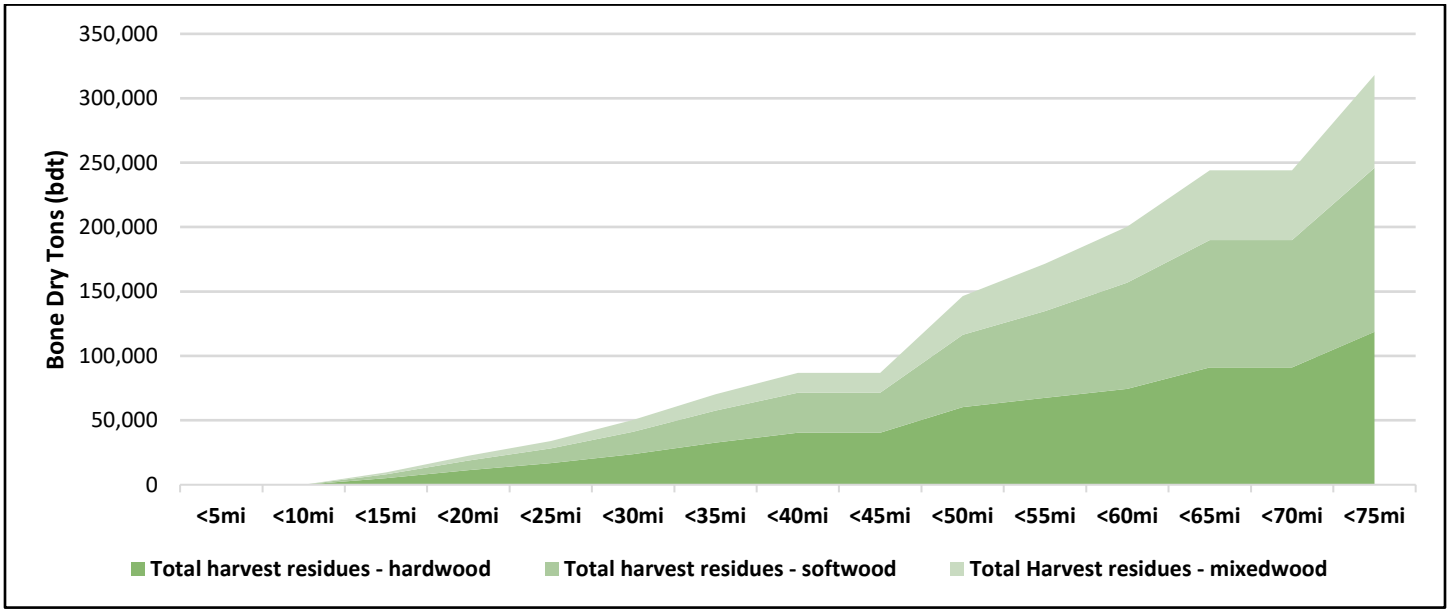
Figure A-7. Estimated Annual Average Pulpwood by Species Group and Driving Distance



	<5mi	<10mi	<15mi	<20mi	<25mi	<30mi	<35mi	<40mi	<45mi	<50mi	<55mi	<60mi	<65mi	<70mi	<75mi
Total pulpwood - mixedwood	0	0	440	1,388	2,334	4,122	6,454	8,020	8,020	16,560	21,731	26,485	31,124	31,124	40,296
Total pulpwood - softwood	0	0	2,841	9,418	15,920	27,620	42,986	55,229	55,229	101,524	125,657	140,045	163,364	163,364	197,709
Total pulpwood - hardwood	0	0	10,743	23,026	37,481	60,629	78,505	99,248	99,248	181,428	219,962	257,834	318,867	318,867	466,174

- Hardwood species comprise the majority of available pulpwood, at 66% of all available timber.
- Softwood species make up 28% of all timber available.
- Mixedwood species about 6% of timber.

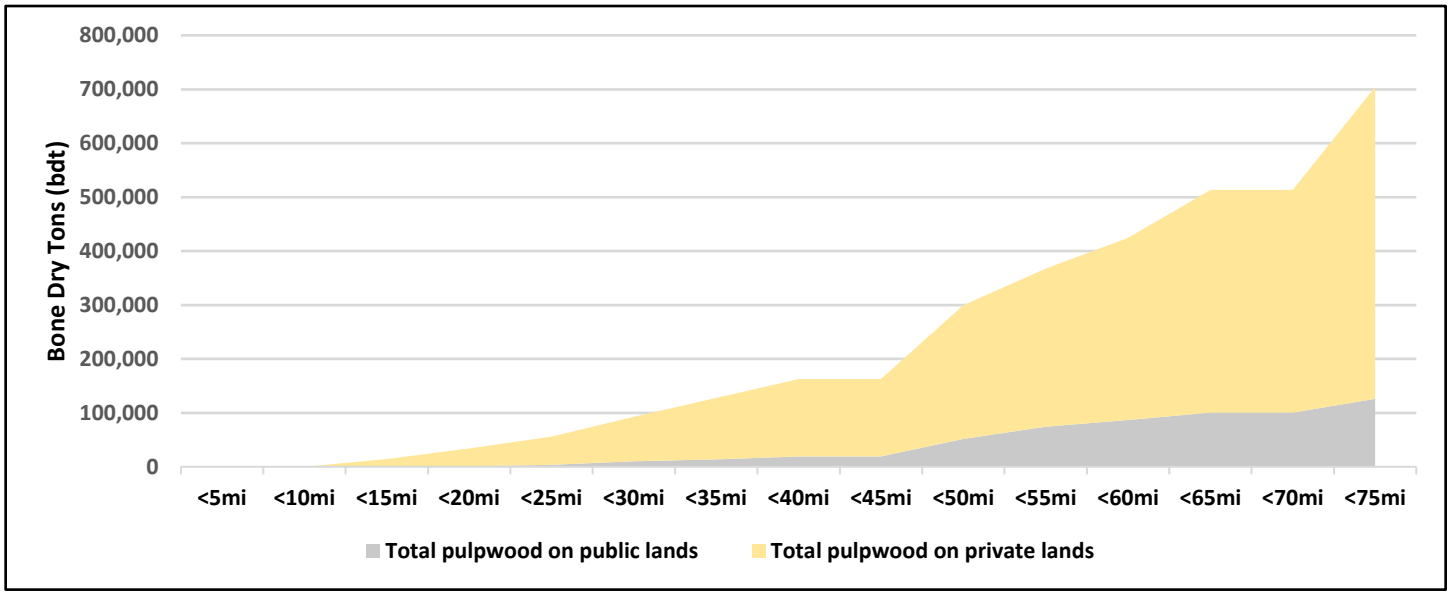
Figure A-8. Estimated Annual Average Harvest Residues by Species and Driving Distance



- Residues from hardwoods are slightly more prevalent up to 50 miles from the BDO Zone center point.
- Beyond 50 miles, softwood residues become the main supply.

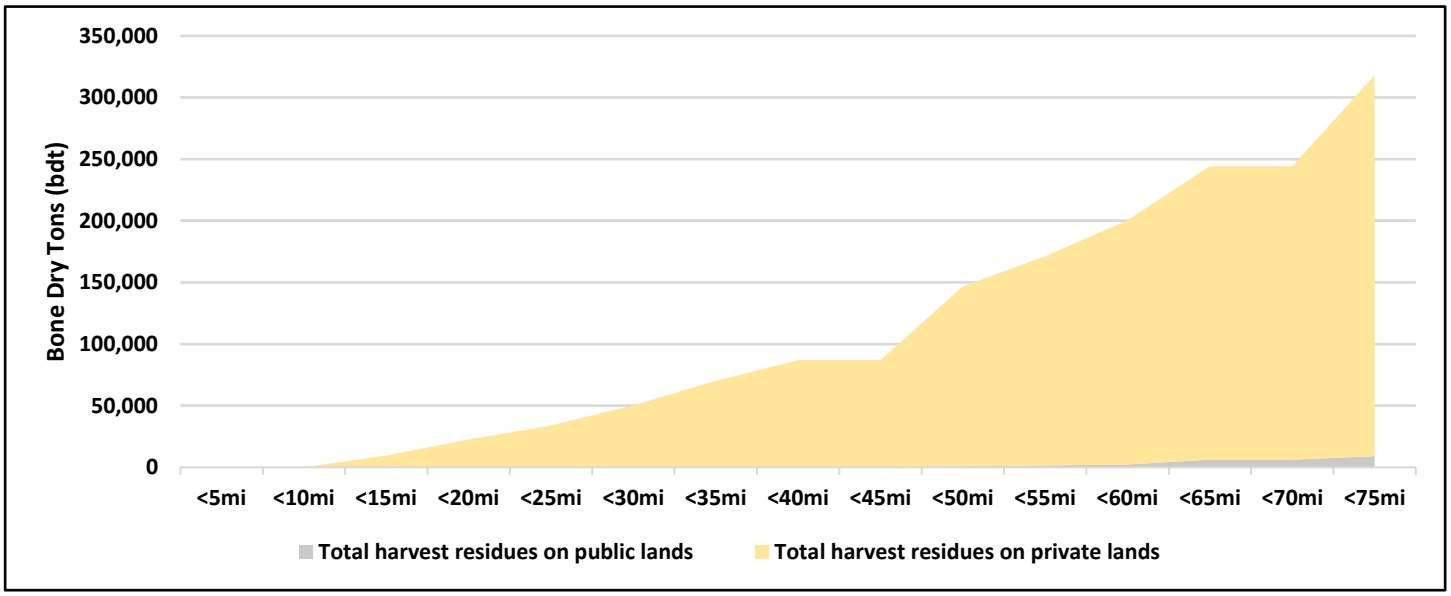
The availability of pulpwood and forest residues in private vs public lands is shown in Figures A-9 and A-10, respectively.

Figure A-9. Estimate of Annual Average Pulpwood Availability – Private vs Public Lands



- The majority of pulpwood is available from private lands, about 89%.

Figure A-10. Estimate of Annual Average Forest Residues Availability – Private vs Public Lands



- The majority of harvest residues are available from private lands.

Sawmill Residues Availability in the Supply Zone

Within the Supply Zone, there are 14 potential suppliers of sawmill residues. Figure A-11 shows the location of these mills in the Supply Zone. Nine of these mills produce lumber, while the remaining five produce plywood or veneer. The nine mills produce lumber with a total annual capacity of 1,222 MMBF (Table A-4). The five plywood/veneer mills produce 606 MMSF of product annually.

Figure A-11. Feedstock Suppliers in the Supply Zone

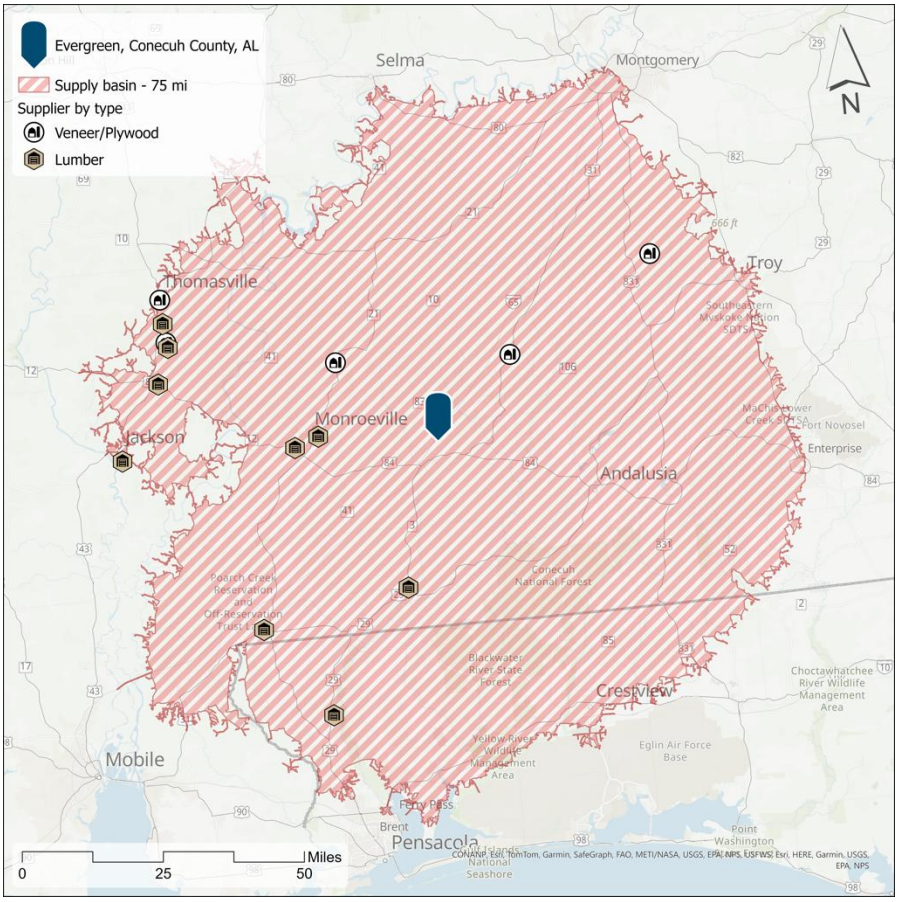


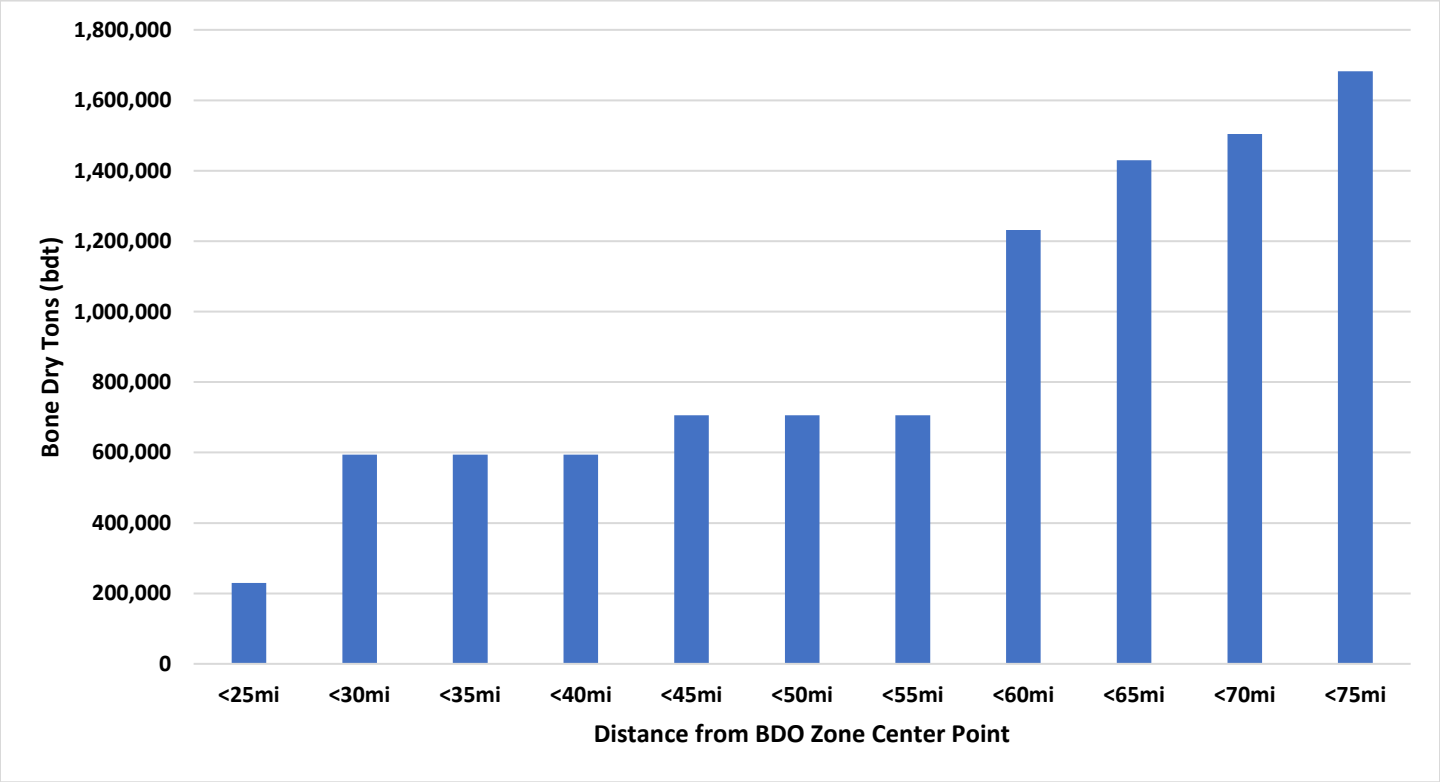
Table A-4. Sawmill Capacity in the Supply Zone

Sawmill Type	Estimated Annual Capacity
Lumber	1,212 MMBF
Veneer/Plywood	606 MMSF

During the process of converting roundwood to the final product, waste material is generated. These waste materials are referred to as sawmill residues and include: chips, sawdust, shavings, hog fuels (bark), log yard breakage, and finished trims. The availability of sawmill residues can vary considerably due to several factors. Differences in the generation of residues can vary because of production efficiencies and prioritized use of the various residues. For example, a sawmill may generate heat and power on-site by combusting its residues. Alternately, sawmills may have preferred customers for their residues. Often, residual chips are bought by pulp & paper mills or industrial wood pellet mills. Pellet mills may use shavings and sawdust as feedstock. Bark is often sold as boiler fuel or for landscaping mulch. Log yard breakage and finished trims may be chipped and mixed with other residues.

Sawmills in the Supply Zone were contacted to determine the actual volume of available residues. Figure A-12 shows the available supply of sawmill residues based on distance from the BDO Zone center point.

Figure A-12 Annual Sawmill Residue Generation in the Supply Zone – Distance by Volume



- 42% of the total available sawmill residues are within 45 miles of the center point.
- 73% of the total available sawmill residues are within 60 miles of the center point.

Based on outreach to sawmills, it was determined that almost all the sawmill residues produced are currently being used internally or bought by other facilities. However, there does not appear to be a high degree of vertical integration between sawmills and pulp & paper or pellet mills that could limit sawmill residue availability.

The current situation is that all sawmill residues are sold. Most of the sawmills have contracts with buyers that are in the three- to five-year range. Each of the sawmills contacted indicated that they were open to new buyers upon termination of the current contract. While this situation suggests that sawmill residues can be available, sawmills would likely prefer to continue with current buyers where the business relationship has been good.

Another consideration regarding the ability of a new entrant into the market to acquire sawmill residues is location. Given the location of competitors for feedstock (Figure A-2) and the suppliers of sawmill residue (Figure A-11), the clusters of suppliers and competitors occur in three primary areas relative to Evergreen: northwest, west and southwest. The advantage of proximity in these clusters is the reduced transport cost of sawmill residues from the suppliers to the competitors

A new facility in Evergreen would likely have a competitive disadvantage in acquiring sawmill residues both because of distance and the strength of ongoing relationships. New buyers of sawmill residues would probably need to pay a premium of 10 to 20 percent over current prices to secure contracts.

Due to the uncertainty around the sawmill residues availability for future biomass projects, as with pulpwood and forest residues, a Biomass Availability Multiple (BAM) is applied to estimate the amount of harvest residues that would be available for future biomass projects at low risk. Given the current market, a BAM of 4.0 was applied for sawmill residues

in the Supply Zone, meaning that only 25% of sawmill residues would be available for future biomass projects at a premium price (Table A-5).

Table A-5. Estimated Low-risk Available Quantities of Sawmill Residues

Biomass Type	Average Annual Availability (bdt/yr)	Low-Risk Quantity after incorporating BAM factor (bdt/yr)	Percent of Total
Residual Chips	1,231,000	308,000	73%
Sawdust	6,700	1,000	<1%
Shavings	154,000	38,000	9%
Bark	291,000	72,000	17%
Total	**1,682,700**	**419,000**	

- Large majority of available sawmill residues are residual chips.
- Clean sawdust is in short supply, less than 1% of the total.
- Most sawmills mix sawdust with bark or burn it on site.

Woody Biomass Pricing

Feedstock pricing data for this project was collected from three sources, including direct outreach to the sawmills and local experts in the supply zone, Timber Mart South,[8] which provides average historical pricing for both pulpwood and sawmill residuals on a quarterly basis, and published documents.

In this section, we first report the current delivered price of sawmill residues, pulpwood, and forest residues provided by the local sawmills and other local experts (Table A-6). The recent and historical price of pulpwood sawmill residues estimated by Timber Mart is shown in Table A-7.

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 pulpwood and moisture content of other feedstock as indicated.

Table A-6. Pricing Estimates for Woody Biomass in the Supply Zone Based on Outreach

Woody Biomass Type	Asking price delivered to the center point ($/bdt)	Comments/Assumptions
Pulpwood	61.20	Price range: $56 to $83 Delivered moisture content 50%
Forest Residues[9]	65.50	Price range: $59 to $72 Not being harvested currently.
Residual Wood Chips	74.67	Price range: $64 to $91 Delivered moisture content 40-50%
Sawdust	72.50	Price range: $64 to $80 Delivered moisture content 50%
Wood Shavings	66.93	Price range: $56 to $101 Delivered moisture content 9-12%
Hog fuel/bark	40.93	Price range: $30 to $52 Delivered moisture content 35-40%

[8] 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.

[9] Estimated delivered price. Personal Communication. Bear Creek Consulting LLC, Grove Hill, AL; Sizemore & Sizemore, Inc, Tallassee, AL.

TimberMart South pricing data is shown in Table A-8. This pricing is a regional average covering roughly the southeastern half of Alabama and the western portion of the Florida panhandle. While not exactly overlaying the Supply Zone and Competition Zone, these prices are a good approximation of the area. A summary of the price range for sawmill residues is shown in Table A-8.

Table A-7. Recent and Historical Average Regional Price of Woody Biomass - TimberMart-South

Woody Biomass Type	Price in Q3 2023 ($/bdt)	Historical Price (2014-2023) ($/bdt) Adjusted for Inflation			Comments/Assumptions
		Average	High	Low	
Softwood Pulpwood, AL	57.18	63.75	71.80	57.18	Delivered price, AL
Softwood Pulpwood, FL	60.51	67.56	75.97	60.51	Delivered price, FL
Hardwood Pulpwood, AL	68.55	75.98	83.49	65.22	Delivered price, AL
Hardwood Pulpwood, FL	58.56	61.99	74.90	56.35	Delivered price, FL
Softwood Sawmill Chip	31.65	53.49	62.67	31.65	AL pricing, FOB sawmill
Whole Tree Chip, Pine	54.13	50.08	67.40	39.82	South-wide pricing, FOB
Forest Residues					Data not available
Hardwood Sawmill Chip	57.16	63.82	67.44	57.16	AL pricing, FOB sawmill
Sawdust					Data not available
Wood Shavings	52.08	46.73	58.78	40.67	South-wide pricing, FOB
Hog fuel/bark	37.06	34.48	42.37	27.90	South-wide pricing, FOB

A summary of the price range for sawmill residues is shown in Table A-8.

Table A-8. Summary of Pricing for Woody Biomass Available in the BDO Zone.

Woody Biomass Type	Delivered Price Range ($/bdt)
Pulpwood	56 - 83
Wood chips	64 - 91
Sawdust	64 - 80
Wood shavings	56 - 101
Bark/hog fuels	30 - 52

The delivered price of biomass reported here includes the cost of stumpage (pulpwood and whole tree chip) paid to the landowners, harvesting and loading onto a log truck, transportation costs, and broker fees. Stumpage prices as a fraction of total delivered cost varies by state and species. For Alabama, pine pulpwood stumpage fees account for 28% of total delivered cost while hardwood pulpwood stumpage fees are 41% of total delivered cost[10]. For Florida, these fractions are 36% and 25%, respectively. The cost of harvesting and loading onto a log truck makes up about 30% of the delivered cost for pulpwood[11]. The cost of transportation is discussed in the next section.

[10] TimberMart South 4Q2023 South-Wide Complete. Vol. 48 No. 4.
[11] TimberMart South 4Q2023 Supplement.

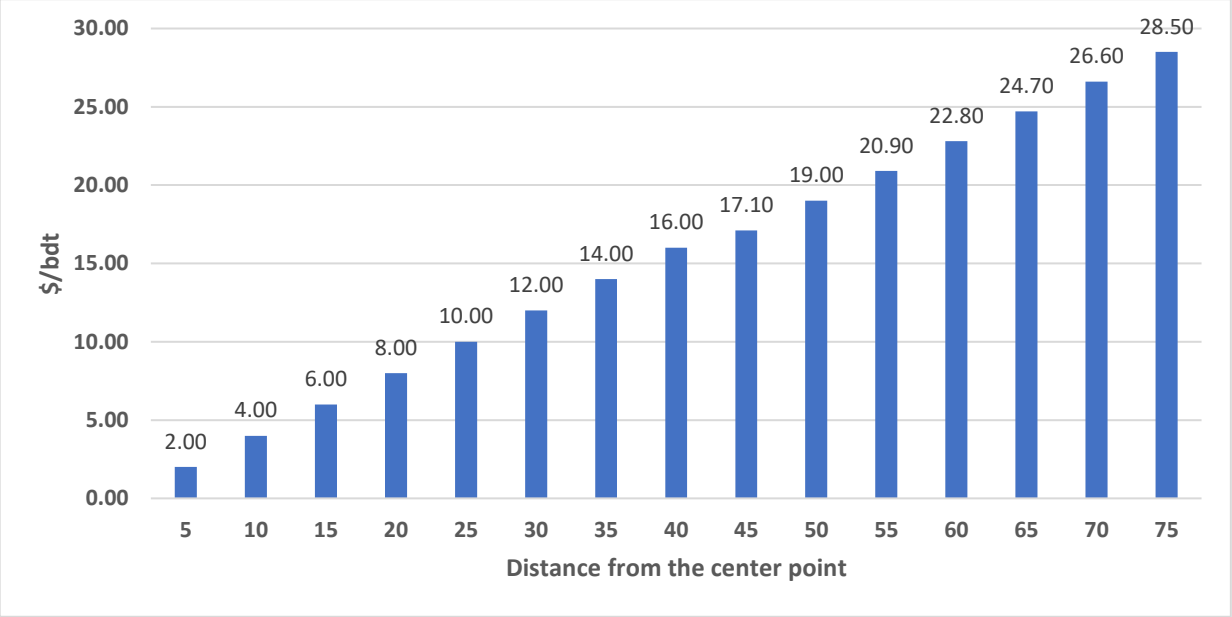
Transportation Cost

Transportation of woody biomass from timberland to mill in the BDO Zone is carried out by trucking. Whole logs are transported by logging trucks. Chipped whole trees, harvest residues, and sawmill residues are transported by open bin trailers or walking floor trailers.

Understanding the portion of delivered cost accounted for by hauling biomass from the source to the delivery point is useful. According to TimberMart South,[12] current haulage costs are based on USD per green ton per loaded mile. A minimum haul rate of $0.19 for the first 40 miles is charged. Additional haul distance is charged at $0.19 per mile. The average haul distance is 47 miles. Note that haul rates can change seasonally.

Figure A-13 below shows the cost of various haul distances. These data were converted to cost per bdt to remain consistent with other data in this document. For an average transportation distance of 50 mile, the transportation cost is estimated to be $19/bdt.

Figure A-13. Transportation Cost Based on Distance ($/bdt)



- Transportation costs are directly proportional to the haulage rate per loaded mile
- As of 4th quarter 2013, the haulage rate per loaded mile is $0.19 per green ton ($0.38/bdt)
- In Alabama, the average loaded log truck carries 12.5 bdt

[12] ibid.

APPENDIX B: RISK INDICATOR SCORING METRICS

CATEGORY 1.0: SUPPLIER RISK

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

1.1.1 Longevity & History of Supplier Performance

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

Risk Information: Forestry has a long and rich history in southern Alabama, with large-scale logging and lumbering becoming widespread in the late 19th century with the establishment of railroads, steam-powered equipment, and mills.[13]

There are 14 suppliers and lumber mills in the BDO Zone, 10 of which have been operational for years or more. Two lumber mills were established within four and six years, respectively.

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**

1.2 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 11 pulp & paper mills and six pellet mills in the BDO Zone that compete for available sawmill residues. Most sawmill residues are under contract to these facilities or sold to out-of-state competitors. Where present, these contracts for sawmill residues are typically 3 to 5 years in length. Of the sawmills contacted, most were interested in working with new customers upon termination of existing contracts.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**6**

[13] Encyclopedia of Alabama. https://encyclopediaofalabama.org/article/forest-products-industry-in-alabama/

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: Within the 75-mile radius of the study area, approximately 89% of the timberlands are privately owned, while the federal or state government owns 11%.[14] This ownership distribution is highly advantageous for accessing open-market timber resources for industrial purposes. The significant private ownership proportion facilitates a favorable environment for industrial timber procurement within the region.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10.	**Score** **2**
Raw Risk Impact (RRI) The risk impact is deemed *very low*, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 4 out of 100.	**Score** **4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 4 out of 100.	**Score** **4**

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

[14] Alabama Forestry Commission.

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 the final feedstock.
Risk Information: In Alabama, it is common for logging companies to own their logging equipment, such as feller-bunchers, skids, and loaders.
Raw Risk Likelihood (RRL) — **Score**
The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. — **2**
Raw Risk Impact (RRI) — **Score**
The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. — **2**
Gross Risk Indicator (GRI) — **Score**
The Gross Risk Indicator (RRL × RRI) is 4 out of 100. — **4**
Mitigation/Notching — **Notch**
RRL Mitigation (Notch) — **NN**
No adjustment.
RRI Mitigation (Notch)
No adjustment.
The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score ((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: It is common in Alabama for logging companies to own their own logging trucks and trailers.
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**

1.3.4 Feedstock as a Secondary Transformation

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

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

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

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

Risk Information: The primary source of feedstock in the BDO Zone is pulpwood, which is not a byproduct of the forest industry. In contrast, the production of forest and sawmill residues mainly depends on the housing market, a leading indicator for the US economy.

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

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 in Alabama is an industry with a rich and long history, with professional forestry and forestry programs being practiced since the mid-20th century. Alabama's forestry sector is a significant part of the economy, using modern methods and sustainable management practices.

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: The Supply Zone has a long history of robust timber production and log processing, spanning several decades. Since 2010, the region has consistently increased annual timber production from about 7 to 10.3 million bone dry tons (bdt), a 47% increase (Figure A-4). Notably, the growth-to-drain ratio exceeds 2.0, indicating that more than twice the amount of wood is produced than consumed.

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**

1.5 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: In the BDO Zone, logging and trucking have deep roots, with a forest products industry boasting a rich 150-year history. Suppliers in this region possess extensive expertise in harvesting, handling, and transporting 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 natural by-product of the sawmill industry, generated as an integral part of wood processing operations. Similarly, forest residues are produced as a by-product of the harvesting of pulpwood and sawtimber, typically being piled at the harvest site. The production of sawmill and forest residues is closely linked to the regular operations of the industry.

Sawmill residues are generated in substantial quantities and are highly sought-after as a feedstock by the pulp & paper and industrial pellet industries. On the other hand, while forest residues are not commonly harvested, there is a significant level of expertise and experience in their collection, and the necessary equipment for their gathering is readily available.

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**

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 Evergreen, AL, there are 34 competitors for woody biomass feedstock. Seven of these are within the 75-mile driving distance constitution of the BDO Zone. Of these facilities, the BDO Zone includes four pulp & paper mills, two wood pellet mills, one OSB/MDF mill, and three biomass energy facilities. See Figure A-2 for a map showing the location of these competitors.

The combined consumption of these mills is estimated to be approximately 24.5 million bdt annually. 11.9 million bdt of this demand (56%) comes from competitors within the BDO Zone itself. Concerning the total biomass demand, pulp & paper accounts for 60%, wood pellets 10%, biomass energy 26%, and OSB/MDF/Engineered Wood Products production 4% (Table C-3).

The woody feedstocks subject to this competition are pulpwood and sawmill residues. Forest residues are not collected in significant amounts within the Competition Zone.

The likelihood of this risk indicator is deemed to be medium, given the large proportion of total competition coming from within the BDO Zone.

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**

2.1.2 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 were down about 26% between 2011 and 2019 (Figure A-3). In the BDO Zone, this decline equals approximately 930,000 bdt. 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.

Almost 100% of the sawmill residues are being consumed by pulp & paper mills and manufacturers of industrial wood pellets. While the supply of sawmill residues is mostly under contract for the short term, 3 to 5 years, all the sawmills contacted were receptive to new market entries.

Forest residues have historically been an underutilized resource. None of the local experts[15] contacted reported that forest residues were being collected. This trend is unlikely to change in the near future, as this feedstock is more expensive to harvest than pulpwood and tends to be dirty, given the harvest methods.

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

The overall risk likelihood and impact are deemed low, given that the most available feedstock is pulpwood.

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**

[15] Personal communications: Dan Chappell, AL Forestry Commission; Benji Elmore, AL Forestry Commission; Thomas Gallagher, Auburn University.

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: For the past decade, delivered pulpwood has averaged about $67 per bdt, varying between a low of about $56 and a high of about $84. Wood shavings delivered prices have averaged about $52 per bdt with a low of about $41 and a high of $59. Bark/hog fuel delivered prices have averaged about $37 per bdt, with a low of about $28 and a high of $42.

Price fluctuations reflect economic indices such as CPI and the price of diesel fuel. Pulpwood prices, adjusted for inflation, have changed little over the past ten years, and the associated risk is rated low.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**Score** **4**
Raw Risk Impact (RRI) The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**Score** **16**

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: Two new pellet mill projects have been announced that are expected to start production in 2024. These mills will have a combined production capacity of 1.63 million tons and a biomass demand of 2,604,000 bdt/yr.

Three facilities are planning to expand, two pellet mills and one pulp & paper mill, increasing wood demand by 632,000 bdt/yr. These expansions will increase total demand in the Competition Zone by 3,236,000 bdt/yr. If all the announced new capacity is implemented, this would represent a 13% increase in wood demand. Another factor is the migration of wood-using industries from the US Pacific Northwest and Canada to the US South to take advantage of the favorable wood baskets.[16]
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**

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: It is common for landowners and forestry contractors to favor the highest bidder for their products or services. A negligible segment of the wood supply chain is anchored in enduring supply contracts or through vertically integrated structures, such as the dual role of sawmill operations and timberland utilization. This strategic positioning is unlikely to affect the availability of rated pulpwood for emerging projects. The prospect of securing rated pulpwood quantities for new initiatives remains unhampered by contractual engagements or established affiliations. *Forest Residues:* The market for forest residues is minimal, as this resource is not being harvested presently. The most common use for this biomass category is as boiler fuel. Given the large amount of available pulpwood and the characteristically low quality of forest residues, harvesting this biomass is only likely to occur if the price of pulpwood and hog fuel becomes high enough to justify it. *Sawmill Residuals:* Sawmill operators are open to establishing relationships with new buyers once existing contracts for residues expire. Outreach to sawmill operators implied they would welcome new buyers if offered a competitive price. However, sawmill operators are unlikely to switch to unknown customers for long-term contracts unless the price offered is a meaningful increase.
Raw Risk Likelihood (RRL) **Score** The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. **4**

[16] North American lumber is moving south. https://qz.com/north-american-lumber-is-moving-south-1849699339. Accessed Jan 19, 2024.

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**

2.1.6 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.[17]

Risk Information: Analysis of the quarterly feedstock prices for pulpwood, shavings, hog fuel, and whole tree chip does not indicate any significant 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 *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**

2.2 Risk Factor: Specific Competitors' Competitive Advantage

2.2.1 Relative Inventory Capacity

Rationale: The more inventory a competing biomass facility is able to store, the more competitively pressure it can exert on supply. Ability to store large inventories allows competitors to purchase inventory when the prices are low,

[17] Bergtold, 2018.

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 local experts,[18] one week's on-site inventory is standard for mills in southwest Alabama. Storage should not exceed two weeks to maintain wood quality.

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**

2.2.2 Relative Accessibility/Delivery Hours and Wait Times

Rationale: The value attributed by suppliers to local competing markets for biomass is often directly related to the degree of flexibility the market provides in terms of delivery hours, and the more efficiently discharge can occur.
Risk Information: Information from local experts[19] and a published article[20] indicates that log truck turn-times at pulp & paper mills and sawmills averaged about 30 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 *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**

[18] Personal communications: Dan Chappell, AL Forestry Commission; Matt Goodin, West Fraser, McDaniel Mill.
[19] Personal communications: Dan Chappell, AL Forestry Commission; Shannon Casey, West Fraser, McDaniel Mill.
[20] Conrad IV, J. L. (2018). Costs and challenges of log truck transportation in Georgia, USA. Forests, 9(10), 650.

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: Specifications for available feedstock remain consistent across pulpwood, sawmill residues, and forest residues in the BDO Zone. Standardized techniques have been employed for decades in both biomass production methods and the processing of this biomass, and the available feedstocks have predictable quality regardless of the market.

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**

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: The pulpwood market has been consistently falling over the past decade, while industrial wood pellet production is projected to increase due to worldwide demand, especially in Europe.[21] This situation will likely further increase demand and competition for sawmill residues in the BDO Zone. It is possible that if the pulpwood market continues to decrease, more pellet mills will be established and start sourcing pulpwood if pellet demand continues to increase. Another factor is the migration of wood-using industries from the US Pacific Northwest and Canada to the US South to take advantage of the favorable wood baskets.[22]

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**

[21] Industrial Wood Pellet Market. https://www.fortunebusinessinsights.com/industrial-wood-pellet-market-104844. Accessed January 29, 2024.
[22] North American lumber is moving south. https://qz.com/north-american-lumber-is-moving-south-1849699339. Accessed Jan 19, 2024.

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**

CATEGORY 3.0: SUPPLY CHAIN RISK

3.1 Risk Factor: Feedstock Availability

3.1.1 Biomass Availability Multiple (BAM)

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

Risk Information: The likelihood of the BAM factors being incorrect is considered low, given the consensus among consulted sources regarding the availability of pulpwood, sawmill residues, and forest residues, establishing a robust foundation for biomass availability. Additional details on the BAM estimation are given in Appendix A.

However, it is essential to recognize that inherent in the BAM factors are assumptions about future biomass supply and demands. Unforeseen supply and market factors, including the emergence of new competitors, weather events, and shifts in economic conditions, can significantly impact these assumptions and, in turn, influence biomass availability. Continuous monitoring and adaptation to dynamic external factors are imperative to maintaining the accuracy and reliability of BAM estimations.

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 *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 32 out of 100.	**32**
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 32 out of 100.	**32**

3.1.2 Feedstock Supply Curve/Marginal Cost Curve

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

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

Risk Information: The supply patterns for pulpwood, forest residues, and sawmill residues exhibit distinct characteristics. For pulpwood and forest residues, biomass availability increases as you move farther from the center point (as depicted in Figure A-6). In contrast, sawmill residues are only accessible from a limited number of sawmills, resulting in a stair-step availability pattern, as illustrated in Figure A-12.

Specifically, within a 55-mile driving distance the availability of feedstock:

- 52% of the total available pulpwood (367,000 of 704,000 bdt).
- 54% of the total available forest residues (171,000 of 318,000 bdt).
- 42% of the total generated sawmill residues (671,000 of 1,682,700 bdt).

Within 35 to 40 miles, approximately half the limit of the Supply Zone, feedstock availability is:

- 21% of the total available pulpwood (148,000 of 704,000 bdt).
- 25% of the total available forest residues (80,000 of 318,000 bdt).
- 35% of the total generated sawmill residues (559,000 of 1,682,700 bdt).

The low availability of feedstock close to the center point increases risk and impacts transportation costs.

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

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[23] and can manifest in shortages and higher costs for Issuers.

Risk Information: Timber harvests in the BDO Zone occur throughout the year, with the winter and spring seasons tending to be wetter. These weather conditions can occasionally limit loggers' ability to transport wood to the mills, although such limitations are typically temporary and of short duration. During the wetter winter and spring months, loggers may be relocated to "wet weather" tracts, which are usually situated on higher ground or have sandy/sandy loam soils that are more resilient in wet conditions. Conversely, the fall season is generally drier, making it an opportune time for mills to stockpile inventory in preparation for the ensuing winter and spring months. This well-coordinated approach helps to mitigate the challenges posed by seasonal weather patterns and ensures a steady supply of timber to the mills.

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**

3.1.4 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 increasing for the past decade (Figure A-4). The net growth of pulpwood increased between 2010 and 2019 by approximately 3.3 million bdt, a 47% increase. The growth-to-drain ratio for all timber has been rising steadily from 1.0 in 2010 to 2.0 in 2019, averaging 1.5 over this period. A growth-to-drain ratio of 2.0 indicates that twice as much timber is grown than removed each year.

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**

[23] 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 4 out of 100.	**4**

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: Over the past decade, feedstock price variations for pulpwood, whole tree chip, wood shavings, and hog fuel have been documented, as summarized in Table A-7. Notably, the historic peak prices for all these feedstocks were recorded in 2022, aligning with inflation rates. Among these feedstocks, pulpwood prices exhibited the least degree of price fluctuation, with the average price for pine pulpwood showing a slight downward trend. Conversely, shavings, whole tree chip, and hog fuel prices have demonstrated an upward trajectory over the past decade.

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**

3.2.2 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 significant industry in the BDO Zone for decades, and the supply chains for timber and sawmill residues are well established. While forest residues have not been harvested in large quantities, the methods used for their harvest are well-established and common to forestry operations.

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**

3.2.3 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: The region has a long history of forestry and use of forest products. The establishment of sawmills in southern Alabama traces its roots to the 19th century, a period marked by the rapid expansion of the lumber industry in the region. So, the industry has an established knowledge of pulpwood harvesting, handling and transportation, and the production and use of sawmill residues. The first pulp & paper mill was built in 1929. In contrast, harvesting forest residues, while feasible, is carried out rarely.

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 significantly influence the delivered feedstock prices. Key economic indicators, such as the Producer Price Index (PPI) or Consumer Price Index (CPI), are effective tools for monitoring price trends that impact biomass logistics, operations, and associated costs, including fuel, labor, equipment parts, and administration.

Figure C-9 illustrates the change in the CPI over the past four years for the US South Region, indicating a notable increase in inflation from November 2020 to June 2022. Subsequently, the rate of inflation has generally declined until now.

Diesel fuel is a significant component of biomass harvesting and delivery, thus rise and fall of fuel prices should be expected to follow general economic trends. A comparison between diesel prices (Figure C-10) and the CPI trend from 2020 to 2023 confirms that fuel costs parallel economic trends in the BDO Zone. Additionally, the price of delivered pulpwood closely tracks the CPI, further highlighting the interconnectedness between economic indicators and biomass-related costs.

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**

3.3.2 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: Currency risk is not a factor 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 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.

Risk Information: Border risk is not a factor 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 not rated.	**Notch** **NR**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is not rated.	**Score** **NR**

3.3.4 Temporary Externality-Driven Markets for Feedstock

Rationale: Alternative, non-traditional, externality-driven competitors for feedstock can drive feedstock demand (and cost) in unusual circumstances. For example, an Issuer using corn stover as a feedstock would not typically compete with the higher-end animal feed market. However, in times of significant hay shortage (e.g., during drought), farmers may use corn stover as hay replacement, driving the price of stover feedstock and decreasing its availability for bio-projects.[24]

Risk Information: The feedstock supply chains and manufacturing processes in the BDO Zone are firmly established. The probability of temporary external factors causing disruptions in the BDO Zone is low. Furthermore, there is no historical record of alternative, non-traditional competitors emerging in the region due to externalities. The established nature of

[24] Bergtold, 2018.

the supply chains and processes and the absence of such competitors contribute to the stability and reliability of feedstock availability in 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**

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: Harvest and collection of forest biomass uses modern methods that have been evolving for several decades. These well-established practices and equipment configurations contribute to the efficiency and effectiveness of forest harvesting operations in the 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	**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**

3.4.2 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: Equipment used for harvesting and processing forest biomass is commonly used in US 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	**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**

3.4.3 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.[25]

Risk Information: Not relevant to the BDO Zone.

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

[25] Huhnke, 2018.

Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *not relevant*, therefore the RRI is not rated.	**NR**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is not rated.	**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**

3.4.4 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 typical harvesting crew comprises five to six personnel to produce at least 55 to 65 truckloads per week.[26] Each truckload carries 12 to 14 bone dry tons (bdt) of wood, and the number of logging trucks required depends on the distance to the mill, with an average haul distance of 47 miles, according to TimberMart South. Published logistics analyses indicate an average of 12 loads per week per truck.[27]

Additional logging crews, truck drivers, logging equipment, and trucks are needed for a new biomass facility in the BDO Zone, operating at the rated volume of 470,000 bdt per year. Based on productivity statistics in the Alabama Lower Coastal Plain, this would require 12 to 13 logging crews (68 to 74 personnel) and 48 logging truck drivers.

A shortage of logging truck drivers has been identified as a bottleneck in Alabama, impacting forestry supply chains[28]. Moreover, rising log truck insurance costs in Alabama have exacerbated the log truck driver shortage.[29] Any difficulty in hiring logging truck drivers would directly impact biomass deliveries.

Some local experts[30] have identified a shortage of logging crews as an area of concern. While not as acute as the logging truck driver shortage, this labor pool impacts productivity.

The average age of logging company owners in Alabama is 56, and the average age of employees is 48.[31] About 35% of owners are expected to exit the industry within five years, with one-third reporting that their business would cease to operate. However, this trend may be offset by increasing consolidation, leading to the formation of larger logging companies in the industry**.**

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

[26] Bowman, T., Jeffers, S., & Naka, K. (2023). Characteristics and concerns of logging businesses in the southeastern United States: Results from a state-wide survey from Alabama. *Forests*, *14*(9), 1695.
[27] Diniz, C., Smidt, M., Cooper, J., & Zhang, Y. (2023). Logging Crew Attributes by Region in the Southeast USA. *Croatian Journal of Forest Engineering: Journal for Theory and Application of Forestry Engineering*, *44*(2), 431-439.
[28] Personal communications: Dan Chappell, AL Forestry Commission; Matt Goodin, West Fraser, McDaniel Mill.
[29] Conrad IV, J. L. (2018). Costs and challenges of log truck transportation in Georgia, USA. *Forests*, *9*(10), 650.
[30] Personal communications: Will Daniels, Webb Taylor Timber; Shannon Casey, West Fraser, McDaniel Mill; Benji Elmore, AL Forestry Commission.
[31] Bowman, T., Jeffers, S., & Naka, K. (2023). Characteristics and concerns of logging businesses in the southeastern United States: Results from a state-wide survey from Alabama. *Forests*, *14*(9), 1695.

Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**8**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 64 out of 100.	**64**
Mitigation/Notching *RRL Mitigation (Notch)* Permitting and construction of a new project will likely span a two-to-four-year time frame, possibly more. New logging truck drivers can be recruited and trained during this period and ramp-up to full production. We consider 25% notching. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 25%.	**Notch** **25%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 48 out of 100.	**48**

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 costs in the BDO Zone are calculated on a per-ton-per-mile basis, with an average haul distance of 41 miles, according to TimberMart South. The standard haul rate is $0.40 per mile for distances up to 41 miles, with an additional charge of $0.38 per bone dry ton per mile. The primary factor influencing haul rates is fuel cost, with each $1 increase in fuel costs resulting in an approximate $0.74 per ton increase in hauling expenses.[32]

Our analysis indicates that, on average, 25% of a logging operation's revenue is allocated to fuel costs. Escalating diesel prices can significantly impact overall costs, exemplified by Alabama diesel prices surging from $2.84 in 2019 to $5.37 in 2022—a 147% increase.

With current diesel prices in Alabama, the percentage of logging truck operation costs attributed to fuel, ranges from 35 to 40% of the total. When diesel prices are below $3.00 per gallon, the fuel-related percentage approaches 20%, while prices exceeding $5.00 per gallon elevate this proportion to 40% and beyond.

Despite competitive and consistent biomass hauling rates across the BDO Zone, haulers may implement a fuel surcharge during periods of high fuel prices. The medium risk likelihood is acknowledged, as all operators are equally susceptible to fuel-related impacts.

[32] 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

In summary, the Risk Likelihood is deemed medium as all industries are affected by rising fuel costs. However, given the substantial influence of fuel costs on all facets of logging operations, the impact for this indicator is deemed high.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**Score** **6**
Raw Risk Impact (RRI) The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 48 out of 100.	**Score** **48**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* 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 48 out of 100.	**Score** **48**

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 crucial in all facets of biomass logistics, powering tree harvesting equipment, and logging trucks. The fluctuation in diesel prices directly impacts the delivered cost of biomass. Research indicates that for every $2.00 increase in diesel prices, there is an associated rise of approximately $2.43 per green ton of logs.[33] These cost increases are passed on to end-users of biomass through mechanisms such as fuel surcharges or escalators incorporated into contracts.

Since 2016, diesel fuel prices in the US South have generally exhibited an upward trend, as depicted in Figure C-10. The lowest recorded price was just below $2.00 per gallon in 2016, while the highest reached $5.73 in 2022. These price variations closely mirror the national average for diesel. Consequently, changes in diesel prices can exert a significant influence on the overall delivered cost of biomass.

Risk likelihood is deemed medium.
Risk impact is deemed high.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10.	**Score** **6**
Raw Risk Impact (RRI) The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 48 out of 100.	**Score** **48**

[33] 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 48 out of 100.	**48**

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: While not commonly done, the collection of forest residues in the BDO Zone does not necessitate any specialized equipment. Three common methods are employed for this purpose. Residue with a minimum length of 20 feet is gathered using a knuckle boom and double-bunked onto standard logging trucks. Tops and branches are collected using a knuckle boom or other grapple device and loaded into chip vans. Alternately, residues are chipped on-site and conveyed into chip vans. The necessary equipment for these tasks is readily accessible and readily available within the region.

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**

3.5.4 Delivery Routes through Local Communities

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

Risk Information: In the BDO Zone, pulpwood is the primary biomass likely to be transported, as forest residues are not actively harvested. To handle the rated volume of 470,000 bone dry tons (bdt) per year, a facility would need to facilitate approximately 150 deliveries by logging trucks each day.

Local industry experts[34] suggest that significant opposition to these operations is unlikely due to the significance of forestry and biomass to the community. Additionally, trucking professionals are knowledgeable about potential nuisance areas and have received training to avoid them, further contributing to the smooth functioning of biomass transportation in the region.

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

3.5.5 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: The weight limit for trucks in Alabama is 80,000 lbs. In 2022, the Rural Logging Support Act, also known as House Bill 368 in Alabama, was introduced to increase weight limits by 10% but failed to pass. This bill aimed to increase the weight limits for logging trucks, which was seen as a potential solution to alleviate the supposed truck driver shortage. However, it also raised concerns about how such increases would impact road conditions and safety.

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

[34] Personal Communication: Roslyn Sales, Clark Mobile Gas; Dan Chappell, AL Forestry Commission

Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 24 out of 100.	**24**

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: Access to timberlands is not limited because of road infrastructure. Alabama forestry has been practiced for decades, with most areas already undergoing one or more harvests. Loggers generally use equipment to clear roads if needed. The state also provides some funding to maintain road infrastructure.

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 4 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: To meet the demands of a new biomass facility in the BDO Zone, handling a rated volume of 470,000 bone dry tons (bdt) per year, several additional resources will be necessary, including logging crews, truck drivers, logging equipment, and trucks. Pulpwood is the most likely biomass to be transported in this region, given that forest residues are not actively harvested, and there is competition for acquiring sawmill residues. To manage the transportation of this volume, the facility would need to accommodate roughly 150 deliveries by logging trucks per week, requiring an additional 48 logging truck drivers.

Logging truck drivers are in short supply in Alabama and the US South in general. More rigorous requirements for certification and increased insurance rates have impacted the availability of qualified logging truck drivers, posing a challenge to the industry. Consequently, we assess the likelihood of this risk as high.

While hiring additional log truck drivers may be a challenge, it is somewhat mitigated by the fact that facility construction and ramp-up to full production will likely take place over two to four years. This extended timeline allows new companies to recruit and train new logging truck drivers.

However, if logging truck drivers cannot be recruited as needed, it could pose a significant challenge for a new facility to acquire enough biomass to operate profitably. Therefore, the potential impact of this risk is considered high, as it could directly affect the facility's viability and profitability.

Raw Risk Likelihood (RRL) The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10.	**Score** **8**
Raw Risk Impact (RRI) The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 64 out of 100.	**Score** **64**
Mitigation/Notching *RRL Mitigation (Notch)* Recruiting new logging truck drivers or sponsoring their participation in logging truck training will reduce the likelihood of a shortage of drivers for a specific project. We consider a notching of 25%. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is 25%.	**Notch** **25%**
Loaded RI Score The Loaded RI Score ((1-Total Notch) × GRI Score) is 48 out of 100.	**Score** **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 various sizes (and from multiple BDO Zones) is important for ensuring steady and uninterrupted feedstock supply with minimal price fluctuations. If a small number of large suppliers provides a high proportion of total feedstock, a disruption or supplier breach will have a 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: In the Supply Zone, there are a total of 14 major sawmills and plywood/veneer mills. Four of these mills indicated that they have no residues available as they use that material internally. Nine of the ten remaining mills responded to requests for volume and pricing information for residues. These mills sell residues to pulp & paper facilities or to pellet mills, usually under contract for two to five years. Each of the mills contacted welcomed new customers to negotiate agreements once the existing contracts expire. The risk of negotiating contracts for sawmill residues is deemed medium.

The Alabama Forestry Association provides training and education for certification as a Professional Logging Manager. There are 260 individuals within 100 miles of the BDO Zone center point possessing Alabama Professional Logging Manager certification. Local resources have suggested that the availability of skilled loggers may be limited depending on the amount of timber required. The risk of negotiating contracts for sawmill residues is deemed medium.

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	**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**

3.6.2 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: Pulpwood removals, as illustrated in Figure A-3, have consistently declined, mirroring the overall decrease in paper consumption. On the other hand, sawmill output did not parallel housing starts in the US South, as observed by comparing Figures C-6 and C-12**.** However, pulpwood removals parallel the sawtimber removals, indicating that these two resources may be subject to the same economic drivers, putting the biomass supply at the same high risk.

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

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: According to the Alabama Forestry Commission, approximately 89% of the timberlands in the BDO Zone are privately owned. About 6% of the land is under federal government ownership, and 5 % is held by state and

local governments. This ownership distribution proves highly advantageous for accessing open-market timber for industrial purposes.

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**

3.7 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 in the BDO Zone occur throughout the year, with the winter and spring months typically experiencing higher precipitation levels. This can occasionally limit loggers' ability to transport wood to the mills, although these limitations are generally temporary and of short duration. During the wetter winter and spring periods, loggers may be redirected to "wet weather" tracts, which are typically situated on higher ground or have sandy/sandy loam soils that are more resilient in wet conditions. Conversely, the fall season tends to be drier, allowing mills to accumulate inventory in preparation for the upcoming winter and spring months.

The region has established protocols to mitigate harvesting disruptions caused by seasonal weather patterns. Additionally, the available timber supply surpasses current demand, and the diverse terrain enables the avoidance of harvest areas susceptible to seasonal moisture-related issues. These measures collectively contribute to the uninterrupted flow of timber harvesting operations in 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	**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: Climate change can disrupt agricultural operations, resulting in various challenges such as crop failure, outbreaks of pests or diseases, and alterations in water availability. To address these potential impacts, researchers in Alabama's agriculture and forestry sectors are actively implementing measures to mitigate future risks.

These measures encompass promoting forest management practices aimed at maximizing overall forest health. Additionally, efforts include ongoing monitoring of forestry operations to ensure the correct implementation of Best Management Practices (BMPs), which are designed to minimize environmental impacts. Furthermore, researchers are consistently engaged in developing new varieties of forest plantation stock that demonstrate resilience to the stresses induced by climate change.

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**

3.7.3 Forest/Crop Fire

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

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

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

climate change estimates of fire activity, and at investigating adaptation strategies and options to deal with future fire occurrence. There is growing consensus that as wildfire activity increases, fire agency suppression efforts will be increasingly strained. However, fire history analyses suggest that the effect of climate variability on precipitation regimes is the primary reason for the decreasing fire activity in the southern BDO Zone of Canada.

Risk Information: On average, wildlife firefighters respond to 2,500 wildfires during spring. 2023 was a below-average year for wildfires, with only 927 fires compared to years in the past. The most damaging fire season was in 2016, which lasted 60 days, with 2,800 fires.[35] The wildfires tend to be small and extinguished quickly.

Protecting Alabama's rural areas from wildfire is the number one priority of the Alabama Forestry Commission. Wildfires burn thousands of acres of forestlands in the state every year. Through the efforts of the Forestry Commission and local volunteer fire departments, those wildfires are decreasing, but they still take a significant toll on Alabama's forest resources. The Forestry Commission has a modern, aggressive detection system that allows the discovery and suppression of wildfires in the most efficient way possible. A fleet of airplanes regularly patrols over the forest and looks for wildfires. In addition, the public can report wildfires 24 hours a day through a toll-free telephone system. When a fire is reported, a dispatch center sends Forestry Commission crews and volunteer fire departments as needed to suppress it.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed *low*, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL × RRI) is 16 out of 100.	**16**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**16**

3.7.4 Risk of Infestation

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

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

Risk Information: The southern pine beetle (SPB) and other pine bark beetles continue to represent the most significant threat to pine timber in Alabama and the South. The Alabama Forestry Commission monitors SBP activity annually and

[35] Forestry Commission talks wildfires in Alabama. https://www.wsfa.com/2023/04/13/forestry-commission-talks-wildfires-alabama/. Accessed Dec 28, 2023.

takes measures to thwart its spread. Other common pests include needle blight and pine decline. While pests are an ongoing concern, this threat has not changed significantly in recent years.

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 *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 32 out of 100.	**Score** **32**
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 32 out of 100.	**Score** **32**

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: While hail may occur in the BDO Zone, it is rare and does not significantly impact woody biomass feedstock or supply chains.

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**

3.7.6 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: This location is designated by FEMA as an area of minimal flood hazard.	
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: Drought can impact the growth rates of agricultural crops, including trees. However, the risk of drought in the BDO Zone is assessed as low by the US National Integrated Drought Information System despite regular seasonal periods of dry conditions. Alabama has encountered drought conditions on multiple occasions, notably in 2000, 2007–2008, and 2011–2012.

Unlike agricultural crops, trees in the BDO Zone are less susceptible to drought-related mortality. Instead, standing timber tends to slow its growth rate until more favorable conditions prevail.

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**

3.7.8 Risk of Hurricanes, Tornadoes and Strong Winds

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

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

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

Risk Information: Evergreen-area historical tornado activity is below the Alabama state average. It is 34% greater than the overall U.S. average. The BDO Zone is close to the Gulf of Mexico and possibly subject to hurricane damage. Damage can occur due to coastal flooding and wind. The BDO Zone is not in direct contact with the Gulf of Mexico and, thus, is not at high risk for flooding. Wind damage to buildings and timberlands is possible if a major hurricane strikes directly between Gulfport, MS, and Panama City, FL. The inland counties are rated low risk for hurricane damage. A major hurricane can cause wind damage as far as 100-200 miles inland. However, only four hurricanes have made direct landfall that affected the BDO Zone in the past 20 years. The impact of wind events is considered medium.

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**

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: Low temperatures typically pose minimal risk to woody biomass in the BDO Zone unless exotic species are introduced to achieve exceptionally high growth rates. The timber species currently present in the area are native and well-suited to the regional climate. Over the course of the year, the temperature typically varies from 39°F to 91°F and is rarely below 25°F or above 96°F. There is a very low chance of freeze damage for the forest species grown in the BDO Zone.

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**

3.8 Risk Factor: Political and Social

3.8.1 Government Subsidies for Feedstock Production or Utilization

Rationale: Feedstock that is directly subsidized through 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 subsidies 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: No subsidies for feedstock production or use in Alabama are known to be available.

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

3.8.2 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: Alabama air permits follow the federal EPA requirements. No specific permits for biomass-related industries are required.

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**

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

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

Risk Information: The Alabama Forestry Commission and local experts[36] report that there have been no public demonstrations opposing biomass projects.

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**

[36] Personal Communication: Roslyn Sales, Clark Mobile Gas.

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 Cooperation 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 cooperation with, Indigenous communities and First Nations decreases Issuer risk.

Risk Information: Local Indigenous or First Nations people have been supportive of the forest products industry, and some tribes are actively involved in forestry.

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**

3.8.5 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: Food security is not a concern in the BDO Zone.

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 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 forestry operations within the BDO Zone exhibit robust management practices, undergoing regular audits to ensure compliance with Best Management Practices (BMPs). Alabama, having instituted forestry BMPs in 1975, continues to assess their application yearly. BMPs serve as guidelines for preserving forest health, emphasizing soil and water considerations during forest management and harvesting. The Alabama Forestry Commission supports forest certification by third-party agencies such as the Forest Stewardship Council (FSC), the Sustainable Forestry Initiative (SFI), the TREASURE Forest Program, and the Tree Farm Program. The high level of BMP observance is an advantage to new 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**

3.9.2 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: Best Management Practices (BMPs) include standards to minimize the risk to soil arising from forestry operations. According to a 2019 report from the Alabama Forestry Commission assessing BMP compliance, the statewide implementation of BMPs pertaining to soil-related concerns exceeded 97%. Specifically, practices directly addressing soil quality demonstrated a commendable compliance rate.

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**

3.9.3 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: Best Management Practices (BMPs) address mitigation methods to minimize the risk to water quality resulting from forestry operations. As per a 2019 report on BMP compliance by the Alabama Forestry Commission, the statewide implementation of BMPs pertaining to water-related issues surpassed 97%. Notably, practices directly linked to water quality exhibited a commendable compliance rate.

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**

3.9.4 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: Certain agricultural crops, fruit trees, nut trees, and forestry species like eucalyptus have the potential to significantly influence the water table due to their substantial water consumption. However, it is worth noting that forestry species in Alabama do not exhibit exceptionally high water usage.

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**

3.9.5 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 used in agricultural operation to manage insect populations. In the realm of forest tree species, their use is most prevalent in fruit and nut operations, while their application in timber production is infrequent. The state of Alabama regulates the use of pesticides in timberlands, necessitating a permit and strict adherence to Best Management Practices, with 100% compliance, according to the 2019 assessment.

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**

3.9.6 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: Alterations to the landscape resulting from forestry operations, encompassing activities such as tree planting, forest management, the construction of logging roads, and harvest operations, possess the potential to disrupt landscapes and wildlife habitats. In Alabama, forestry practices adhere to Best Management Practices (BMPs) outlined by the Alabama Department of Environmental Management under the authority of the Alabama Environmental Management Act. These guidelines dictate the methods employed in all facets of forestry operations, aiming to safeguard water and soil quality, minimize impacts on wildlife and the landscape, and preserve biodiversity. The Alabama Forestry Commission oversees compliance with BMPs, and in the most recent report available, statewide adherence to BMPs stood at 97%.

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**

3.9.7 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: In May 2010, the United States Department of Agriculture (USDA) and the Animal and Plant Health Inspection Service (APHIS) approved two permit applications (08-011-106rm and 08-014-101rm) submitted by

ArborGen, LLC. These permits allow for field plot testing of genetically engineered Eucalyptus trees (*Eucalyptus grandis* X *Eucalyptus urophylla*) in coastal Alabama, specifically south of Interstate 10. The tests have been completed, and the material has been rendered inactive according to USDA regulations.

There are no active tests of GMO woody biomass species in the BDO Zone, and there have been no announcements of GMO woody species tests for the near future.

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**

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: The BDO Zone has a long-established and well-organized system for the production, harvesting, transport, and processing of sawmill residues and pulpwood, ensuring consistent production quality over decades.

Although the collection of forest residues is not common practice, these residues naturally arise as by-products of sawtimber and pulpwood harvesting. Harvesting forest residues involves piling them at the loading site, a practice already integrated into existing operations. The loading and transportation of forest residues utilize established methods and standard logging equipment.

Anticipating an increase in demand for forest residues, the existing forest industry is expected to possess the capability and experience necessary to manage the quality of forest residues delivered to future biomass projects. The established practices and expertise within the industry are poised to adapt seamlessly to meet the heightened demand 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 *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**

4.1.2 Capacity of Supply Chain Components & Equipment to Scale

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

Risk Information: The forestry supply chains in the BDO Zone have maintained a professional standard for decades, constituting a vital component of the local economy. Support from local, county, and state governments further bolsters this sector. Key elements of the supply chain, including the land base, roads, equipment, and labor, are well-established.

Scale-up to meet increased demand brought on by new lumber mills has occurred several times. Most recently, new lumber mills opened in 2013, 2019, and 2022, increasing production capacity by 200, 50, and 250 MMBF/yr, respectively. Three new pellet mills have opened in the Competition Zone since 2020, adding almost 300 million tons of pellet production capacity.

The shortage of log truck drivers is a concern for scaling as this factor is currently limiting to existing businesses. A tight labor market for logging crews, while less acute, is also a factor to consider. Local experts[37] report that logging crews may be alleviated if new businesses were willing to pay attractive wages.

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 *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 48 out of 100.	**48**

[37] Personal Communication: Ryan Holland, AL Forestry Commission, Matt Goodin, West Fraser McDaniel Mill; Benji Elmore, AL Forestry Commission.

CATEGORY 5.0: INFRASTRUCTURE RISKS

5.1 Risk Factor: Physical Infrastructure

5.1.1 Land Parcel/Ind. District

Risk Information: Evergreen, AL, the county seat of Conecuh County, offers several industrial building sites for commercial development.[38] The center of the BDO Zone is a former Louisiana-Pacific manufacturing site with two main buildings (Figure C-12). This is a 122-acre site with 65 buildable acres and lies 1 mile north of the Evergreen city limits. There are two existing buildings on site: 100,000 sq ft and 12,000 sq ft. This site provides access to Interstate 65, US Highways 31 and 84, and CSX rail service adjacent to the site. This site is not zoned by Conecuh County but is designated as an Opportunity Zone, Hubzone, and a New Market Tax Credit Zone.

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

5.1.2 Ownership of Land

Risk Information: The Evergreen LP Site is owned by Conecuh County.

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**

[38] Conecuh County Alabama, Sites/Buildings. https://www.conecuhcountyeconomicdevelopment.com/properties. Accessed Feb 1, 2024.

5.1.3 Permitting Description

Risk Information: The Alabama Department of Environmental Management regulations require that any source that plans to construct or modify equipment or a process that has the potential to emit air contaminants apply for a permit from the Air Division.[39] The time necessary to secure an air quality permit depends upon the specific permit types required and the quantity and nature of air emission sources undergoing construction or modification. In instances involving an Air Permit or Significant Modification of Operating Permit (SMOP) that grants authorization for the establishment or modification of an air emission source, the Air Division is generally able to issue the permit within 4-6 weeks from the date of receipt of a comprehensive application. Alternatively, for an Air Permit associated with a project undergoing Major Source (PSD) review, the Air Division typically tries to issue the permit within 120 days after receipt of a complete application.

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**

5.1.4 Environmental Issues

Risk Information: The LP site is a total of 112 acres, with approximately 65 continuous buildable acres. FEMA designates this location as an area of minimal flood hazard. The US EPA does not list Conecuh County as an area of air quality non-attainment. The site is generally level, with a total change in elevation of 24 feet. There are no existing environmental influences on the site that would represent a further 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**

[39] Alabama Department of Environmental Management Air Permitting. https://adem.alabama.gov/programs/air/permitting.cnt. Accessed Dec 19, 2023.

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**

5.2 Risk Factor: Utilities

5.2.1 Natural Gas Availability

Risk Information: The site is served by a 4" natural gas line by South Alabama Gas. The 10-year historical average price of natural gas for industrial use in Alabama[40] has closely followed the US national average[41] with a correlation of 0.92. (Figure C-14).

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**

5.2.2 Electric Availability

Risk Information: Electric power is available on the site and is provided by Southern Pine Electric Coop. Evergreen's average industrial electricity cost is 9.8 cents per kWh for large industrial and 11.99 cents per kWh for small industrial users.[42]

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**

[40] Alabama natural gas industrial price: https://www.eia.gov/dnav/ng/hist/n3035al3m.htm. Accessed Dec 15, 2023.
[41] United States natural gas industrial price: https://www.eia.gov/dnav/ng/hist/n3035us3m.htm. Accessed Dec 15, 2023.
[42] Southern Pine Electrical Cooperative. Personal communication Dec 19, 2023.

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**

5.2.3 Water Availability

Risk Information: Fresh water is provided to the site by Evergreen Utilities via a 6" water main. and a 4" meter box. Sewer service is provided by a 6" main pipe.

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**

5.2.4 Waste Disposal

Risk Information: Commercial waste management services are available in 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	**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 provides DSL service to the LP site. In addition, other internet service providers have satellite internet service 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 *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 Evergreen LP Site is located on State Highway 29, one mile north of the Evergreen city limits. Evergreen is served by two interchanges on Interstate Highway 65, with the Evergreen LP Site being two miles from Exit 101. Two US Highways, 31 and 84, serve Evergreen. Nearby significant cities include Mobile, AL via I-65 (95mi, 1.5 h), Montgomery, AL via I-65 (78mi, 1.2h), Pensacola, FL via I-65, and US-29 (88mi, 1.5h), and Tallahassee, Fl via US-84 and I-10 (195mi, 3.3h). See Figure C-13 for map.

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**

5.3.2 Rail Access

Risk Information: The Evergreen LP Site is bordered on the western property line by CSX rail, a class I railroad. This rail line provides direct access to the Ports of Mobile, Pensacola, Gulfport, and New Orleans to the south and southwest. Toward the northeast, there is direct access to Montgomery, AL, a major junction. See Figure C-13 for map.

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**

5.3.3 Airport Access

Risk Information: Evergreen, AL, is served by Evergreen Regional Airport, nine miles from the LP Site. The nearest major airports include: Montgomery Regional (MGM, 72mi, 1h), Pensacola International (PNS, 89mi, 1.6h), Destin-Fort Walton Beach (VPS, 99mi, 1.9h), and Mobile Regional (MOB, 104mi, 1.6h). See Figure C-13 for map.

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**

5.3.4 Water Freight Access

Risk Information: Three major ports on the Gulf of Mexico near the BDO Zone exist. The Port of Mobile is 95 miles from Evergreen via Interstate 65. The Port of Pascagoula, MS, and the Port of Panama City, FL, are 130 and 140 miles away, respectively. See Figure C-13 for map.

The Port of Mobile provides access via five class one railroads and two interstate highways, including CSX rail and I-65. Access to the Gulf of Mexico, inland waterways, and the Intracoastal waterway is available. The port can handle breakbulk cargo and intermodal transport via containers. The port has a capacity of 560,000 twenty-foot container units (TEUs) per year. The Port of Mobile can currently accommodate Post Panamax I and II ships, which can carry approximately 6,000 and 8,500 containers, respectively.

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**

5.4 Risk Factor: Social Infrastructure

5.4.1 Healthcare (Local)

Risk Information: Evergreen Medical Center is a 44-bed acute care hospital in Evergreen, Alabama. Services include: inpatient care, 24-hour E.R., Clinical lab, radiology, ultrasound, mammography, C.T., MRI, DXA, Inhouse pharmacy, RT, PT, Wellness Center, and Rural Health Clinic.

Evergreen Nursing and Rehabilitation is a federal and state-licensed 61-bed facility providing skilled nursing services and rehabilitative services. Services include: physical therapy, speech therapy, and occupational therapy.

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**

5.4.2 Education (Schools)

Risk Information: The Conecuh County school system operates nine schools for K-12 education, with about 1500 students and a student-teacher ratio of 21:55. A private school, Sparta Academy, is located in Evergreen and offers grades three through 12. Reid State Technical College is located in Evergreen. Coastal Alabama Community College operates 14 campuses throughout the state, with the closest located in Monroeville, a 26-mile drive. LBW Community College is 42 miles away in Andalusia. The University of Alabama is located in Tuscaloosa (165 miles), while Auburn University is 130 miles away. Colleges in Pensacola (88 miles) include The University of West Florida and Pensacola State College. Mobile (92 miles) offers several colleges, including the University of South Alabama. Education availability and quality are 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: No public bus or rail service to the LP site exists. Evergreen has bus service through Greyhound and FlixBus US. One taxi service is based in Evergreen, along with Uber and Lyft. Amtrak passenger rail service was discontinued in 1995. This lack of ground transportation options within 25 miles for prospective employees is a high risk to new development.

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

5.4.4 Public Safety (Local)

Risk Information: The police force consists of 20 officers. The total crime index for Evergreen, AL, is 12, so it is considered safer than 12% of similar-sized population centers in the country. The crime index presents a high risk to a new project.	
Raw Risk Likelihood (RRL) The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10.	**Score** **8**
Raw Risk Impact (RRI) The risk impact is deemed *high*, therefore the RRI is 8 out of 10.	**Score** **8**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL × RRI) is 64 out of 100.	**Score** **64**
Mitigation/Notching *RRL Mitigation (Notch)* 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 64 out of 100.	**Score** **64**

5.4.5 Housing/Cost of Living

Risk Information: The cost of living in Evergreen is 74% of the national average and lower than the Alabama average. The median home price in Evergreen is $96,000 compared to the Alabama average of $214,000 and the $338,000 national average.[43] 9.3% of the houses and apartments in Evergreen are available to rent. Within a 50-mile radius of Evergreen, about 1,900 homes and 3,400 rental units are vacant. The low cost of living is considered an asset for new projects.	
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 4 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**

[43] Best Places, Cost of Living. https://www.bestplaces.net/cost_of_living/city/alabama/evergreen. Accessed Dec 18, 2023.

5.5 Risk Factor: Labor

5.5.1 Workforce

Risk Information: Unemployment in Evergreen is 4.7% and 3.0% for Conecuh County[44] as of October 2023. For the same time period, the Alabama average is 2.3%, and the US national average is 3.9%. Within a 50-mile radius of Evergreen, 36% of the population hold a high school diploma, 33% some college or an Associate's degree, and 16% a Bachelor's or Postgraduate degree.[45] Several regional and state training programs are available to new businesses including: AIDT, Alabama Technology Network, Regional Workforce Council, and Alabama Works. Additionally, the Forestry Works program provides specific training in forestry-related professions and support to businesses[46]. Reid State Technical College provides training for truck drivers[47].

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) Availability of the Forestry Works and commercial truck driver programs mitigates this risk by 25%. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch × RRI Notch) is NN (No Notch).	**25%**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) × GRI Score) is 16 out of 100.	**36**

5.5.2 Labor Costs

Risk Information: The median household income in Evergreen in 2021 was $35,346, and the median per capita income was $17,658.[48] By comparison, Alabama's median household income and median per capita income in 2021 were $62,496 and $30,608, respectively. As part of Alabama's Renewal Communities Program, Conecuh County offers: $1,500 per employee wage credits, accelerated depreciation, increased equipment reduction, and capital gains tax exclusion.[49]

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**

[44] Alabama Department of Labor. https://www2.labor.alabama.gov/laus/clfbycnty.aspx. Accessed Dec 18, 2023.
[45] Demographics 50 mile radius Evergreen. https://www.conecuhcountyeconomicdevelopment.com/_files/ugd/6922b6_2e20ab4a93384489bb28593922ea8a0e.pdf. Accessed Dec 18, 2023.
[46] Forestry Works. https://forestryworks.com/. Accessed Apr 1, 2024.
[47] Reid State Technical College. https://www.rstc.edu/apprenticeships. Accessed Apr 1, 2024.
[48] City-Data.com. https://www.city-data.com/income/income-Evergreen-Alabama.html. Accessed Dec 18, 2023.
[49] Renewal Communities in Alabama. https://www.downtownmobile.org/pdf/renewalcommunity.pdf. Accessed Dec 18,2023.

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**

APPENDIX C: TABLES AND FIGURES

SUPPLY ZONE INFORMATION

Table C-1. Counties in Supply Zone with Percent Overlap.

State	County	Percent in Supply Zone	State	County	Percent in Supply Zone
AL	Conecuh	100%	AL	Geneva	32%
AL	Butler	100%	AL	Dallas	27%
AL	Covington	100%	AL	Baldwin	24%
AL	Crenshaw	100%	AL	Marengo	1%
AL	Escambia	100%	AL	Mobile	>0.5%
AL	Lowndes	93%	AL	Washington	>0.5%
AL	Monroe	93%	FL	Santa Rosa	79%
AL	Wilcox	81%	FL	Escambia	55%
AL	Coffee	76%	FL	Okaloosa	49%
AL	Montgomery	41%	FL	Walton	17%
AL	Clarke	38%	FL	Holmes	>0.5%
AL	Pike	38%			

BIOMASS SUPPLY SUPPLEMENTAL INFORMATION

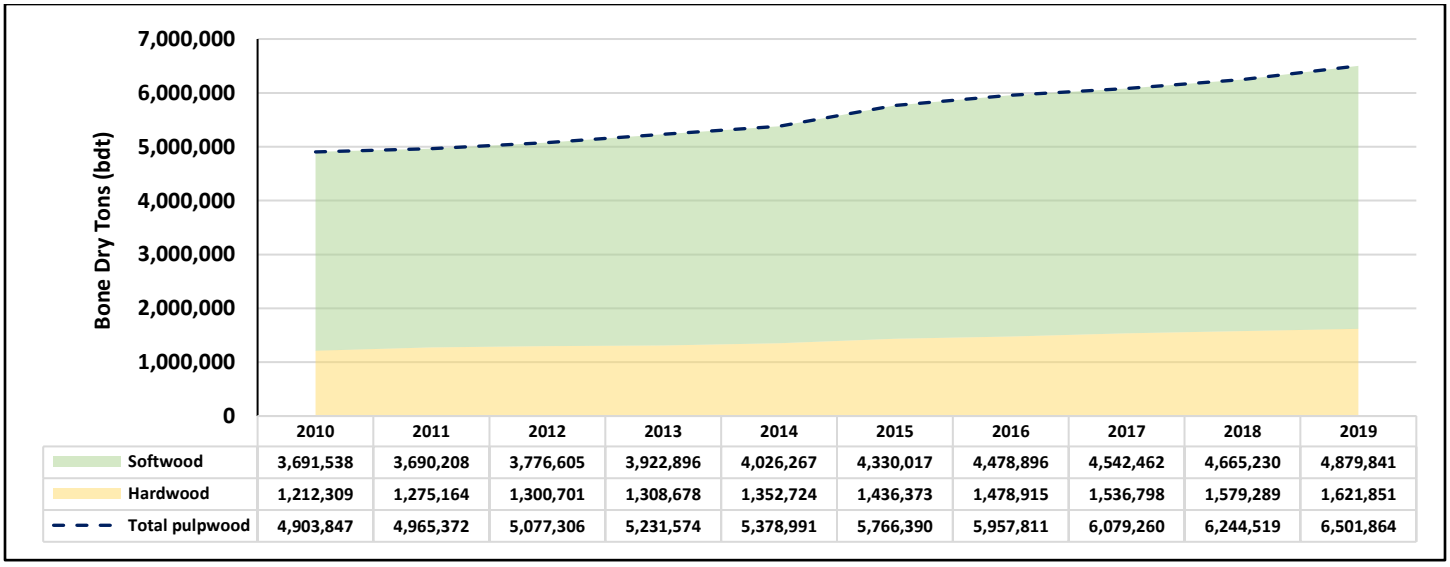
Table C-2: Billion-Ton Report Assumptions and Parameters Included in the Analysis

Bioenergy – Knowledge Discovery Framework, US Department of Energy Billion-Ton Report – 2016 Vol. 1 Data Download Tool[50]		
Data retrieval		County level
		Year 2020, 2025, 2030, 2040
Data presented as		Bone dry tons per year (bdt/yr)[51]
		Average of the five retrieved years (2020, 2025, 2030, 2040)
Resource Category	**Forestry**	All biomass resources modeled on forestlands with commercial timber, i.e., forest residues and small-diameter trees.
Demand for feedstock		Based on 2016 data
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 housing starts 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

[50] US Department of Energy 2016 Billion Ton Report. https://bioenergykdf.net/2016-billion-ton-report
[51] Dry tons (0% moisture content) were converted to green tons using a moisture content assumption of 50% for pulpwood, 35% for forest residues.

		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, Mixedwood forest residues, Mixedwood 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	**2**	Timberland trees with diameter at breast height 5-11 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.

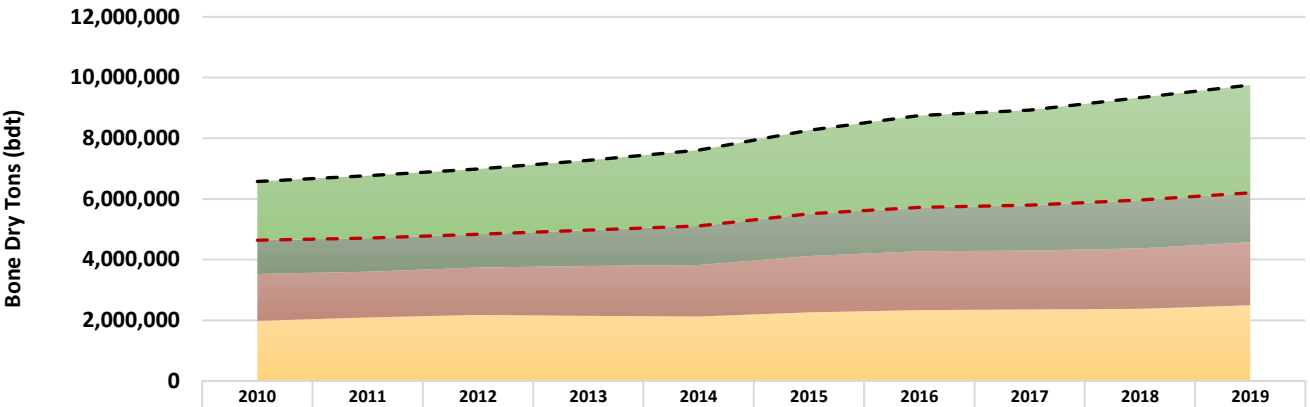
Figure C-1. Pulpwood Net Growth by Species Group.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Softwood	3,691,538	3,690,208	3,776,605	3,922,896	4,026,267	4,330,017	4,478,896	4,542,462	4,665,230	4,879,841
Hardwood	1,212,309	1,275,164	1,300,701	1,308,678	1,352,724	1,436,373	1,478,915	1,536,798	1,579,289	1,621,851
Total pulpwood	4,903,847	4,965,372	5,077,306	5,231,574	5,378,991	5,766,390	5,957,811	6,079,260	6,244,519	6,501,864

- Pulpwood supply increased by about 25% for both softwood and hardwood between 20210 and 2019
- The pulpwood supply increased by about 1.6 million bdt during this period

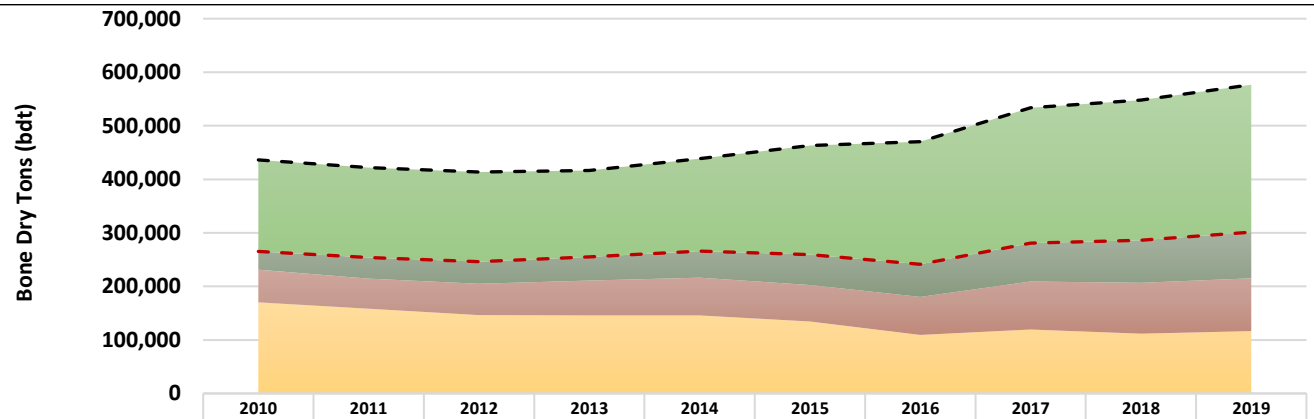
Figure C-2. Pulpwood Net Growth on Private Lands.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Others >11'	1,935,314	2,050,681	2,151,874	2,297,932	2,490,475	2,755,712	3,026,407	3,128,996	3,381,972	3,553,523
Puplwood 9.0"-10.9"	1,111,982	1,109,023	1,093,345	1,181,677	1,293,298	1,387,536	1,443,204	1,506,305	1,586,671	1,630,118
Puplwood 7.0"-8.9"	1,545,135	1,513,463	1,557,812	1,648,806	1,697,834	1,860,774	1,933,130	1,937,547	1,990,959	2,081,079
Puplwood 5.0"-6.9"	1,981,369	2,089,021	2,179,808	2,146,038	2,122,180	2,258,964	2,340,217	2,354,461	2,380,627	2,489,319
Total	6,573,800	6,762,188	6,982,840	7,274,453	7,603,787	8,262,986	8,742,958	8,927,309	9,340,229	9,754,039
Total pulpwood	4,638,486	4,711,507	4,830,966	4,976,521	5,113,312	5,507,274	5,716,551	5,798,313	5,958,257	6,200,516

- Volume increase on private lands is across all size classes
- Growth has been consistent between 2010 and 2019

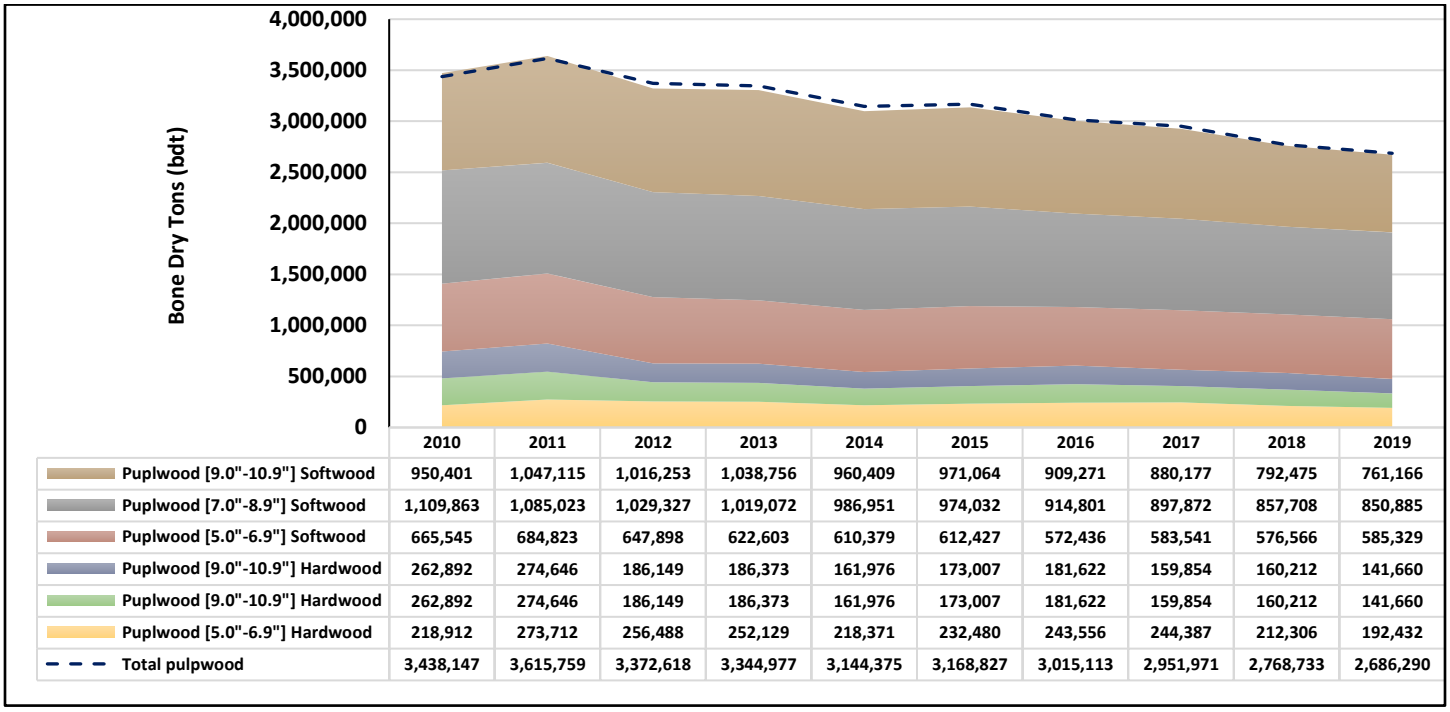
Figure C-3. Pulpwood Net Growth on Public Lands.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Others >11"	170,672	167,973	167,292	161,331	172,692	203,771	228,896	252,444	261,727	275,309
Puplwood 9.0"-10.9"	34,266	39,457	41,467	44,224	49,524	56,511	60,880	71,724	79,682	86,377
Puplwood 7.0"-8.9"	60,614	56,201	58,660	65,075	70,281	68,308	71,045	89,909	94,952	98,599
Puplwood 5.0'-6.9'	170,480	158,208	146,213	145,755	145,874	134,297	109,335	119,313	111,627	116,372
Total	436,033	421,839	413,632	416,384	438,371	462,886	470,156	533,391	547,988	576,658
Total pulpwood	265,360	253,866	246,340	255,053	265,679	259,116	241,261	280,947	286,262	301,348

- Timber growth on public lands decreased slightly between 2010 and 2013, followed by increased volumes through 2019
- Timber volume on public lands is about 5% of the volume available from private timberlands

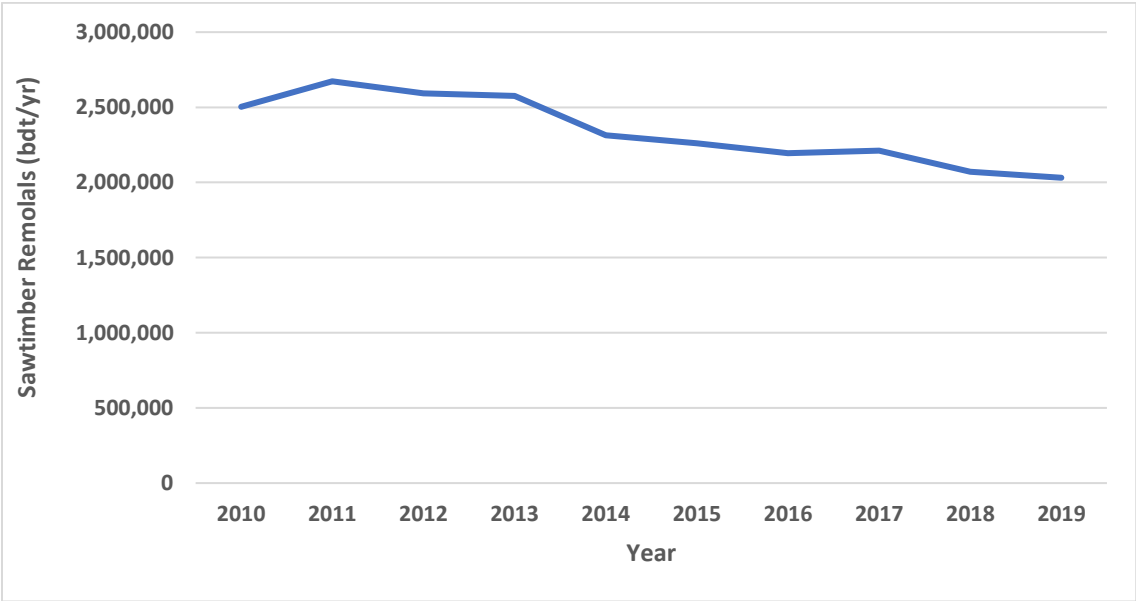
Figure C-4. Pulpwood Harvest Removals by Year.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Puplwood [9.0"-10.9"] Softwood	950,401	1,047,115	1,016,253	1,038,756	960,409	971,064	909,271	880,177	792,475	761,166
Puplwood [7.0"-8.9"] Softwood	1,109,863	1,085,023	1,029,327	1,019,072	986,951	974,032	914,801	897,872	857,708	850,885
Puplwood [5.0"-6.9"] Softwood	665,545	684,823	647,898	622,603	610,379	612,427	572,436	583,541	576,566	585,329
Puplwood [9.0"-10.9"] Hardwood	262,892	274,646	186,149	186,373	161,976	173,007	181,622	159,854	160,212	141,660
Puplwood [9.0"-10.9"] Hardwood	262,892	274,646	186,149	186,373	161,976	173,007	181,622	159,854	160,212	141,660
Puplwood [5.0"-6.9"] Hardwood	218,912	273,712	256,488	252,129	218,371	232,480	243,556	244,387	212,306	192,432
Total pulpwood	3,438,147	3,615,759	3,372,618	3,344,977	3,144,375	3,168,827	3,015,113	2,951,971	2,768,733	2,686,290

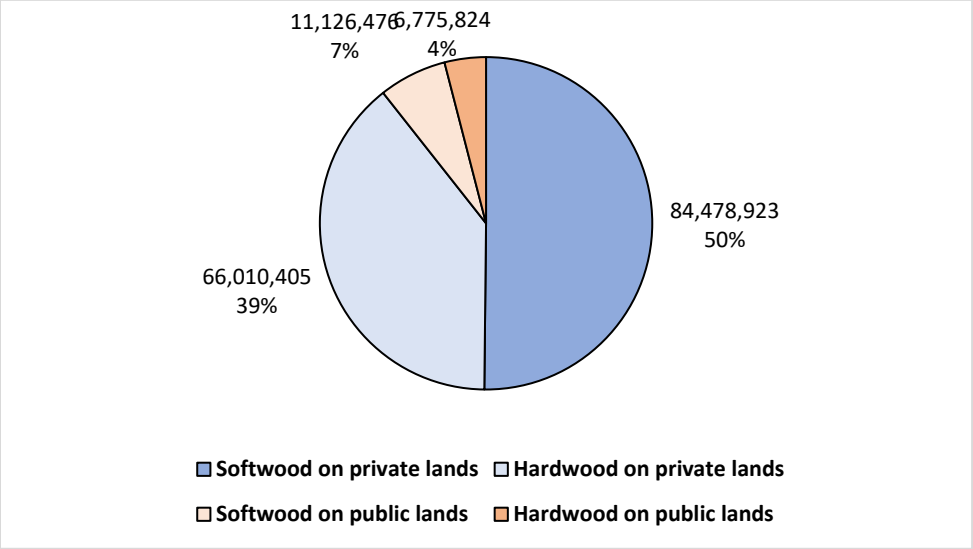
- Total pulpwood removals fell by about 752,000 bdt between 2010 and 2019, approximately 22%, adding this biomass to the available amount
- Softwood pulpwood accounted for about 70% of the affected removals

Figure C-5. Sawtimber - Average Annual Harvest Removals in Supply Zone



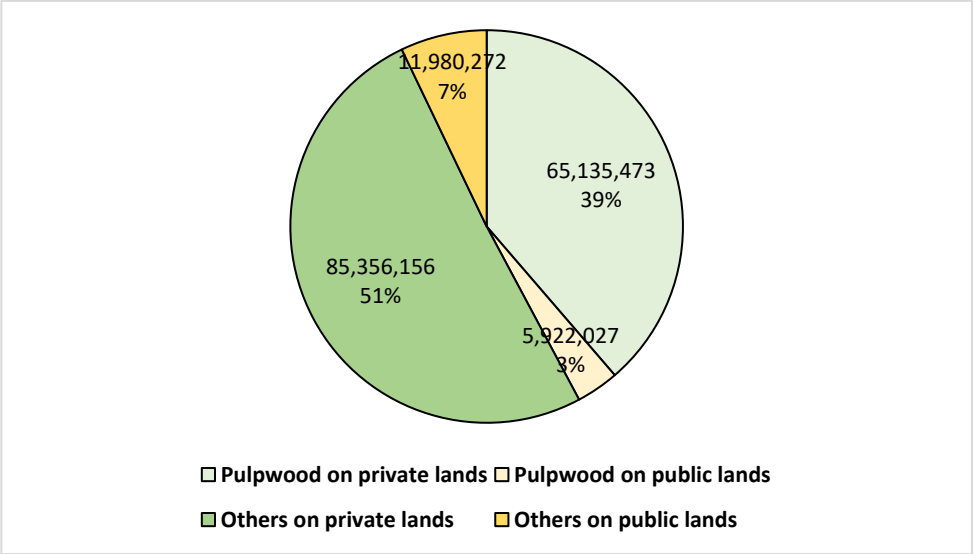
- Sawtimber removals have declined steadily since 2011.
- Removals declined about 24% between 2011 and 2019, approximately 640,000 bdt.

Figure C-6. Aboveground Biomass by Species Group and Ownership Type



- Timber on private lands accounts for 89% percent of the total supply
- Timber on public lands accounts for 11% percent of the total supply
- Softwoods make up 46% of the total timber supply
- Hardwoods make up 54% of the total timber supply

Figure C-7. Aboveground Biomass by Species Group and Ownership Type

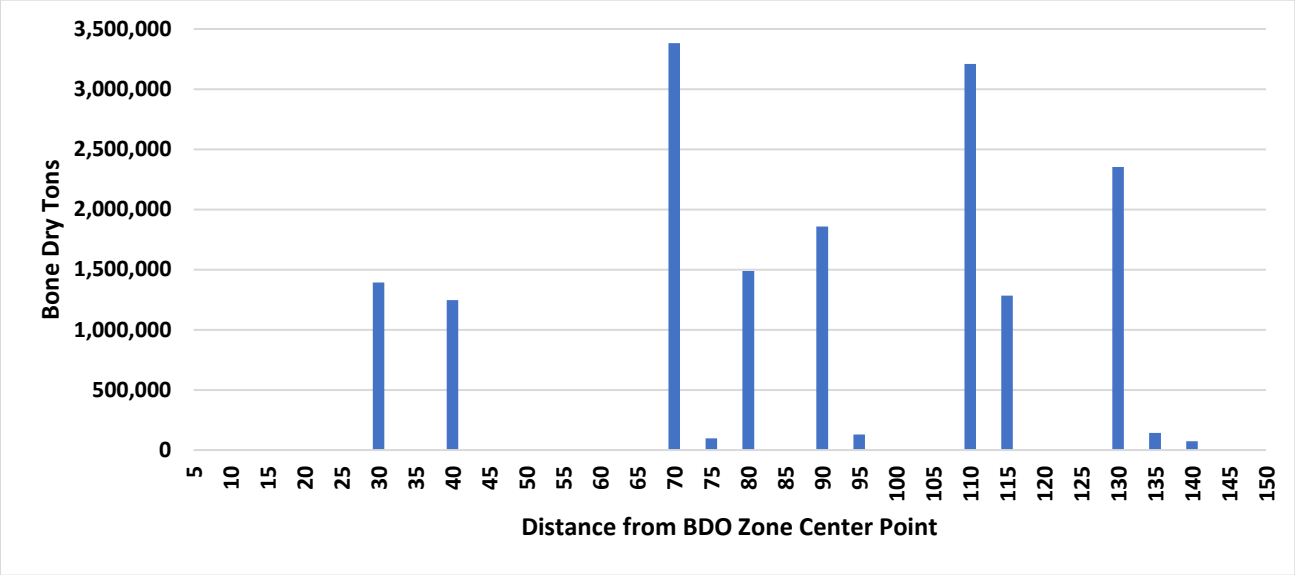


- Pulpwood accounts for 54% of the total timber supply, with the vast majority coming from private lands
- Other wood types account for 46% of the total timber supply, with the vast majority coming from private lands

Competitors Supplemental Information

The impact of this competition can be determined based on the number of competitors, their location, and the demand for woody biomass. Figure C-8 shows the competitive demand for woody biomass as a function of distance from the BDO Zone center point. Table C-3 breaks down the competition biomass demand by industry.

Figure C-8. Competitors in the Competition Zone. Use of Woody Biomass by Distance from Center Point.



- There are eight major peaks of biomass demand based on distance
- These peaks occur at 30, 40,70, 80, 90, 110, 115, and 130 miles from the BDO Zone center point

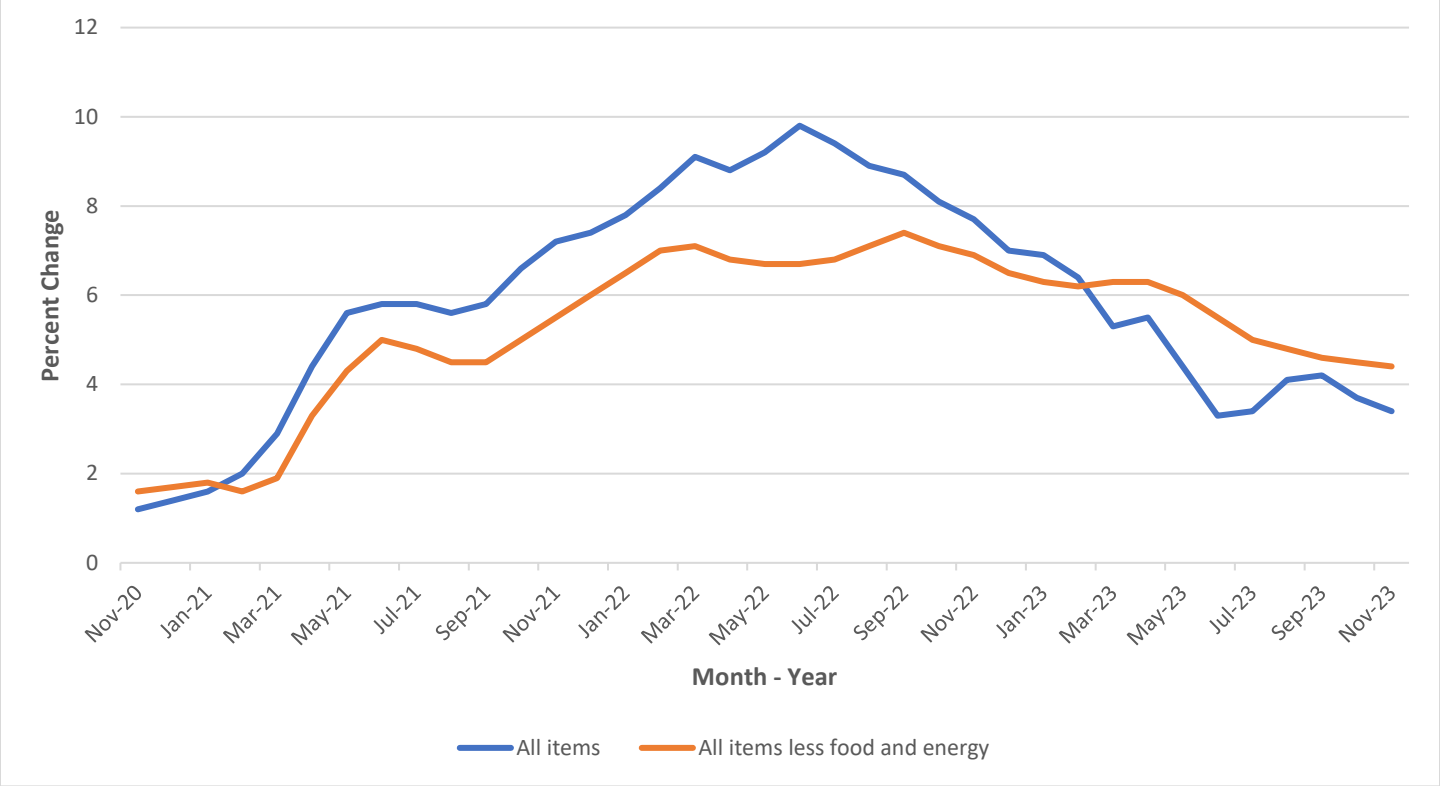
Table C-3. Impact of Competition on Woody Biomass Supply by Industry.

Industry	Estimated Wood Demand Met from Supply Zone (bdt/yr)	Percent of Impact
Pulp & Paper	4,143,000	75
Industrial Wood Pellets	254,000	5
OSB/MDF	239,000	4
Engineered Wood Products	150,000	3
Biomass Energy	733,000	13
Total	5,519,000	

- The current impact is the amount of feedstock being used by competitors in the BDO Zone
- The pulp and paper industry is the largest competitor, accounting for 75% of biomass demand
- Biomass energy applications are the second largest competitor, accounting for 13% of biomass demand

Risk Indicators Supporting Information

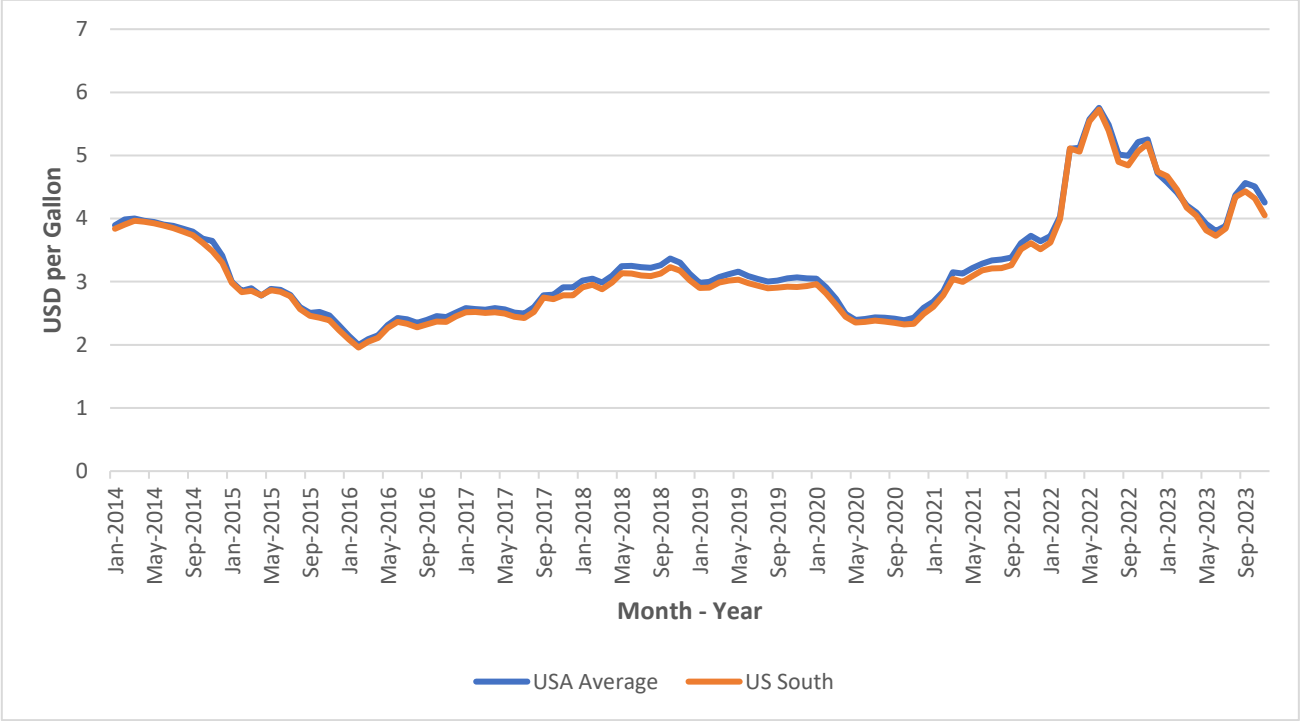
Figure C-9. Percent Change in Consumer Price Index - US South Region[52]



- The rate of inflation increased between Nov 2020 to Jul 2022
- Inflation has been steadily falling from Jul 2022 to the present

[52] US Bureau of Labor Statistics. https://www.bls.gov/regions/southeast/news-release/ConsumerPriceIndex_South.htm. Accessed Dec 19, 2023.

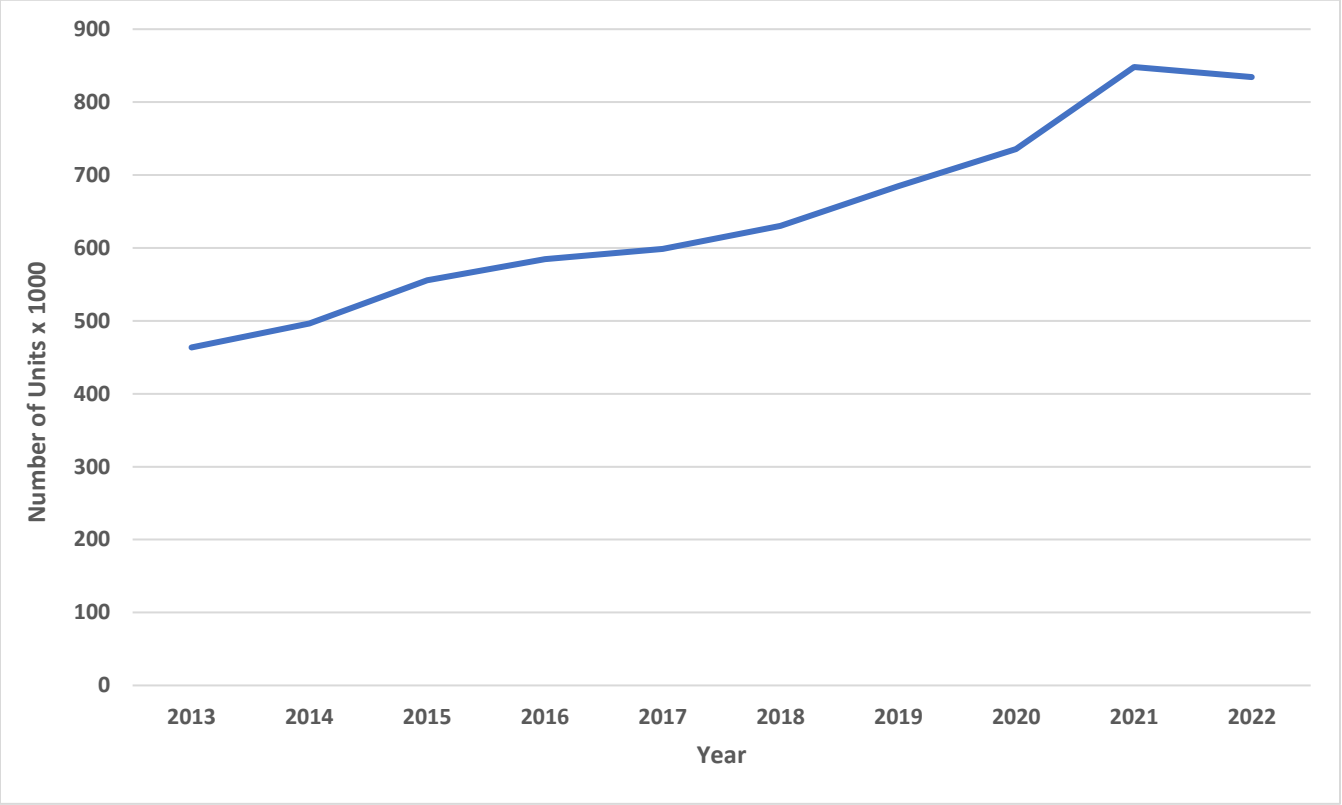
Figure C-10. 10 yr Retail Price Diesel US South[53]



- Retail diesel prices for the US South track very closely to the national average
- US South retail diesel prices ranged from $1.96/gal to 5.73/gal over the past 10 years

[53] US Energy Information Administration. https://www.eia.gov/ Accessed Dec 19, 2023.

Figure C-11. Housing Starts US South[54]



- Housing starts in the US South rose steadily between 2013 and 2021.

[54] US Census. Housing Starts US South. https://www.census.gov/construction/nrc/historical_data/index.html. Accessed Jan 16, 2024.

BDO Zone Center Point Map

Figure C-12. Aerial Photo of BDO Zone Center Point.



- Former Louisiana Pacific site
- County Owned
- 110 Acres
- 2 buildings on site, one 100,000 sq ft and the other one is 12,000 sq ft
- 2 miles from I-65 @ Exit 101
- All utilities present
- New Market Tax Credit Zone
- Opportunity Zone*
- Favorable Geographic Area
- Historically Underutilized Business Zone

Figure C-13. Major Infrastructure in the Supply Zone and Competition Zone.

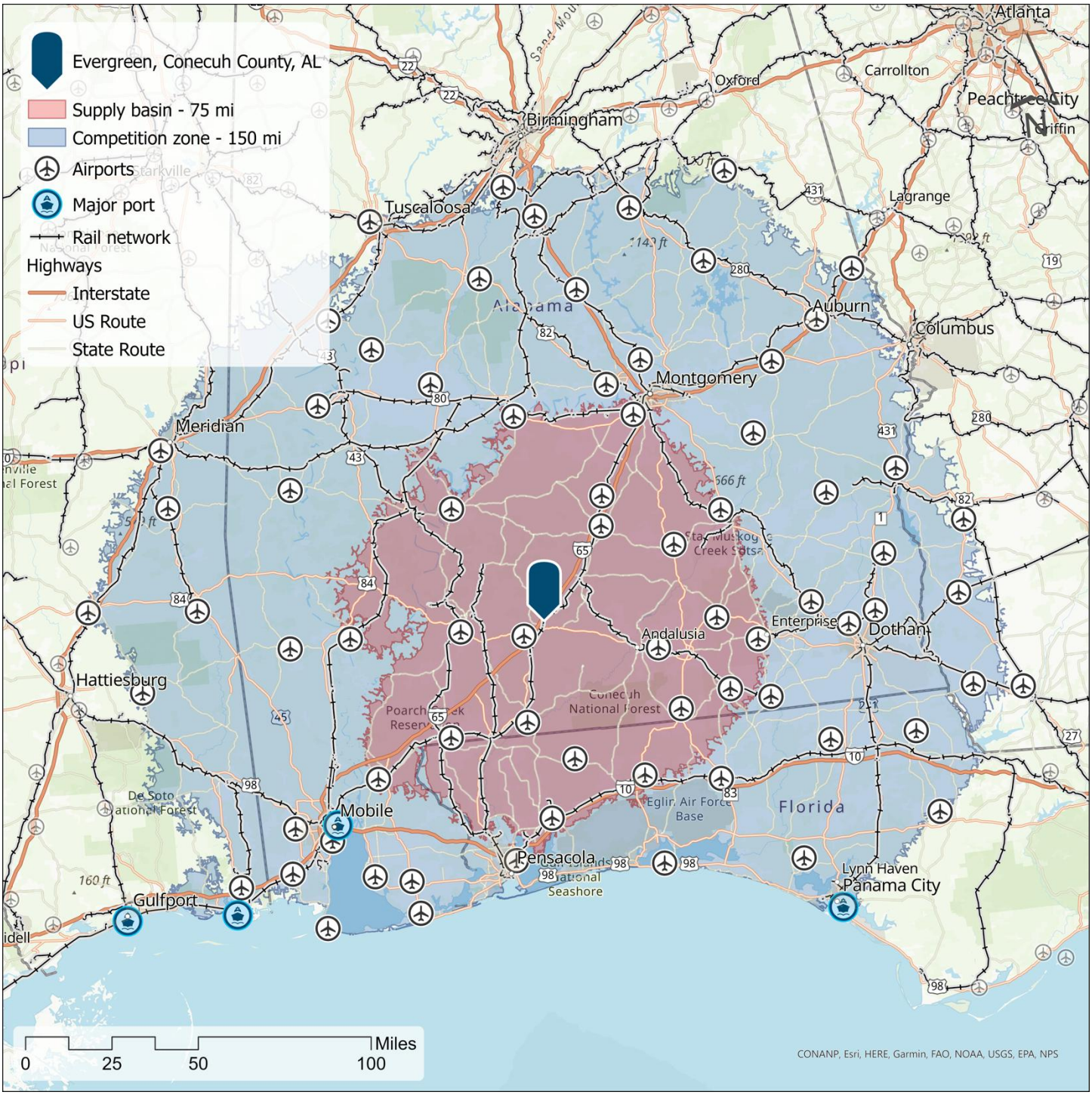
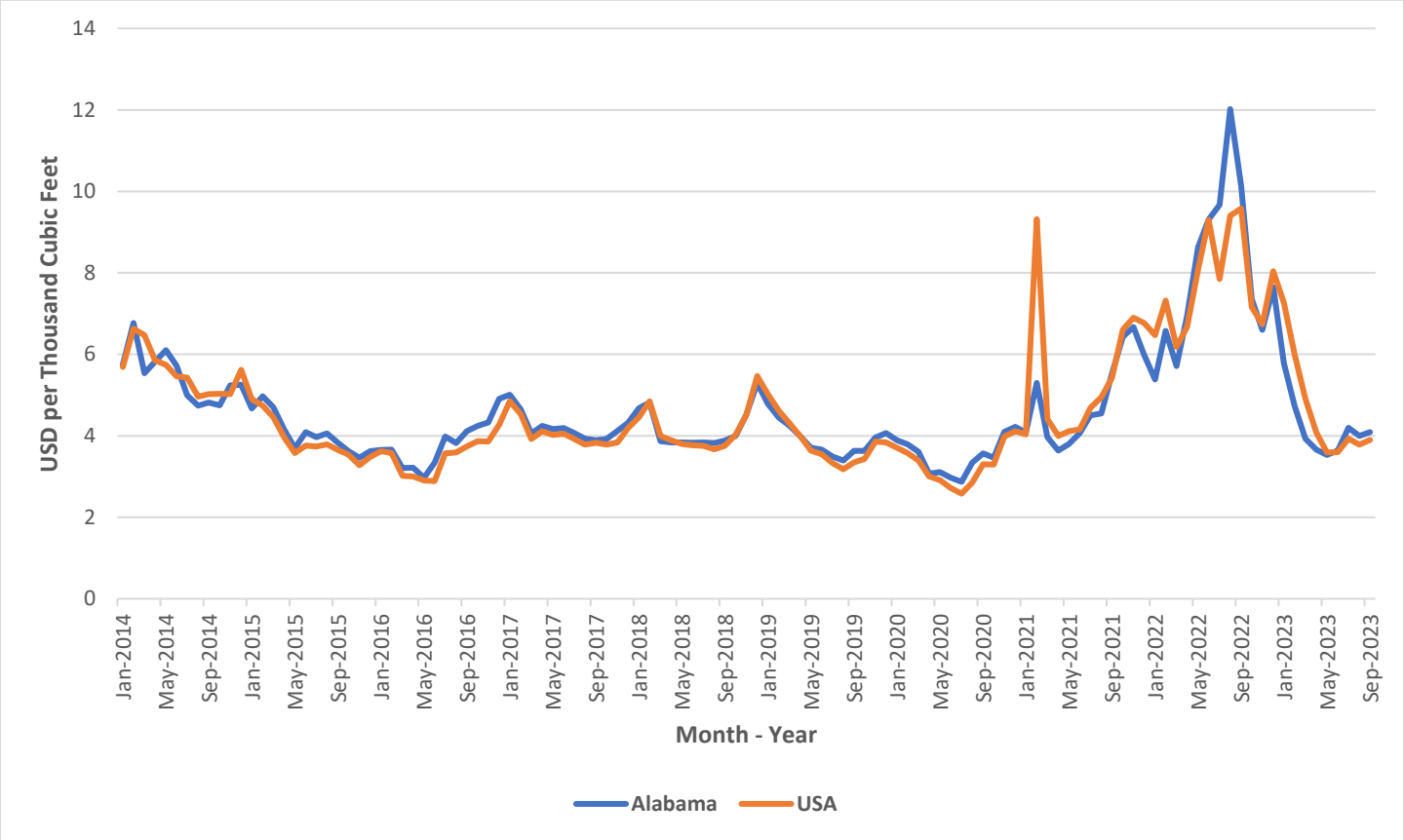


Figure C-14. Historical Natural Gas Price – Alabama vs USA Average[55]



- The price of natural gas in Alabama tracks the average price in the USA with a correlation of 0.92.

[55] Alabama natural gas industrial price: https://www.eia.gov/dnav/ng/hist/n3035al3m.htm. Accessed Dec 15, 2023.

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