CAMERON COUNTY, PA

Biofuel Development Opportunity Zone

RATING GRADE: 'A'

Date of Issue: December 20, 2024

A
High Quality

Rating Parameters:

Category	Rated Quantity	Delivered Price	BDO Zone Size
Pulpwood	350,000 bdt/yr	$70-$90/bdt	75-mi drive distance
Forest residue	100,000 bdt/yr	$70-$90/bdt	from Emporium, PA

BDO ZONE ASSETS

- Leading hardwood lumber and wood product manufacturing hub in North America.
- Adequate logging and transportation capacity to support new large-scale bio-projects.
- Synergy between pulpwood markets and silvicultural objectives in public forests.
- High quality infrastructure attributes, including low-cost natural gas, low electricity rates, and rail access.

BDO ZONE LIABILITIES

- Feedstock likely to be procured over distances greater than 55 miles due to proximity to competitors.
- Aging workforce and need for improved recruitment.

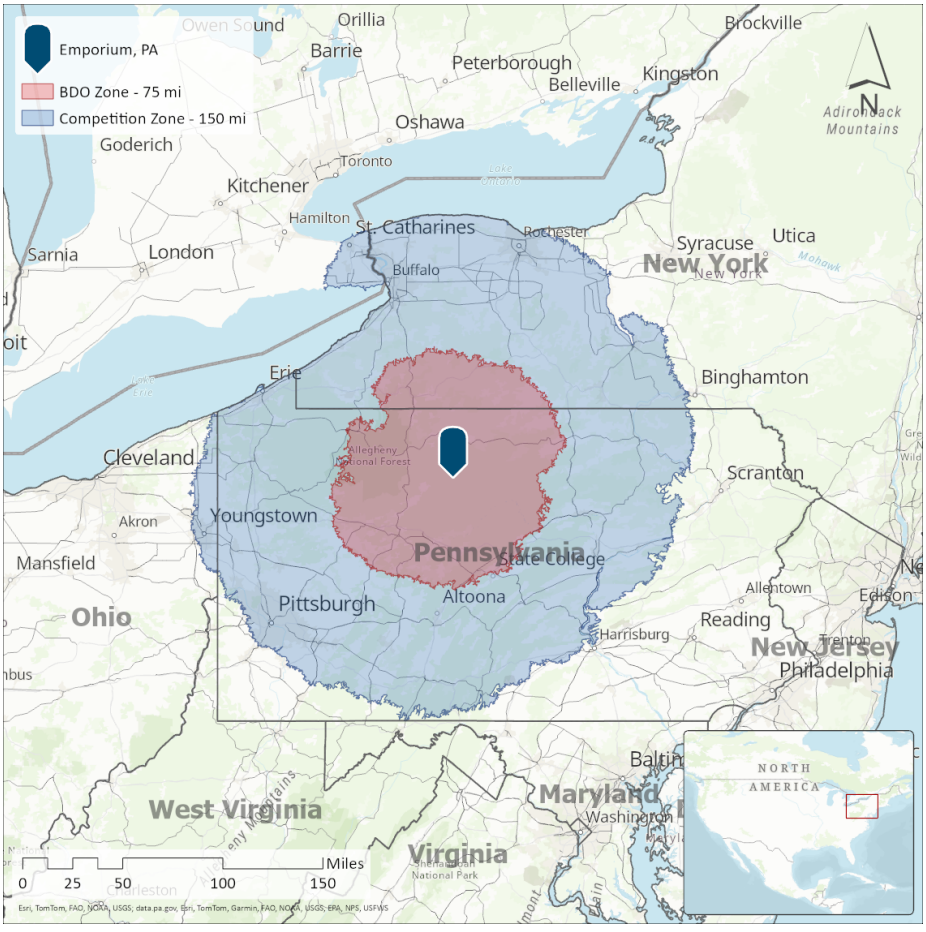
RATING GRADE

The Cameron County, PA, 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 competition, scale-up requirements, and long-term sustainable wood supply than is the case for higher ratings.

CAMERON COUNTY, PA BDO ZONE



ANALYST NOTES

The Cameron County, PA BDO Zone encompasses a 10,000 square mile area centered in Emporium, PA. Forests cover 90% of the land area within the BDO Zone and are principally comprised of hardwood species. Pennsylvania is a global leader in hardwood product manufacturing but has experienced declining production in recent decades in response to changes in consumer preferences and international competition. Despite recent trends, fundamentals remain strong. There are over 26 wood processing facilities in the BDO Zone, including sawmills, pellet mills, and a specialty paper mill. Pulpwood demand has also declined in recent years, providing an opportunity for new entrants. Experienced logging professionals are available to increase pulpwood and forest residue recovery, although efforts to recruit and retain workers will likely be required in the long run.

A total of 450,000 bdt/yr of wood fiber (approximately 900,000 green metric tons) is estimated to be available for new projects in the BDO Zone at low risk, including 350,000 bdt/yr of pulpwood and 100,000 bdt/yr of forest residue. The delivered price is expected to range from $70 to $90/bdt for both feedstock types. Sawmill residues are unlikely to be available to new projects at low risk due to the presence of a large specialty paper mill and a landscaping materials company, both located within a 30-mile drive distance of Emporium. A detailed description of the methods used to estimate the rated quantities and prices is presented in Section B.

Risks relevant to the rated quantities and prices were assessed using 88 Risk Indicators from the US Standards for Biomass Supply Chain Risk (BSCR). Details of the risk assessment are presented in Section D. The following is a summary of the most significant assets and liabilities of the BDO Zone, as inferred from the risk assessment.

BDO ZONE ASSETS

Pennsylvania has the largest hardwood growing stock in the United States and is a leading producer of hardwood products. The regional industry remains strong despite long-term declines in price and demand relating to international competition and changing consumer preferences. Although the sawmills in the region cannot be guaranteed to supply sawmill byproducts to new projects owing to proximity to a specialty paper mill, large landscaping materials producers, and numerous pellet mills, sawtimber supply chains ensure continuous production of pulpwood.

The supply chain capacity required for the rated quantities is adequate and does not require scaling up. The logging workforce is large and experienced, and there are a sufficient number of chip trucks. Whole-tree chipping operations are common on private timberlands and include the option for debarking to increase feedstock quality.

Tree species with intermediate shade tolerance, including red and white oak, are best managed using shelterwood silvicultural systems, which produce large proportions of pulpwood. Regional pulpwood demand is currently inadequate to support shelterwood operations to the extent required. The willingness of the Pennsylvania Department of Conservation and Natural Resources (DCNR), the United States Forest Service (USFS), corporate timberland management organizations, and other organizations (National Wild Turkey Federation, Ruffed Grouse Society) to work with new pulpwood buyers in order to meet silvicultural objectives provides additional assurances that the rated quantities will be available.

BDO ZONE LIABILITIES

The specialty paper mill in Johnsonburg, PA, processes over 200,000 bdt of pulpwood annually and operates strategically positioned chipping yards north and south of Emporium for efficient pulpwood consolidation. Although the rated quantity was determined after accounting for the mill's demands, competition risk is elevated.

Most available pulpwood and forest residue would likely be sourced over distances greater than 55 miles. Sourcing pulpwood and forest residue over long distances introduces significant transportation risks. Although the USFS Forest Inventory and Analysis (FIA) data used to infer the geographic distribution of forest resources is limited, competitors' supply chains in the vicinity of Emporium are well established (i.e., three chipping yards and numerous logging contractors).

The forestry workforce in Pennsylvania is aging and recruitment is not keeping pace with attrition. This is a

problem common to North American forestry. It is expected that the rated quantities can be made available to new bio-projects, but the timeliness and consistency of deliveries would improve over the long-term with an expansion of workforce training programs.

INFRASTRUCTURE PROFILE

The 13-acre site in Emporium, against which infrastructure risks were evaluated, is zoned for industrial use. Proximity to rail lines enhances logistics capabilities. The presence of all primary utilities and a 244,000-square-foot building on the site provides immediate opportunities for businesses to begin operations with minimal initial investment. The combination of strong community support, affordable living costs, and a skilled labor force further enhances prospects for bio-project development.

Higher risk items, including regional water supply, transportation infrastructure, and broadband connectivity, are noteworthy but are unlikely to significantly impact new projects. Note that a number of other sites are available, owned by the County and by private companies.

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 50-mile driving distance from the center point (Emporium, PA).

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

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

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

Loaded RI scores of 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 and Infrastructure Indicators. The BDO Zone score for Cameron County, PA, is ***18.12 out of 100, resulting in an 'A' designation.***

All scoring and rationale for each Risk Indicator are provided in Section D.

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SECTION A: RISK INDICATOR SUMMARY

Figure A-1. All Risk Indicators Sorted by Risk Level

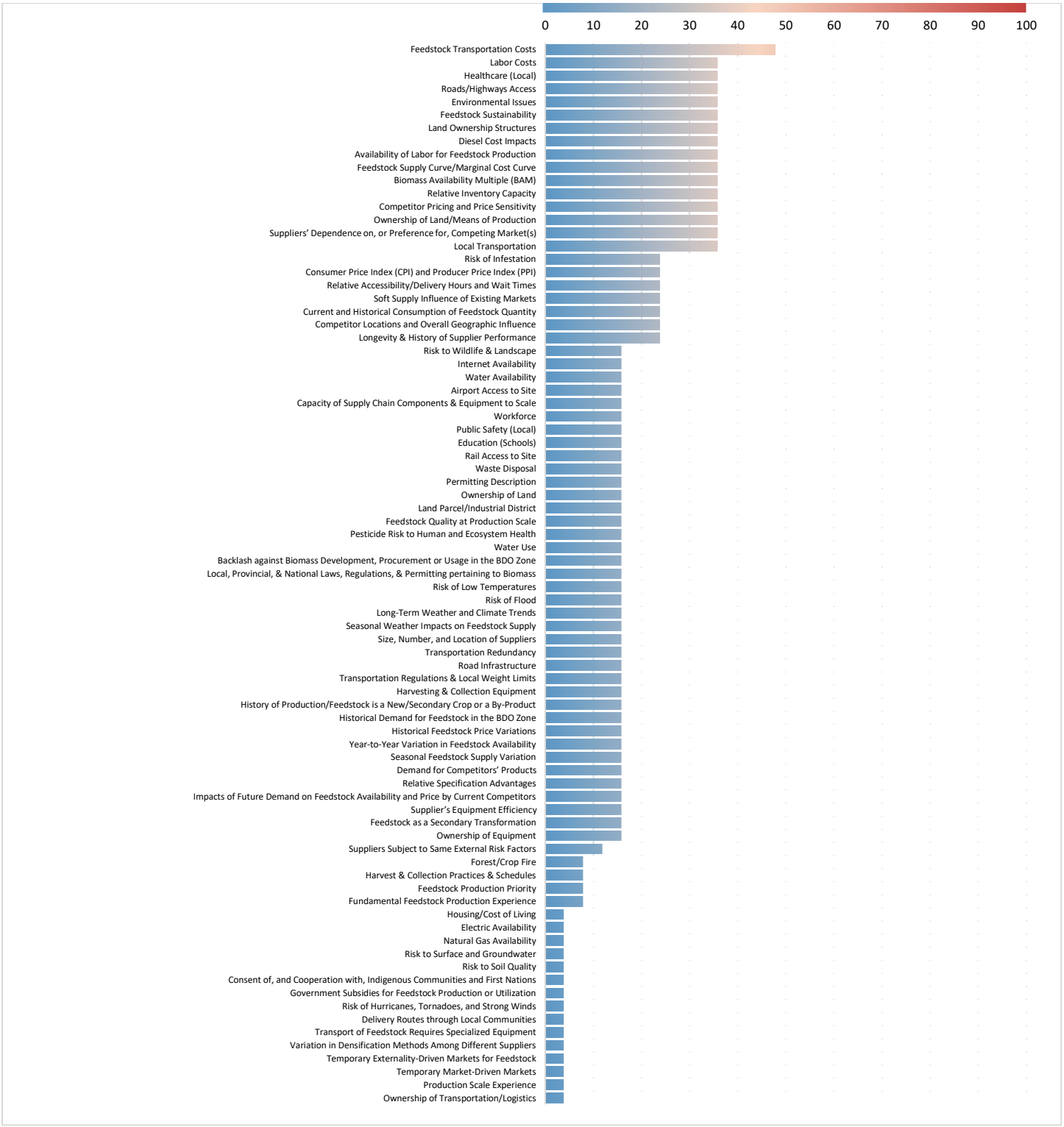


Table A-1. Risk Indicators and Associated Scores

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 Risk Factor: Credit-Worthiness/Future Solvency of Suppliers					
1.1.1 Longevity & History of Supplier Performance	6	4	24	NN	24
1.2 Risk Factor: Conflicts of Interest/Vested Interest with Competing Market(s)					
1.2.1 Suppliers' Dependence on, or Preference for, Competing Market(s)	6	6	36	NN	36
1.3 Risk Factor: Supplier Control Over Production and Transportation					
1.3.1 Ownership of Land/Means of Production	6	6	36	NN	36
1.3.2 Ownership of Equipment	4	4	16	NN	16
1.3.3 Ownership of Transportation/Logistics	2	2	4	NN	4
1.3.4 Feedstock as a Secondary Transformation	4	4	16	NN	16
1.4 Risk Factor: Supplier Experience					
1.4.1 Fundamental Feedstock Production Experience	4	2	8	NN	8
1.4.2 Production Scale Experience	2	2	4	NN	4
1.5 Risk Factor: Supplier Harvesting/Collection/Processing Capacity					
1.5.1 Supplier's Equipment Efficiency	4	4	16	NN	16
1.6 Risk Factor: Supplier Motivation					
1.6.1 Feedstock Production Priority	4	2	8	NN	8
Category 2.0: Competitor Risk					
2.1 Risk Factor: Influence on Feedstock Supply of Existing Markets					
2.1.1 Competitor Locations and Overall Geographic Influence	6	4	24	NN	24
2.1.2 Current and Historical Consumption of Feedstock Quantity	6	4	24	NN	24
2.1.3 Competitor Pricing and Price Sensitivity	6	6	36	NN	36
2.1.4 Impacts of Future Demand on Feedstock Availability and Price by Current Competitors	4	4	16	NN	16
2.1.5 Soft Supply Influence of Existing Markets	4	6	24	NN	24
2.1.6 Temporary Market-Driven Markets	2	2	4	NN	4
2.2 Risk Factor: Specific Competitors' Competitive Advantage					
2.2.1 Relative Inventory Capacity	6	6	36	NN	36
2.2.2 Relative Accessibility/Delivery Hours and Wait Times	6	4	24	NN	24
2.2.3 Relative Specification Advantages	4	4	16	NN	16
2.2.4 Demand for Competitors' Products	4	4	16	NN	16
Category 3.0: Supply Chain Risk					
3.1 Risk Factor: Feedstock Availability					
3.1.1 Biomass Availability Multiple (BAM)	6	6	36	NN	36
3.1.2 Feedstock Supply Curve/Marginal Cost Curve	6	6	36	NN	36
3.1.3 Seasonal Feedstock Supply Variation	4	4	16	NN	16
3.1.4 Year-to-Year Variation in Feedstock Availability	4	4	16	NN	16
3.2 Risk Factor: Historical Issues					
3.2.1 Historical Feedstock Price Variations	4	4	16	NN	16
3.2.2 Historical Demand for Feedstock in the BDO Zone	4	4	16	NN	16
3.2.3 History of Production/Feedstock is a New/Secondary Crop or a By-Product	4	4	16	NN	16
3.3 Risk Factor: Non-Weather Based Externalities					
3.3.1 Consumer Price Index (CPI) and Producer Price Index (PPI)	6	4	24	NN	24
3.3.2 Currency Risk	NR	NR	NR	NR	NR
3.3.3 Border Risk	NR	NR	NR	NR	NR
3.3.4 Temporary Externality-Driven Markets for Feedstock	2	2	4	NN	4
3.4 Risk Factor: Risks Related to Feedstock Production, Harvest, and Collection					
3.4.1 Harvest & Collection Practices & Schedules	4	2	8	NN	8
3.4.2 Harvesting & Collection Equipment	4	4	16	NN	16
3.4.3 Variation in Densification Methods Among Different Suppliers	2	2	4	NN	4
3.4.4 Availability of Labor for Feedstock Production	6	6	36	NN	36
3.5 Risk Factor: Transportation					
3.5.1 Feedstock Transportation Costs	6	8	48	NN	48
3.5.2 Diesel Cost Impacts	6	6	36	NN	36
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 & Local Weight Limits	4	4	16	NN	16
3.5.6 Road Infrastructure	4	4	16	NN	16
3.5.7 Transportation Redundancy	4	4	16	NN	16

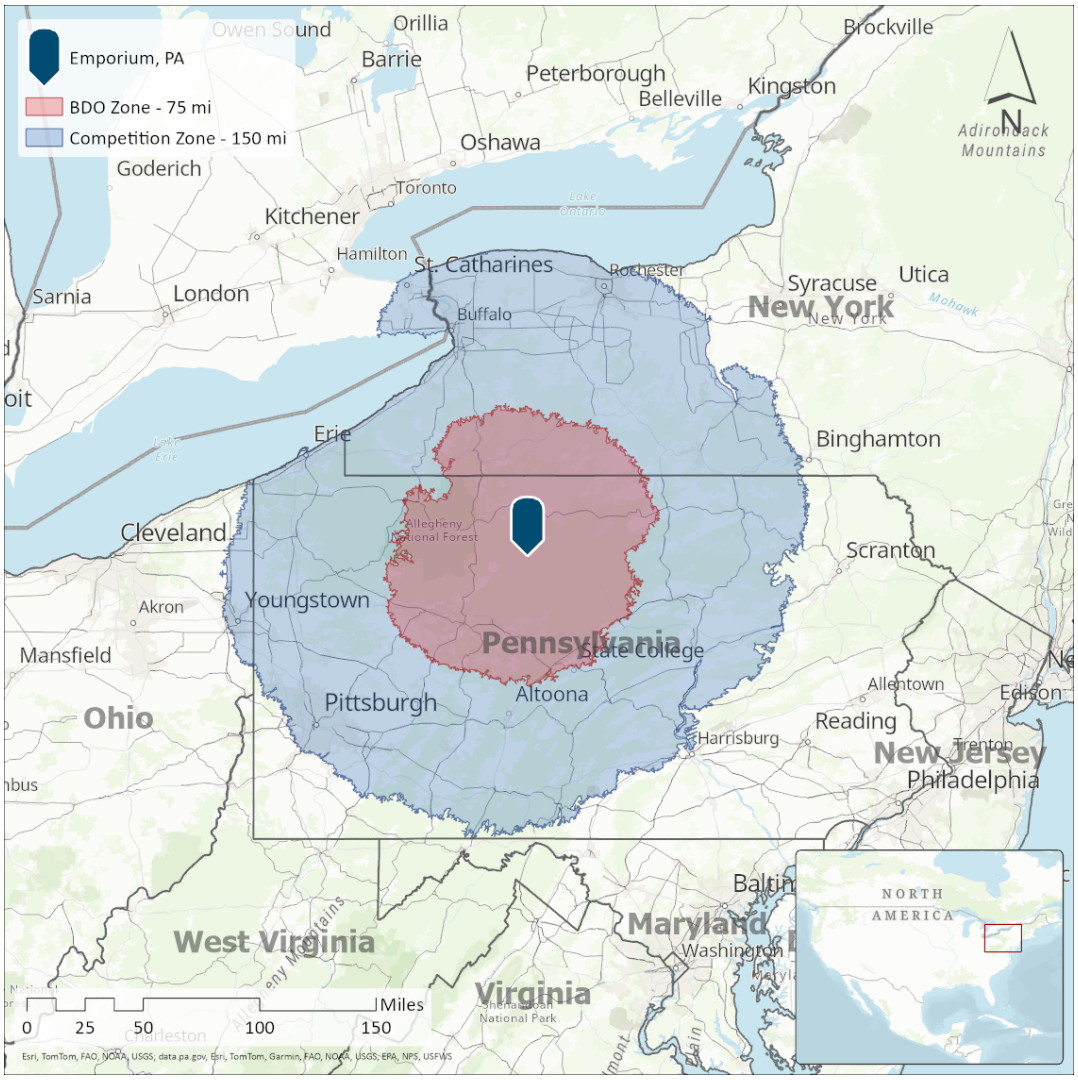
3.6 Risk Factor: Supply Chain Resiliency					
3.6.1 Size, Number, and Location of Suppliers	4	4	16	NN	16
3.6.2 Suppliers Subject to Same External Risk Factors	2	6	12	NN	12
3.6.3 Land Ownership Structures	6	6	36	NN	36
3.7 Risk Factor: Climate and Natural Risks					
3.7.1 Seasonal Weather Impacts on Feedstock Supply	4	4	16	NN	16
3.7.2 Long-Term Weather and Climate Trends	4	4	16	NN	16
3.7.3 Forest/Crop Fire	2	4	8	NN	8
3.7.4 Risk of Infestation	4	6	24	NN	24
3.7.5 Risk of Hail	NR	NR	NR	NR	NR
3.7.6 Risk of Flood	4	4	16	NN	16
3.7.7 Risk of Drought	NR	NR	NR	NR	NR
3.7.8 Risk of Hurricanes, Tornadoes, and Strong Winds	2	2	4	NN	4
3.7.9 Risk of Low Temperatures	4	4	16	NN	16
3.8 Risk Factor: Political and Social					
3.8.1 Government Subsidies for Feedstock Production or Utilization	2	2	4	NN	4
3.8.2 Local, Provincial, & National Laws, Regulations, & 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 Cooperation with, Indigenous Communities and First Nations	2	2	4	NN	4
3.8.5 Food Security Concerns	NR	NR	NR	NR	NR
3.9 Risk Factor: Sustainability and Environmental Concern					
3.9.1 Feedstock Sustainability	6	6	36	NN	36
3.9.2 Risk to Soil Quality	2	2	4	NN	4
3.9.3 Risk to Surface and Groundwater	2	2	4	NN	4
3.9.4 Water Use	4	4	16	NN	16
3.9.5 Pesticide Risk to Human and Ecosystem Health	4	4	16	NN	16
3.9.6 Risk to Wildlife and Landscape	4	4	16	NN	16
3.9.7 Biomass Classified as Genetically Modified Organism (GMO)	NR	NR	NR	NR	NR
Category 4.0: Feedstock Scale-up Risk					
4.1 Risk Factor: Feedstock Scale-Up					
4.1.1 Feedstock Quality at Production Scale	4	4	16	NN	16
4.1.2 Capacity of Supply Chain Components & Equipment to Scale	4	4	16	NN	16
Category 5.0: Infrastructure					
5.1 Risk Factor: Physical Infrastructure					
5.1.1 Land Parcel/Industrial District	4	4	16	NN	16
5.1.2 Ownership of Land	4	4	16	NN	16
5.1.3 Permitting Description	4	4	16	NN	16
5.1.4 Environmental Issues	6	6	36	NN	36
5.2 Risk Factor: Utilities					
5.2.1 Natural Gas Availability	2	2	4	NN	4
5.2.2 Electric Availability	2	2	4	NN	4
5.2.3 Water Availability	4	4	16	NN	16
5.2.4 Waste Disposal	4	4	16	NN	16
5.2.5 Internet Availability	4	4	16	NN	16
5.3 Risk Factor: Transportation/Logistics					
5.3.1 Roads/Highways Access	6	6	36	NN	36
5.3.2 Rail Access to Site	4	4	16	NN	16
5.3.3 Airport Access to Site	4	4	16	NN	16
5.3.4 Water Freight Access	NR	NR	NR	NR	NR
5.4 Risk Factor: Social Infrastructure					
5.4.1 Healthcare (Local)	6	6	36	NN	36
5.4.2 Education (Schools)	4	4	16	NN	16
5.4.3 Local Transportation	6	6	36	NN	36
5.4.4 Public Safety (Local)	4	4	16	NN	16
5.4.5 Housing/Cost of Living	2	2	4	NN	4
5.5 Risk Factor: Labor					
5.5.1 Workforce	4	4	16	NN	16
5.5.2 Labor Costs	6	6	36	NN	36
				Average	**18.12**

SECTION B: BIOMASS AVAILABILITY AND PRICING

OVERVIEW

BDO Zone Risk Indicators are scored with reference to specific feedstock quantities and prices. The rated quantities are determined by first estimating the potential amount of biomass feedstock that can be produced within the BDO Zone, defined by a 75-mile drive distance from Emporium, PA (Map B-1). Thereafter, biomass availability for new bio-projects is estimated by subtracting the current demand for the rated feedstock types in the Competition Zone (150-mile drive distance from Emporium, PA) from the estimate of total potential production. The rated quantity is then determined by dividing the availability estimate by a Biomass Availability Multiple (BAM) of between 1.5 and 4.0. The BAM is applied to account for uncertainty in underlying data, models, assumptions, and future supply and demand conditions. The resulting rated feedstock quantities are conservative estimates of availability for new projects. The price range associated with each rated quantity is determined through outreach and market analysis in the Competition Zone and reflects the anticipated price that a new bio-project would have to pay to secure the rated quantity of biomass.

Map B-1. Map of BDO Zone and Competition Zone



EVALUATED FEEDSTOCKS

Pulpwood: Trees with a diameter at breast height (DBH) of between 5 and 11 inches. We confirmed through outreach that this is the resource category with the greatest promise in the area.

Forest residues: Branches, the top section of stems, and small diameter trees that are recovered during forest operations but that cannot be sectioned into roundwood. Recovery of forest residue typically requires the use of mobile chippers or grinders capable of comminuting the material into smaller, homogenous particle sizes. Chip trucks are subsequently used to transport the material to the destination.

Sawmill residues: Byproducts of sawmill operations produced from the conversion of sawlogs into lumber and finished wood products. A typical lumber mill converts 40-60% of sawlogs into finished wood products. The remaining portion of sawn timber is transformed during milling into sawmill residue, including wood chips, sawdust, planer shavings, and bark.

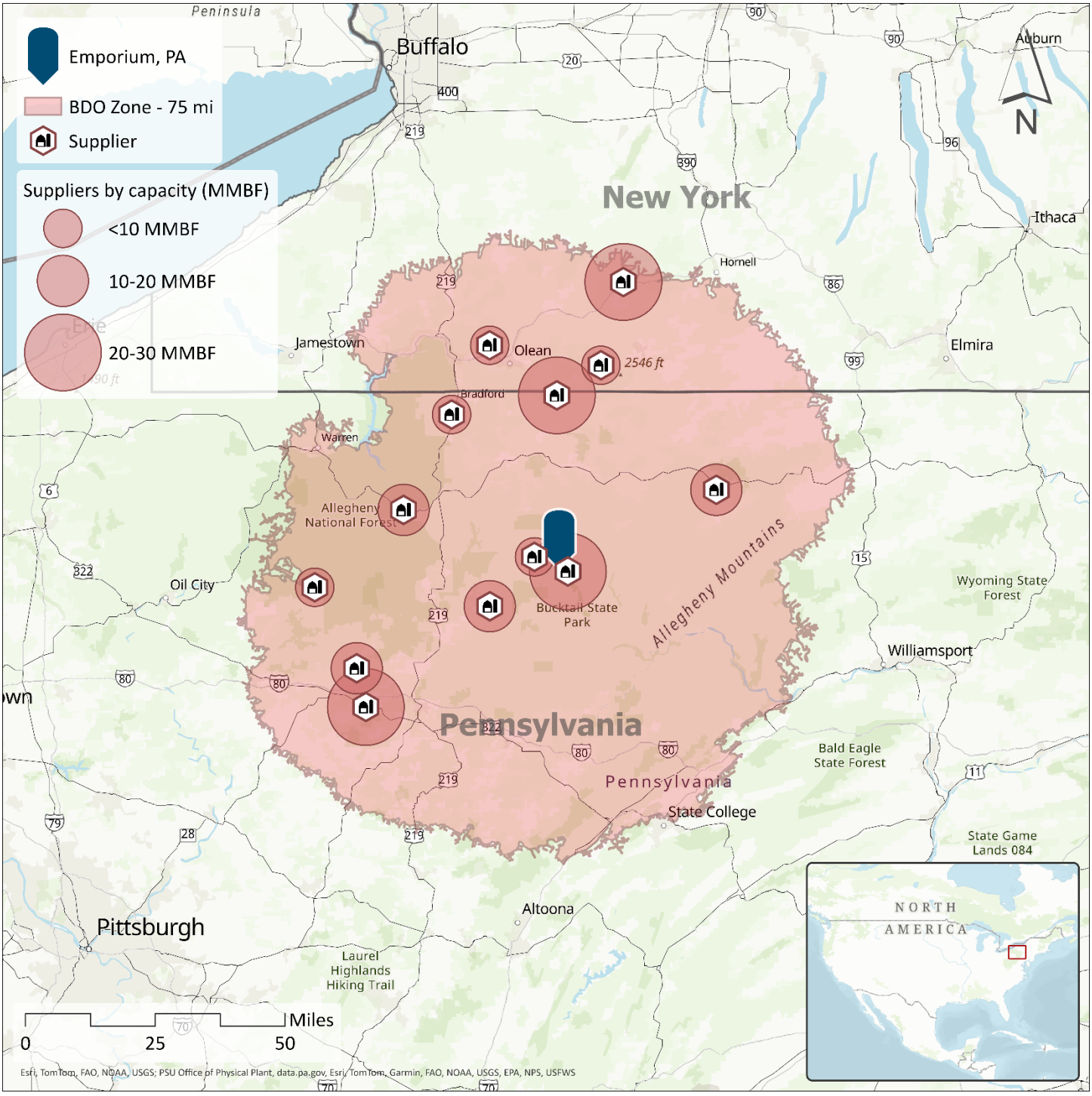
SUPPLY ANALYSIS

There are 13 operational sawmills located within the BDO Zone with capacities larger than 5 MMBF/yr, generating approximately 433,000 bdt/yr of sawmill byproducts (Table B-1). The average lumber production capacity of sawmills in the BDO Zone is 15 MMBF/yr. Sawmills are concentrated in the northwest quadrant of the BDO Zone (Map B-1). Principal species harvested and utilized for wood products manufacturing include red oak, black cherry, and red maple.

Table B-1. Sawmill Residue Production in the BDO Zone

Sawmill Residue Type	Annual Production (bdt/yr)
Wood chips	228,000
Sawdust	127,000
Hog fuel/bark	78,000
Total	**433,000**

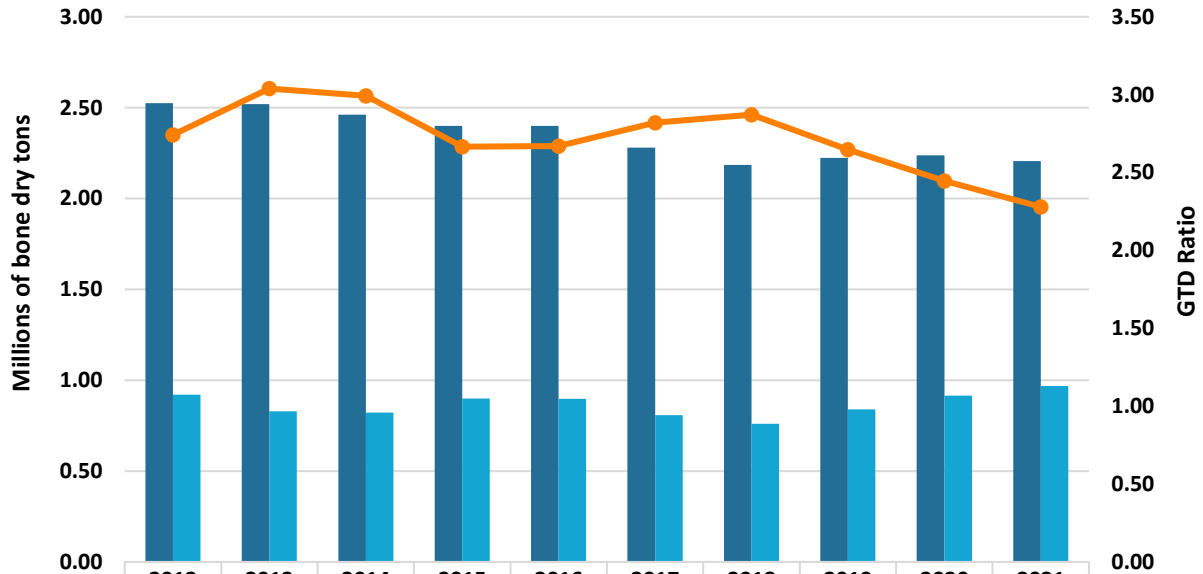
Map B-1. Location of Sawmills Within a 75-Mile Drive Distance of Emporium



The hardwood-dominant forests within the BDO Zone have the capacity to sustain a significant increase in harvest removals. United States Forest Service (USFS) Forest Inventory and Analysis (FIA) data show that average annual net growth (ANG) (growth minus natural mortality) and annual harvest removals (AHR) on public and private forestlands have been stable over the 2012-2021 period (Figure E-1).

Pulpwood availability for new projects was estimated with reference to pulpwood net growth, harvest removals, and the resulting growth-to-drain (GTD) ratio. Harvest removal data available for the region through the FIA does not distinguish between sawtimber and pulpwood. Therefore, pulpwood removals were inferred through outreach to local forestry professionals. We approximated current pulpwood harvest removals using a sawlog-to-pulpwood ratio of 3, meaning that 1 unit of pulpwood was produced for every 3 units of sawtimber. This results in an average pulpwood AHR of approximately 870,000 bdt/yr. When applied to the average ANG for pulpwood over the same period (2,340,000 bdt/yr), the pulpwood GTD ratio is 2.71 (Figure B-1).

Figure B-1. Annual Net growth, Harvesting Removals, and Growth-to-Drain Ratio for Pulpwood (5-11" DBH)



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
ANG - Pulpwood	2.53	2.52	2.46	2.40	2.40	2.28	2.18	2.22	2.24	2.21
AHR - Pulpwood	0.92	0.83	0.82	0.90	0.90	0.81	0.76	0.84	0.91	0.97
GTD Ratio - Pulpwood	2.74	3.04	2.99	2.67	2.67	2.82	2.87	2.65	2.45	2.28

The amount of pulpwood that could be available annually in the BDO Zone for future biomass projects was estimated by calculating the average difference between the pulpwood ANG and AHR, and adjusting the resulting availability estimate to ensure a pulpwood GTD Ratio of 1.2. This results in an estimate of 1,085,000 bdt/yr of pulpwood available annually for sustainable removal. FIA data indicates that 68% of this quantity is available on private lands (740,000 bdt/yr), whereas 32% is available on public lands (345,000 bdt/yr).

Forest residue includes the tops and branches of merchantable trees ("topwood"), as well as small diameter trees ("incidentals"). Topwood and incidentals can be recovered from forest operations on private lands if tops and branches are not separated before extraction and if the density of incidentals is sufficient to enable cost-effective recovery without

impeding the production of merchantable roundwood. Forest residue recovery is most likely to occur at scale on private timberlands.[1]

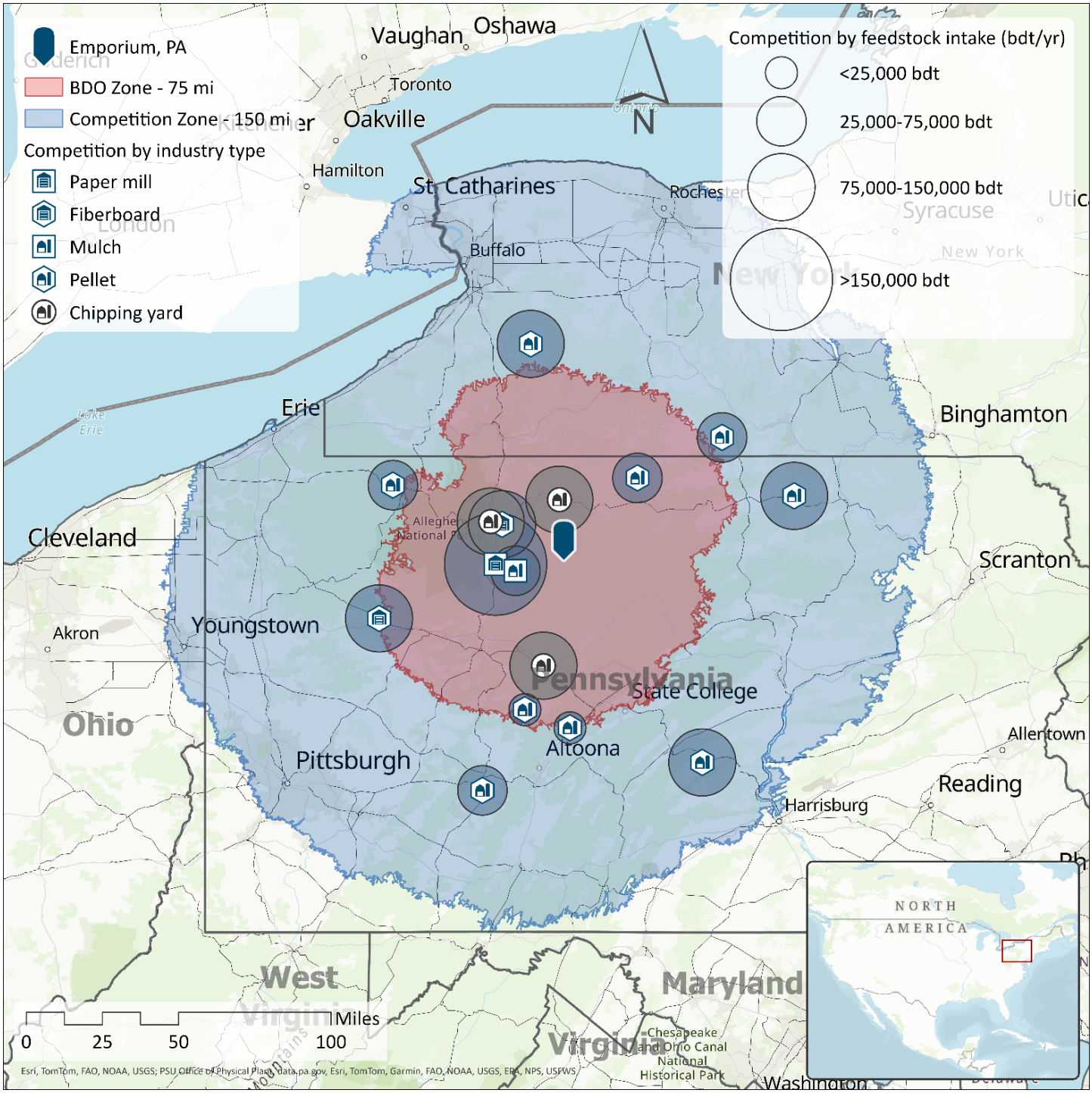
To estimate forest residue production, we assume that 0.35 units of forest residue are recovered for every 1 unit of sawtimber.[2] Private timberlands account for approximately 68% of the wood supply in the BDO Zone, and therefore approximately 1.2 million bdt/yr of sawtimber is produced on private lands.[3] Under these assumptions, the total annual production of forest residue on private lands amounts to 420,000 bdt/yr.

COMPETITION ANALYSIS

We identified a total of 13 competitors for pulpwood and sawmill residue in the Competition Zone, defined by a 150-mile drive distance from Emporium, PA (Map B-2). The identified competitors consume an estimated 1,190,000 bdt/yr of sawmill residue and pulpwood. About half of this amount (570,000 bdt/yr) is likely sourced from sawmills and managed timberlands located within the BDO Zone. There are also at least three large chipping yards that are used by competitors to consolidate pulpwood (grey circles on map).

[1] On federal and state forest lands in the region, tops and branches are generally left in the forest due to smaller operating areas, the practice of partial harvesting, and the need to protect regeneration from deer browsing.
[2] Based on internal database and previous BDO Zone ratings.
[3] Average sawtimber production in the BDO Zone between 2012 and 2021 was 1.76 million bdt/yr.

Map B-2. Location of competitors within a 150-mile drive distance of Emporium



The largest competitor is a specialty paper mill in Johnsonburg, PA, which has an estimated intake capacity of 400,000 bdt/yr. The mill is located 30 miles from Emporium and sources a mixture of sawmill chips and pulpwood chips, with a preference for sawmill chips. Pulpwood chips are produced at three chipping yards located within a 60-mile drive distance of the mill (grey circles on Map B-2). Whole-tree chipping operations supply additional amounts of debarked wood chips as required. The majority of wood chips produced by the 13 sawmills in the BDO Zone (~228,000 bdt/yr) are sold to the paper mill. Therefore, we estimate that the mill consumes approximately 200,000 bdt/yr of pulpwood. Two secondary wood product manufacturing facilities and a mulch producer likely consume an additional 100,000 bdt/yr of pulpwood and sawmill residue from the BDO Zone.

Sawdust and hog fuel/bark generated by the region's sawmills are used on-site to meet process energy demands (e.g., kiln drying of lumber) or are purchased by the mulch producer and by the nine pellet mills located within the Competition Zone. The pellet mills are estimated to intake a total of over 500,000 bdt/yr of sawdust and hog fuel/bark, whereas the mulch producer likely sources the majority of bark produced by the identified sawmills (78,000 bdt/yr). There is also a new pellet mill planned for construction in Port Allegheny, PA. Note that no evidence of forest residue utilization was identified during outreach.

RATED QUANTITIES AND PRICING

The total quantity of biomass estimated to be available for new projects in the BDO Zone at low risk is 450,000 bdt/yr, including 350,000 bdt of pulpwood and 100,000 bdt of forest residue. Sawmill residue is not available in sufficient quantities at low risk to support new projects. Wood chips produced by the region's sawmills are a priority feedstock for the paper mill located within a 30-mile drive distance of Emporium. Sawdust and bark are utilized by a large mulch producer located in St. Mary's, PA (20 miles from Emporium), pellet mills, and sawmills to meet process heating requirements (e.g., kilns).

The rated quantity of pulpwood (350,000 bdt/yr) was determined by applying a Biomass Availability Multiple (BAM) of 3.0 to the estimated pulpwood availability. A relatively high BAM value was selected on the basis of incongruencies between USFS FIA data and timber sales data for the Allegheny National Forest and the four state forests that overlap with the BDO Zone. As described in the supply analysis, FIA harvest removals data indicates that approximately 345,000 bdt/yr of the available pulpwood is produced on public lands (32% of 1,085,000 bdt/yr). However, inferences using timber sales data lead to a much lower annual pulpwood supply estimate for public timberlands (50,000-100,000 bdt/yr).[4] Considering the uncertainties associated with both pulpwood estimation methods, the high level of pulpwood production that has been sustained in the region for decades, and feedback from local forestry professionals during outreach, we conclude that at least 350,000 bdt/yr could be secured by new bio-projects at low risk. The delivered price is likely to range from $70 to $90/bdt.[5]

The quantity of forest residue rated for new projects was determined by applying a BAM of 3.0 to the estimate of availability from private lands. This effectively assumes that 25% of forest operations on private timberland would involve forest residue recovery if a facility sited in the area was willing to pay a delivered price of between $70 and $90/bdt.

[4] Estimated by converting MBF values reported by USFS and Pennsylvania BOF to green tons using a conversion factor range of 4.5 – 9.0 tons per MBF, and assuming that 1 unit of pulpwood is produced for every 3 units of sawtimber. The conversion factor range of 4.5 – 9.0 tons per MBF was derived from outreach and from Table 6 of the USDA Timber Products Monitoring publication (https://www.srs.fs.usda.gov/pubs/gtr/gtr_srs251.pdf).
[5] Price based on outreach to local forestry professionals.

Table B-2. Available and Rated Quantities and Corresponding Rated Price Range for the Evaluated Feedstocks

Feedstock Type	Available Quantity (bdt/yr)[6]	Rated Quantity (bdt/yr)	Rated Price Range ($/bdt delivered)[7]
Pulpwood	1,085,000	350,000	$70-$90
Forest residues	420,000	100,000	$70-$90
Sawmill residues	0	N/A	N/A

[6] Calculated by subtracting current demand (as derived in Competition Analysis subsection) from total supply potential (as derived using FIA data in Supply Analysis subsection).

[7] Prices based on outreach to local forestry professionals and transportation cost of $0.20/green ton/loaded mile over an average distance of 50 miles.

SECTION C: INFRASTRUCTURE



PROPERTY OVERVIEW

Address:	1 Airport Road
City:	Emporium
State:	Pennsylvania
County:	Cameron
Acres:	13 Acres
Pricing Note:	$3.75MM
Topography:	Flat
Zoning:	M-industrial
Building on Site:	Yes

ADDITIONAL BUILDING SPECS

Building:	244,000 sq ft
Loading Docks:	7
Cranes:	Two 3-ton, one 1.5 ton
Offices:	3-story 27,000 sq ft

SITE CONTACT

Dana L. Grau
Lee & Associates
11 Stanwix Street
Pittsburgh, PA 15222
P: 412-512-3737
dgrau@lee-associates.com

ADDITIONAL NON-RATED SITES

Infrastructure Sites Contact
Bob Buckingham
BDO Zone Infrastructure
bob@ecostrat.com

PROPERTY PROFILE

The evaluated property is 13 acres in size and is privately owned and marketed by Lee & Associates. The property is located on the western edge of Emporium, PA. A 244,000 square foot building is included with all utilities on site. Rail access is available within a two-mile drive distance of the property and the U.S. Interstate Highway System is located 40 miles south.

Transportation

Nearest Highway: Highway 120
Nearest Interstate: I-80 (55 miles)
Nearest Commercial Airport: Bradford (38 miles)
Nearest Airport: Bradford (38 miles)
Rail Served: Nearby – <2 miles
Rail Infrastructure in Place: No
Rail Accessible: Transmodal – Western New York and Penn Railroad

Electric Service

Supplier: First Energy/WPP
Ownership: Private
Phone: 866-316-1640
Website: www.firstenergycorp.com/
All Utilities Extend to Site: Yes
Nearest Substation: On site
Capability: 46 kV service to the site/building, five transformers

Natural Gas

Supplier: National Fuel
Ownership: Private
Phone: 866-316-1640
Website: https://www.nationalfuel.com/
Size of Proposed Main: 12"
Pressure: 50 psi
Capability: Commercial and industrial volumes supported by Mid-American Energy

Water

Supplier: Emporium Water Company
Ownership: Municipal
Phone: 814-486-3363
Website: www.emporium.water.com
Size of Main: 12"
Peak Capacity: 1 M gallons/day
Capability: Piping for industrial volumes

Wastewater

Supplier: Mid-Cameron Authority
Ownership: Municipal
Phone: 814-486-0481
Website: www.emporiumborough.org/
Size of Main: 6-12"
Capability: 1 M gallons/day

Telecommunications

Supplier: Windstream
Ownership: Private
Phone: 844-221-2999
Website: https://www.windstream.com/
Platforms: Fiber, wireless
Capability: Primary wireless and fiber optics.

SECTION D: RISK INDICATOR SCORING METRICS

CATEGORY 1.0: SUPPLIER RISK

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

1.1.1 Longevity & History of Supplier Performance

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

Risk Information: The regional wood products industry has a strong history of performance but has experienced declining production in recent decades. Since 2020, at least seven sawmills and wood product manufacturers in the area have permanently closed. Curtailments and closures can be linked to declining hardwood product demand and increasing sales of particleboard- and plastic-based products. While no major logging companies have closed in recent years, trends in wood processing facility curtailments and closures indicate that the number of logging companies or crews in the region could eventually decline in response to reductions in sawtimber demand. Overall, prospects for the regional industry are improved by the cyclicality of housing markets, growth in alternative markets (e.g., white oak whiskey and wine barrels), and continued international marketing of U.S. hardwood products by government agencies and industry associations, including the Pennsylvania Forest Products Association and the Hardwood Development Council.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100.	**24**

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 in supplying specific competitors with 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 competitors, resulting in supply disruptions for the Issuer.

Risk Information: The paper mill in Johnsonburg, PA, consistently purchases sawmill chips, pulpwood, and whole-tree chips. The mill has at least two satellite chipping yards where large quantities of pulpwood are aggregated, chipped, and delivered.

Logging contractors and sawmills also sell pulpwood and sawmill chips in lower volumes to two medium density fiberboard (MDF) and particle board manufacturers. All logging contractors and the majority of sawmill owner-operators contacted during outreach indicated that they would be willing to sell to new customers. Logging contractors noted that current demand is insufficient to utilize all pulpwood generated during annual forest operations. Risk is assessed as medium due to the size and procurement efficiency of the Johnsonburg mill and its network of chipping yards.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**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 or a production facility where feedstock is produced tend to have better control of supply chains and present lower degrees of supply risk.

Risk Information: Public timberlands in the BDO Zone do not present significant supply risks. Timber sales and cut volume from the Allegheny National Forest have remained stable over the past decade (Figure E-2, Appendix E). There are no recent announcements of changes in management strategy at the National Forest and therefore wood supply risk is assessed as low.

Major state forests within the BDO Zone include Elk State Forest (SF), Susquehannock SF, Sproul SF, and Moshannon SF. Timber sales data presented in the Pennsylvania Bureau of Forestry's annual Forest Products Statistical Report series shows stable timber sales (Figure E-3, Appendix E). Annual timber sales from the Pennsylvania Game Commission in northwest PA are highly volatile, ranging from 2 to 7 MMBF/yr, and therefore are not considered as a sustainable supply source.

Privately owned forest lands include large tracts owned by timber investment management organizations (TIMOs) and sawmills as well as smaller parcels. Wood supply from private timberlands is highly responsive to fluctuations in sawmill demand and associated finished wood product markets.

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 X RRI) is 36 out of 100.	**36**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**Score** **36**

1.3.2 Ownership of Equipment

Rationale: In most cases, suppliers that own or lease equipment for harvest, collection, and processing feedstock are at lower risk than those that 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 convenient harvest times, and quantity shortages can result. However, in some circumstances, reliance on third-party equipment to harvest or produce feedstock can decrease supply chain risk. For example, when harvesting agricultural residues such as corn stover, using 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: All logging equipment is owned exclusively by logging companies and contractors.

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **16**

1.3.3 Ownership of Transportation/Logistics

Rationale: In most cases, suppliers that own or lease transportation equipment necessary to transport biomass from forests or fields are at lower risk than those that do not. However, in some circumstances, reliance on third parties to transport biomass is common practice and does not contribute to risk.

Risk Information: Logging trucks are owned by logging contractors and independent operators, whereas chip trucks tend to be owned exclusively by larger wood aggregators and manufacturers. A company that owns a large portion of the chip trucks in the area would act as a supplier for a new project, and therefore, risk is assessed as very low.

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100.	**Score** **4**

1.3.4 Feedstock as a Secondary Transformation

Rationale: Secondary transformation is dependent upon the production of primary products. Forest residues, corn stover, bark, and sawmill chips (unless from a dedicated chip mill) are all secondary transformations of a primary product.

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

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

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

Risk Information: Production of the rated quantity of pulpwood depends on continued demand for sawtimber. Sawtimber demand is, in turn, dependent upon domestic and foreign demand for the hardwood lumber and products manufactured by the region's sawmills and the ability of the industry to promote and supply that demand. Although the industry has been in a state of historical decline, this is common to most regions in North America. At least thirteen sawmills, a large paper mill, and two medium sized particleboard facilities remain operational in the BDO Zone, supplied by a large network of independent and vertically integrated logging contractors. Moreover, a new project willing to pay $70-$90/bdt for pulpwood and forest residue would incent whole-tree harvesting operations in marginal stands and, therefore, is not subject to significant risk of sawtimber market decline.

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

1.4 Risk Factor: Supplier Experience

1.4.1 Fundamental Feedstock Production Experience

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

Risk Information: Suppliers in the region are familiar with the logistics of pulpwood, forest residue, and sawmill residue supply. Mobile comminution of slash has been uncommon, but this is unlikely to pose problems for a future supply chain due to operator familiarity with whole-tree chipping.

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 very low, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 8 out of 100.	**Score** **8**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 8 out of 100.	**Score** **8**

1.4.2 Production Scale Experience

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

Risk Information: Before the recent downturn in sawtimber and pulpwood demand, logging contractors had been producing up to 1 million bdt of pulpwood annually. We determined through outreach that the capacity of the regional supply chain to supply additional quantities is adequate: there is sufficient logging capacity, at least two whole-tree chipping crews, and fleets of chip trucks with available hours.

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X 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 the supplier's feedstock production capacity. Understanding the supplier's equipment capability enables understanding of their ability to produce feedstock of suitable quality.

Risk Information: The logging and comminution equipment used in the region is conventional and proven. Equipment efficiency is unlikely to be affected by recovery of the rated quantities. In cases when whole-tree chipping is not used, bringing mobile chipping or grinding units into areas on private timberlands where slash accumulates (roadside/landing) is unlikely to lead to significant efficiency problems. Logging equipment typical for shelterwood and clearcut operations can easily be used to recover smaller diameter trees.

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **16**

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, a by-product, or a residual from a more valuable product, suppliers may not put in sufficient effort for consistent production. The risk of breach increases when feedstock production and/or delivery compromise a supplier's ability to make a primary product.

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

Risk Information: None of the rated feedstock quantities presents a risk to the production of lumber and other value-added forest products. Pulpwood is easily recovered during conventional forest operations. Forest residue recovery from private forest operating areas is unproven at scale, but a large portion of this quantity is likely to come from whole-tree chipping operations.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed low, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed very low, therefore the RRI is 2 out of 10.	**2**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL X RRI) is 8 out of 100.	**8**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 8 out of 100.	**8**

CATEGORY 2.0: COMPETITOR RISK

2.1 Risk Factor: Influence on Feedstock Supply of Existing Markets

2.1.1 Competitors' 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 a competitor's geographical influence on new plants within a BDO Zone, including competitive advantages such as short hauling.

Risk Information: A major purchaser of sawmill chips and pulpwood in the region is located in Johnsonburg, PA, 30 miles from Emporium, PA. The mill sources pulpwood from three chipping yards located in the region, enabling it to strategically consolidate wood fiber. It is located within 35 miles of seven sawmills in the BDO Zone and has long-standing business relationships with owner-operators at these mills. Additional pulpwood and chip purchases are made by the two fiberboard manufacturers, located within an 80-mile drive distance of Emporium. The rated quantity of pulpwood was determined after accounting for the existing demand by these facilities and therefore risk is assessed only as low-to-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 low, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL X RRI) is 24 out of 100.	**24**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch)	**NN**

No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. — **24**

2.1.2 Current and Historical Consumption of Feedstock Quantity

Rationale: Clear understanding of feedstock consumption by key competitors for each rated feedstock type 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 the impact of external events (e.g., weather events, structural economic changes, seasonality, or policy change).

Risk Information: The Johnsonburg mill has been in operation since 1888 and has modernized equipment for specialty paper manufacturing. Capacity has been constant over the past decade. The paper mill continues to operate with a feedstock intake demand of approximately 400,000 bdt/yr. However, in recent years, the mill has favored sawmill chips over pulpwood. Monthly pulpwood quotas of 100 to 600 bdt/month are often imposed by the mill on logging contractors. Alternative buyers for pulpwood are restricted to pellet mills, which rarely purchase logs, and the firewood markets. There are no indications that either market will increase in the foreseeable future: global pellet prices have declined and firewood demand increases would require significant population growth. Overall risk is assessed as medium because the paper mill could increase demand for pulpwood if the sawmill chip production base continues to decline.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100.	**24**

2.1.3 Competitor Pricing and Price Sensitivity

Rationale: Understanding how much competitors pay (or receive) for different feedstock types is essential in determining the Issuer's competitiveness and accurately assessing 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 the ability/willingness to pay premiums for feedstock during times of feedstock shortage or reduce prices (or cut-off deliveries) during gluts. Competitors that have the ability to offer higher prices for feedstock during feedstock shortages can pose a significant risk to the 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: Regional pulpwood pricing has stayed within the range of $70-$80/bdt with the exception of the 2021-2022 period when prices temporarily increased to up to $100/bdt.[8] The firewood market is not of sufficient size to affect prices for pulpwood. There is some risk that procurement managers at the Johnsonburg mill will engage in price competition. Ownership of two satellite chipping yards further increases risk of competitor pricing.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**36**

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

Rationale: Feedstock utilization in a BDO Zone can change over time. Expansion of feedstock demand by current competitors can put additional pressure on feedstock and lead to higher prices, feedstock disruptions, shortages, supplier breaches, 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 the 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: None of the identified competitors have experienced significant increases in demand in recent years. The North American pulp and paper industry has been in a state of historical decline. There is therefore low risk that the Johnsonburg mill will significantly scale up production. The regional pellet industry has experienced modest growth over the past decade, with most capacity expansion occurring during the 2015-16 period (Figure E-4). Pellet prices have

[8] Based on outreach to local forestry professionals.

not increased significantly in recent years. MDF and panel board manufacturers in the BDO Zone are currently experiencing reduced product market demand and have scaled back production. A return to previous intake levels is unlikely to jeopardize access to the rated quantities 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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **16**

2.1.5 Soft Supply Influence of Existing Markets

Rationale: In some cases, existing markets for feedstock may be able to exert high degrees of pressure over local suppliers, effectively enabling control of 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: All forestry professionals contacted during outreach welcomed the prospect of having an alternative purchaser of low-grade wood fiber, noting that this would marginally increase delivered prices. There is some risk that the Johnsonburg paper mill and other incumbents could threaten to turn away pulpwood deliveries by contractors/companies that are working with competitors, but this is regarded as unlikely. Note that the rated quantity of pulpwood (350,000 bdt/yr) is equivalent to 23% of the total available quantity (1,085,000 bdt/yr).

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100.	**Score** **24**

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.[9]

Risk Information: No alternative, non-traditional, market-driven competitors for feedstock were identified.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100.	**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 competitive pressure it can exert on supply. The ability to store large inventories allows competitors to purchase inventory when the prices are low, potentially giving it an economic advantage. Additionally, the ability to store inventory during feedstock supply surpluses can enable competitors to continue to intake feedstock when the Issuer's plant (with lesser inventory capacity) may be forced to put suppliers on quota. Larger inventory capacity on the part of competing markets creates supplier loyalty and can make it more difficult for new projects to secure supply without paying a significant premium.

Risk Information: There are at least three chipping yards located in the BDO Zone, two of which are owned by the specialty paper mill. The yards function to significantly expand the company's inventory capacity. When considering the central yard, the mill, and the satellite yards, the mill has the capacity to stockpile significant quantities of feedstock for its operations.

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 X RRI) is 36 out of 100.	**36**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch)	**NN**

[9] Bergtold, 2018.

No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. — **36**

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 efficient discharge can occur.

Risk Information: We learned through outreach to logging contractors and other forestry professionals that the specialty paper mill in Johnsonburg, PA, is a relatively easy company to work with. Incoming trucks are weighed and unloaded within a matter of minutes using a stationary crane. Payments for pulpwood deliveries are adjusted for distance traveled (e.g., with prices increasing in increments of $2/ton as transportation distance increases). However, the Johnsonburg mill is also known to impose monthly quotas on sawmills and logging contractors.

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 X RRI) is 24 out of 100. — **24**
Mitigation/Notching — **Notch**
RRL Mitigation (Notch) — **NN** No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. — **24**

2.2.3 Relative Specification Advantages

Rationale: When choosing a market for biomass feedstock, suppliers not only look at price but also at relative quality requirements or specifications. It is important to understand feedstock quality specifications for competing markets within the BDO Zone in order to accurately quantify the risk that competitors can exert on the Issuer's supply chain.

Risk Information: The Johnsonburg paper mill accepts hardwood sawmill chips and hardwood logs, down to a diameter of 2-3 inches. The rated quantity of pulpwood is expected to have similar specifications but was determined after accounting for demand by the Johnsonburg mill.

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 X 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) X (RRI Notch) is NN (No Notch).	NN
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

2.2.4 Demand for Competitors' Products

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

Risk Information: There is a low risk that feedstock intake at the Johnsonburg mill will increase significantly in future years, given the downward trend in the pulp and paper industry. Demand at the fiberboard mills in Kane and Shippenville is currently down but is expected to rebound; this was accounted for when determining the rated quantity. Pellet mills have not increased capacity in recent years and generally do not purchase pulpwood and forest residue (Figure E-4). The addition of a new pellet mill in Port Allegheny is not likely to increase competition for pulpwood and forest residue, as pellet mills tend to prefer sawmill 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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

CATEGORY 3.0: SUPPLY CHAIN RISK

3.1 Risk Factor: Feedstock Availability

3.1.1 Biomass Availability Multiple (BAM)

Rationale: Biomass Availability Multiple (BAM) indicates the degree of redundancy in an Issuer's supply chain in relation to the rated quantity in the BDO Zone. BAM is the mean ratio of biomass feedstock available to a project in relation to delivered cost, divided by the Issuer's mean rated quantity. BAM is a strong indicator of supply chain resilience when stressed by a 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 rated quantity of pulpwood (350,000 bdt/yr) was calculated by applying a Biomass Availability Multiple (BAM) of 3.0 to the estimated available supply. A higher BAM value was chosen due to inconsistencies between the U.S. Forest Service's FIA data and timber sales data for the Allegheny National Forest and the four state forests within the BDO Zone.[10] Since there is unresolvable uncertainty inherent in the FIA data and in the conversion factors used to derive pulpwood estimates from federal and state forests, risk associated with production estimates is assessed as medium. Overall, however, we have high confidence that the final rated quantities are available at low risk.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed medium, therefore the RRL is 6 out of 10.	**6**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed medium, therefore the RRI is 6 out of 10.	**6**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**36**

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, as well as 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 at different costs. A biomass supply curve indicates quantities of feedstock available at various price levels from suppliers generally located further away than the core supplier.

Risk Information: The majority of feedstock that could be produced annually within the BDO Zone is located at distance from Emporium (Figure E-5, Appendix E). USFS FIA data indicates that over half of all pulpwood and forest residue is located between 55 and 75 miles from Emporium. Risk is moderated by the low rated quantity relative to the total potential amount that FIA data indicates is available.

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**

[10] According to the supply analysis, FIA harvest removal data suggests that around 275,000 bdt/yr of pulpwood is available on public lands (32% of the total 870,000 bdt/yr). However, timber sales data suggest that pulpwood supply from public lands is no more than 50,000 bdt/yr.

Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL X RRI) is 36 out of 100.	**36**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**36**

3.1.3 Seasonal Feedstock Supply Variation

Rationale: Biomass supply can present significant seasonal variations. Seasonal supply variations, combined with limitations associated with longer-distance transportation and storage, can lead to BDO Zone biomass supply imbalances,[11] which can manifest in shortages and higher costs for Issuers.

Risk Information: Generally, logging crews and trucking companies can operate for 9-10 months per year. Logging and trucking activity declines during the fall-winter and in early Spring in response to wet weather, which can affect mobility, efficiency, and safety. Prolonged operational pauses of over one week can occur during periods of heavy rainfall and snowmelt, particularly on state and federal lands where stricter regulations are in effect. However, this is conventional for North American forestry and does not pose a significant risk to the rated quantities.

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 X RRI) is 16 out of 100.	**16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X 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: Forest industry feedstock demand has been relatively consistent over the past decade.[12] Year-to-year wood supply is not affected by resource constraints, regulations, or unavailability of equipment operators.

[11] Golecha & Gan, 2016.
[12] Forisk Consulting

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **16**

3.2 Risk Factor: Historical Issues

3.2.1 Historical Feedstock Price Variations

Rationale: If the historical feedstock price shows volatility, 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: Pulpwood and sawmill chip prices are mainly driven by the demands of the pulp and paper industry. Prices for pulpwood over the past decade have remained within the range of $70-$80/bdt, with the exception of the 2021-22 period when prices increased to up to $100/bdt.

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **16**

3.2.2 Historical Demand for Feedstock in the BDO Zone

Rationale: If Issuer BDO Zone does not have a history of developed large-scale feedstock procurement, suppliers may not have sufficient expertise in feedstock production to ensure reliable supply, especially in the 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 pulpwood and manage log debarking and chipping internally, rather than requiring inexperienced suppliers to deliver debarked wood chips.

Risk Information: The regional pulp and paper industry has maintained consistent demand for pulpwood and sawmill chips over the past decade. However, monthly quotas are frequently imposed on sawmills and logging contractors, leading to underutilization of 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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

3.2.3 History of Production/Feedstock is a New/Secondary Crop or By-Product

Rationale: If the 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 crops 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 the 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 historical decline in sawtimber demand in the BDO Zone has not had significant impacts on the regional supply chain. At least 13 sawmills remain operational. Moreover, pulpwood and forest residue are likely to be recovered from marginal stands with low sawtimber volumes for the rated price range. See Risk Indicator 1.3.4 for further details.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **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: Between 2021 and 2022, the Consumer Price Index (CPI) for the Northeast region of the U.S. saw a substantial increase driven by the impacts of the COVID-19 pandemic. The national Producer Price Index (PPI) experienced a comparable increase during this period. However, since 2023, these inflationary pressures have started to stabilize, partly due to the Federal Reserve's interest rate hikes.

Raw Risk Likelihood (RRL) The risk likelihood is deemed medium, therefore the RRL is 6 out of 10.	**Score** **6**
Raw Risk Impact (RRI) The risk impact is deemed low, therefore the RRI is 4 out of 10.	**Score** **4**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100.	**Score** **24**

3.3.2 Currency Risk

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

Risk Information: Not relevant.

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

The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated).	**NR**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated.	**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: Not relevant.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR).	**NR**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed not relevant, therefore the RRI is not rated (NR).	**NR**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL X RRI) is not rated.	**NR**
Mitigation/Notching	**Notch**
The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated).	**NR**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated.	**NR**

3.3.4 Temporary Externality-Driven Markets for Feedstock

Rationale: Alternative, non-traditional, externality-driven competitors for feedstock can drive feedstock demand (and cost) in unusual circumstances. For example, an Issuer using corn stover as a feedstock would not typically compete with the higher-end animal feed market. However, in times of significant hay shortage (e.g., during drought), farmers may use corn stover as hay replacement, driving the price of stover feedstock and decreasing its availability for bio-projects.[13]

Risk Information: No alternative, non-traditional competition risks were identified.

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 X 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) X (RRI Notch) is NN (No Notch).	
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100.	**4**

[13] Bergtold, 2018.

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 risks, 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: Pulpwood recovery is most likely from shelterwood and clearcut operations, which involve the removal of 50-100% of standing stock and include a large component of small-diameter trees. The majority of forests in the BDO Zone are managed using shelterwood, clearcut, and related silvicultural systems and therefore there is low harvest and collection practice risk for the rated quantity of pulpwood. Forest residue is not widely recovered and is often left cutovers to mitigate the effects of deer browsing on natural regeneration. If a new project was willing to pay $70-$100/bdt for delivered forest residue, we expect that at least 50% of operations that occur on private lands would involve WT chipping or WT harvesting with mobile chipping of slash at roadside/landing. While WT harvesting on public lands is possible at some level,[14] it is less likely to occur and therefore was not considered in the supply analysis.

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 very low, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 8 out of 100.	**Score** **8**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 8 out of 100.	**Score** **8**

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. Using different types and combinations of harvesting, collection, and

[14] Approximately 10% of forest operations on state lands involve WT harvesting, made possible by a waiver offered by the BOF (https://www.dcnr.pa.gov/Conservation/ForestsAndTrees/StateForestManagement/ResourceManagementPlan/Pages/default.aspx (p.99).

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: Harvesting and collection equipment that would be used to recover the rated quantities is conventional for the northeastern USA. Operations typically consist of feller-bunchers, grapple skidders, and processors. Manual felling with chainsaws is occasionally used for large diameter trees, and forwarders are becoming more common for the extraction phase. Cable skidders are also used by smaller contractors. Overall, these aspects pose no significant risk to the rated quantities.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X 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.[15]

Risk Information: Feedstock variation is unlikely to impact new projects as long as procurement managers specify feedstock quality expectations and manage the supply chain accordingly. WT chipping units in the region are equipped with flail debarkers, allowing flexibility in delivered feedstock composition.

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 X RRI) is 4 out of 100.	**4**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch)	**NN**

[15] Huhnke, 2018.

No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. — **4**

3.4.4 Availability of Labor for Feedstock Production

Rationale: Skilled labor shortages can be difficult to remedy in the short term. The 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 Issuers for whom large feedstock requirements or the development of new (or expanded) supply chains demand significant additions to the local labor force.

Risk Information: Finding skilled equipment operators can be challenging, a problem common to North American forestry. Over the past decade, many forestry professionals in Pennsylvania have taken jobs in the oil and gas industry.[16] The only logging training programs available in the region are offered through the Pennsylvania College of Technology's Forest Technology program in Williamsport, PA (100 miles from Emporium). There are currently no other training programs available in the region; most training is on-the-job. There have been periods when standardization of logging practices has been encouraged, including through a program offered by the Johnsonburg paper mill that certified loggers to operate on state lands. The workforce is aging, and recruitment is not maintaining pace with attrition. However, workforce attrition is not elevated compared to other areas of North America, and therefore, risk is assessed as 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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**36**

3.5 Risk Factor: Transportation

3.5.1 Feedstock Transportation Costs

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

[16] https://www.pa.gov/content/dam/copapwp-pagov/en/pda/documents/business-industry/hardwooddevelopmentcouncil/documents/2020%20State%20of%20the%20Industry.pdf

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

Understanding average transport distance can help flag higher-risk BDO Zones where transport distance materially exceeds the average.

Risk Information: As discussed in Risk Indicator 3.1.2, USFS FIA data indicates that over half of all pulpwood and forest residue is located between 55 and 75 miles from Emporium. For the estimated transportation cost of $0.40/bdt/loaded mile, transportation costs account for up to 43% of final delivered cost.

The location of chipping yards owned by the specialty paper mill in Johnsonburg, PA, to the north and south of Emporium compounds risks, as consolidation of pulpwood from areas close to the Johnsonburg mill (30 miles from Emporium) could force new projects to source material from outside this area, potentially beyond the 75-mile drive distance limit of the BDO Zone. Note that at present, sawmills and loggers operating in the vicinity of Emporium have additional pulpwood to sell.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 48 out of 100.	**48**

3.5.2 Diesel Cost Impacts

Rationale: Changes in diesel costs impact transport costs over time. Sensitivities to worst-case scenarios should be run.

Risk Information: Over the 2008-2023 period, Central Atlantic PADD 2B diesel prices have been an average of $0.19/gallon more expensive than average US diesel prices over the 2008-2023 period (Figure E-6, Section E). Peak inflation-adjusted diesel prices were reached in 2008, 2011-2014, and 2022 (Figure E-7, Section E). As of September 2024, the US EIA forecasts a slight decline in retail diesel prices in 2025.[17] A new project may have to consistently source pulpwood from distances greater than 55 miles (see Risk Indicator 3.5.1) and therefore overall risk associated with diesel costs is judged to be low-to-medium.

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

[17] https://www.eia.gov/outlooks/steo/report/petro_prod.php

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**Score** **36**

3.5.3 Transportation of Feedstock Requires Specialized Equipment

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

Risk Information: There is a large forestry trucking and trailer capacity in the region. A large trucking and logging company has over 30 trucks and 65 trailers, including flatbed, walking floor, Conestoga, and tipping chip trailers. These units work in tandem with their mobile chippers, enabling reliable vertically integrated supply. Outreach to representatives of the company confirmed that this equipment would be available to support new projects.

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100.	**Score** **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 the power to force regulations regarding truck transport, impeding the ability of BDO Zone suppliers to transport feedstock.

Risk Information: Forestry truck traffic is common in the area. No indications of public opposition to truck traffic were received during literature review and outreach.

Raw Risk Likelihood (RRL)	**Score**

The risk likelihood is deemed very low, therefore the RRL is 2 out of 10.	**2**
Raw Risk Impact (RRI) The risk impact is deemed very low, therefore the RRI is 2 out of 10.	**Score** **2**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X 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 gross vehicle weight (GVW) limit in Pennsylvania and New York state is 80,000 lbs. Semi-trailer configurations can reach the 80,000-lbs limit, whereas logging trucks have a typical GVW of 70,000 lbs.[18] Seasonal weight restrictions apply on some roadways. In some areas, if road weight restrictions are exceeded, trucking companies must pay a fee to the township or county for every mile traveled on weight-restricted roads (referred to as a bond). These regulations are conventional and do not pose a significant risk.

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **16**

[18] Based on outreach to local forestry professionals.

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: Tertiary roads (e.g., logging roads) are unpaved and, therefore, affected by wet conditions during the winter-spring transition period. This is a conventional barrier to wood supply in all areas of North America that is addressed through scheduled, stockpiling, road building, and other measures. No major road infrastructure issues were identified during outreach to local forestry professionals.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X 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: As described in Risk Indicator 3.5.3, a large trucking and logging company that operates in the area has over 30 trucks and 65 trailers. Outreach confirmed that capacity would be available for new projects. There are also a number of independent operators that would likely have logging trucks available for the rated quantity of 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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

3.6 Risk Factor: Supply Chain Resiliency

3.6.1 Size, Number, and Location of Suppliers

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

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

Risk Information: There are a number of small, independent logging contractors and truck drivers capable of supplying the rated quantity. One company has a large fleet of logging trucks and chip trucks available. Low risks associated with supplier size, number, or location are foreseen.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

3.6.2 Suppliers Subject to Same External Risk Factors

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

Risk Information: The only single risk event identified as relevant is the continued decline in primary product markets and resulting declines in timber harvesting. This is regarded as unlikely and will only have a moderate impact on the rated quantity of pulpwood and forest residue if a proponent is willing to pay the rated price range. In the event of significant declines in sawtimber demand, WT chipping operations in marginal stands would likely expand to meet the rated quantity.

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 medium, therefore the RRI is 6 out of 10.	**6**

Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X RRI) is 12 out of 100.	**Score** **12**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 12 out of 100.	**Score** **12**

3.6.3 Land Ownership Structures

Rationale: The ownership (or control) of the land base on which feedstock is produced can have a significant impact on the 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, is 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: See Risk Indicator 1.3.1.

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**Score** **36**

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 (e.g., spring thaws, rainy seasons, or dry seasons—as opposed to 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 significant 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 essential in assessing feedstock risk and enable accurate assessment of the efficacy of the Issuer's mitigation methods.

Risk Information: As discussed in Risk Indicator 3.1.3, forest operations temporarily slowdown during the fall-winter and early spring due to wet conditions. Generally, logging crews and trucking companies can operate 9-10 months per year. Seasonal weather impacts are moderated by routinized stockpiling and harvesting in more accessible areas.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed low, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed low, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X 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: Annual precipitation levels and extreme precipitation events have increased over the 1900-2020 period, leading to the inference that these trends will continue.[19] However, the extent to which related flooding events affect forest operations is limited. No other long-term climate change trends relevant to wood supply in the BDO Zone were identified.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

[19] https://statesummaries.ncics.org/chapter/pa/

3.7.3 Forest/Crop Fire

Rationale: Forest/crop fires, especially when occurring on a 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 investigating adaptation strategies and options to deal with future fire occurrences. There is growing consensus that as wildfire activity increases, fire agency suppression efforts will be increasingly strained. However, analyses of fire history 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: Forest fires are not a major concern in the region. Total burned acreage on public and private lands in Pennsylvania over the 2019-2023 period did not exceed 20,000 acres.[20]

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed very low, therefore the RRL is 2 out of 10.	**2**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed low, therefore the RRI is 4 out of 10.	**4**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL X RRI) is 8 out of 100.	**8**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 8 out of 100.	**8**

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 the 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: As of 2019, Emerald Ash Borer was confirmed in all 67 counties in Pennsylvania. The quarantine for spotted lanternfly increased from 25 counties in 2019 to 51 counties in 2023. Gypsy moth populations have affected

[20] Pennsylvania Bureau of Forestry Forest Products Statistical Report series.

441,000 acres of oak in PA as of 2023.[21] There have been some instances of pine tree disease and hemlock wooly adelgid outbreaks, but these have not had significant impacts on mortality and resource quality. Overall, infestation poses a low-to-medium risk to the rated quantity of woody biomass.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed low, therefore the RRL is 4 out of 10.	**4**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed medium, therefore the RRI is 6 out of 10.	**6**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100.	**24**

3.7.5 Risk of Hail

Rationale: Hail has negligible impact on 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 increases.

Risk Information: Not relevant.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR).	**NR**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed not relevant, therefore the RRI is not rated (NR).	**NR**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL X RRI) is not rated.	**NR**
Mitigation/Notching	**Notch**
The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated).	**NR**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated.	**NR**

3.7.6 Risk of Flood

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

[21] Pennsylvania Bureau of Forestry Forest Products Statistical Report series.

Risk Information: Flooding occurs annually. Wood supply can be negatively affected by periods of flooding and wet conditions. Stockpiling is used to mitigate these impacts on wood supply.
Raw Risk Likelihood (RRL) **Score** The risk likelihood is deemed low, therefore the RRL is 4 out of 10. **4**
Raw Risk Impact (RRI) **Score** The risk impact is deemed low, therefore the RRI is 4 out of 10. **4**
Gross Risk Indicator (GRI) **Score** The Gross Risk Indicator (RRL X 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) X (RRI Notch) is NN (No Notch).
Loaded RI Score **Score** The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. **16**

3.7.7 Risk of Drought

Rationale: Droughts can cause significant disruptions to feedstock supplies across entire BDO Zones for extended periods of time, especially in the 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: Not relevant.
Raw Risk Likelihood (RRL) **Score** The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR). **NR**
Raw Risk Impact (RRI) **Score** The risk impact is deemed not relevant, therefore the RRI is not rated (NR). **NR**
Gross Risk Indicator (GRI) **Score** The Gross Risk Indicator (RRL X RRI) is not rated. **NR**
Mitigation/Notching **Notch** The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). **NR**
Loaded RI Score **Score** The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated. **NR**

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 the 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: Hurricanes do not impact the region with sufficient regularity to affect wood supply.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100.	**4**

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: Below freezing temperatures during the winter generally do not negatively affect operational efficiency.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

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 Issuer's operations, such as Loan Guarantees, or to the markets for products produced by the Issuer.

Risk Information: No government subsidies for feedstock production were identified.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100.	**4**

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, which is not, since laws and regulations may be subject to amendment or repeal.

If biomass utilization requires specific permits (e.g., 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), the likelihood of obtaining such permits and/or complying with permitting requirements should be examined.

Risk Information: Prevailing regulations generally serve to reduce risks associated with pulpwood and forest residue supply. Logging contractors are required to remove all merchantable timber designated for removal in federal and state forests, helping to ensure that all available pulpwood is recovered to roadside/landing. On private lands, pulpwood is generally left in the cutover unless markets are available. No other regulations relevant to wood supply were identified.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X 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 the Issuer's ability to procure, transport, trans-load, store, or utilize feedstock by affecting local policies, regulations, and the Issuer's ability to obtain necessary permitting.

Risk Information: Local populations are generally supportive of the forest industry and environmental NGOs do not have a history of activity 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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **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: No Indigenous groups are present 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 X RRI) is 4 out of 100.	**Score** **4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment.	**Notch** **NN**

RRI Mitigation (Notch) No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).
Loaded RI Score **Score** The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. **4**

3.8.5 Food Security Concerns

Rationale: Despite the fact that any significant correlation between food prices and biofuel production is unclear, claims that biofuel production has driven up food prices, taken food from communities or had a negative impact on land use can fuel public backlash. For example, the 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: Not relevant.
Raw Risk Likelihood (RRL) **Score** The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR). **NR**
Raw Risk Impact (RRI) **Score** The risk impact is deemed not relevant, therefore the RRI is not rated (NR). **NR**
Gross Risk Indicator (GRI) **Score** The Gross Risk Indicator (RRL X RRI) is not rated. **NR**
Mitigation/Notching **Notch** The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated). **NR**
Loaded RI Score **Score** The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated. **NR**

3.9 Risk Factor: Sustainability and Environmental Concern

3.9.1 Feedstock Sustainability

Rationale: Public concerns about the 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: Sustained yield forestry is practiced on all public lands and a large portion of private lands, most of which are certified under the Forest Stewardship Council (FSC) and Sustainable Forestry Initiative (SFI). The Allegheny NF is guided by a forest plan that includes a rigorous assessment of environmental risks and specification of objectives related to sustainability.[22] State forests are guided by the Department of Conservation & Natural Resources (DCNR) Bureau of Forestry (BOF) 2016 State Forest Resource Management Plan, which includes objectives related to sustained yield forestry, old-growth conservation, water resource protection, and other environmental attributes.[23] New buyers would be able to source pulpwood from public timberlands with relative ease, as this would enable the PA DCNR, the USFS, and other organizations (National Wild Turkey Federation, Ruffed Grouse Society) to increase the extent of shelterwood silviculture, which is crucial to optimize growth and yield of the region's oak forests.
Raw Risk Likelihood (RRL) **Score** The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. **6**

[22] https://www.fs.usda.gov/main/allegheny/landmanagement/planning
[23] https://www.dcnr.pa.gov/Conservation/ForestsAndTrees/StateForestManagement/ResourceManagementPlan/Pages/default.aspx

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 X RRI) is 36 out of 100.	**36**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**36**

3.9.2 Risk to Soil Quality

Rationale: Soil sustainability can be defined as the 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 the 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 that can degrade the soil and its nutrients.

Risk Information: Forestry on public timberlands in PA is subject to best management practices (BMPs), enforced by the Department of Natural Resources and Conservation. Private timberlands are not subject to specific state or federal regulations, but there is no evidence that past forestry practices have negatively affected soils in the region.[24]

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 X RRI) is 4 out of 100.	**4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100.	**4**

[24] Based on outreach to local experts.

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: There are no significant risks to surface water and groundwater. All logging access roads and skid trails crossing wetlands require permits under both state and federal law.[25]

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100.	**4**

3.9.4 Water Use

Rationale: Biomass feedstock operations can have significant impacts on the hydrological flux (infiltration, groundwater recharge, interception, and transpiration) of ecosystems. This can lead to water shortages, lower yields, and backlash from regulatory bodies if management plans are not properly instituted.

Risk Information: Public timberlands in PA are subject to best management practices (BMPs), enforced by the PA Department of Conservation and Natural Resources. BMPs include criteria for water quality. Logging activities on private timberlands are subject to the federal Clean Water Act.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**

[25] https://extension.psu.edu/forest-management-and-timber-harvesting-in-pennsylvania

Loaded RI Score	Score
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	16

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: The safety of pesticide applications in managed forests is subject to a number of regulations and policies, including those of the U.S. Federal Government (e.g., the Worker Protection Standard), the USFS,[26] the Pennsylvania Bureau of Forestry, and sustainability certification schemes (e.g., FSC, SFI).

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 X 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) X (RRI Notch) is NN (No Notch).	NN
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	16

3.9.6 Risk to Wildlife and Landscape

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

Risk Information: Regulations generally ensure that biomass harvesting on public lands does not negatively affect wildlife. Forestry activities on federal lands (the Allegheny NF) must be preceded by environmental impact assessments that include criteria related to wildlife and landscape. The State Forest Resource Management Plan specifies a maximum clearcut size of 75-125 acres.[27]

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 X RRI) is 16 out of 100.	16
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment.	NN

[26] https://www.fs.usda.gov/science-technology/forest-health-protection/integrated-pest-management/pesticide-management
[27] https://www.dcnr.pa.gov/Conservation/ForestsAndTrees/StateForestManagement/ResourceManagementPlan/Pages/default.aspx (p.91)

RRI Mitigation (Notch) No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).
Loaded RI Score **Score** The Loaded RI Score ((1-Total Notch) X 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: Not relevant.
Raw Risk Likelihood (RRL) **Score** The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR). **NR**
Raw Risk Impact (RRI) **Score** The risk impact is deemed not relevant, therefore the RRI is not rated (NR). **NR**
Gross Risk Indicator (GRI) **Score** The Gross Risk Indicator (RRL X RRI) is not rated. **NR**
Mitigation/Notching **Notch** The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated). **NR**
Loaded RI Score **Score** The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated. **NR**

CATEGORY 4.0: FEEDSTOCK SCALE-UP RISK

4.1 Risk Factor: Feedstock Scale-Up

4.1.1 Feedstock Quality at Production Scale

Rationale: The physical and chemical properties of feedstock used in lab, pilot, and field testing can fail to be representative of feedstock generated by large-scale operations. It is important to conduct tests on feedstock representative of that which will be produced by large-scale operations. Failure to adequately test the full range of parameter values can result in severe problems during scale-up.
Risk Information: Mobile chippers available in the BDO Zone are equipped with flails, enabling debarking before comminution. If bark contamination is not of concern to a new project proponent, the chippers can operate without flail debarking. Generally, feedstock quality at production scale is likely to be maintained due to the experience of the regional forestry workforce and the conventional nature of pulpwood supply chains.
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 X 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) X (RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score ((1-Total Notch) X 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: We confirmed through outreach that there is adequate supply chain capacity for the rated quantities of pulpwood and forest residue, with the exception of chipping units. Procurement of the rated quantity of forest residue would most likely require the purchase of only one-to-two mobile chipping units.[28] Risk is therefore deemed to be low.
Raw Risk Likelihood (RRL) — **Score**
The risk likelihood is deemed low, therefore the RRL is 4 out of 10. — **4**
Raw Risk Impact (RRI) — **Score**
The risk impact is deemed low, therefore the RRI is 4 out of 10. — **4**
Gross Risk Indicator (GRI) — **Score**
The Gross Risk Indicator (RRL X 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) X (RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. — **16**

CATEGORY 5.0: INFRASTRUCTURE RISKS

5.1 Risk Factor: Physical Infrastructure

5.1.1 Land Parcel/Industrial District

Risk Information: The 13-acre site on the west side of Emporium, PA, has favorable industrial zoning, access to rail, utilities, and community support. The existing 244,000 square foot building on the site is suited for both manufacturing and distribution of finished goods.
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 X RRI) is 16 out of 100. — **16**
Mitigation/Notching — **Notch**

[28] Assumes mobile chipping has productivity of 750 bdt/week @32 weeks/year.

RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **16**

5.1.2 Ownership of Land

Risk Information: The industrial site is privately owned, managed, and marketed by Lee & Associates. This centralized control allows for a streamlined and consistent approach to land transactions, reducing potential complications and ensuring that businesses can secure the property with greater ease and reliability.

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **16**

5.1.3 Permitting Description

Risk Information: In Cameron County, Pennsylvania, the permitting process for new industries is overseen by the Cameron County Planning Commission. With a typical timeline of two to three months, the process is relatively expedited compared to many other regions, allowing companies to reduce delays in establishing operations. New construction requires three specific permits: sewage, zoning, and building, which must be obtained sequentially. A sewage permit is needed before zoning approval, and zoning approval is required prior to obtaining a Uniform Construction Code (UCC) building permit.

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 X RRI) is 16 out of 100.	**Score** **16**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment.	**Notch** **NN**

RRI Mitigation (Notch) No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).
Loaded RI Score **Score** The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. **16**

5.1.4 Environmental Issues

Risk Information: Environmental concerns in Cameron County are common in most areas of the State. In recent years, heavy rainfall has become more frequent and intense, leading to flash floods that damage property and contaminate drinking water wells. In 2023, the Pennsylvania Department of Environmental Protection (DEP) identified that oil and gas operations adversely affected three water supply wells in Shippen Township (including Emporium). This finding highlights ongoing concerns about the impact of industrial activities on local water quality and public health. Air quality is always a concern as non-environmental factors like transportation, power generation, and industrial emissions can all contribute to local ozone and particulate matter levels. This is a medium-risk item for new industries.

Raw Risk Likelihood (RRL) **Score** The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. **6**
Raw Risk Impact (RRI) **Score** The risk impact is deemed medium, therefore the RRI is 6 out of 10. **6**
Gross Risk Indicator (GRI) **Score** The Gross Risk Indicator (RRL X 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) X (RRI Notch) is NN (No Notch).
Loaded RI Score **Score** The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. **36**

5.2 Risk Factor: Utilities

5.2.1 Natural Gas Availability

Risk Information: As of June 1, 2024, the commercial and industrial natural gas price in Emporium was $9.54 per mcf,[29] positioning Pennsylvania 39th nationwide for price competitiveness. The highlighted 13-acre site has existing natural gas meters and access to various suppliers, including Just Energy, which provides flexible plans for both residential and commercial consumers. Emporium's natural gas supply is reinforced by Pennsylvania's status as a major producer, attributed to its location over the Marcellus and Utica shale formations, two of the largest natural gas reserves in the United States. Pennsylvania contributed 20% of the nation's total natural gas output in 2023.

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**

[29] https://www.chooseenergy.com/data-center/natural-gas-rates-by-state/

The Gross Risk Indicator (RRL X RRI) is 4 out of 100.	**4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100.	**4**

5.2.2 Electric Availability

Risk Information: Emporium's average commercial electricity rate per kilowatt hour is 8.94 cents per kilowatt hour.[30] This is 50% below Pennsylvania's average rate of 17.80 cents. In 2023, Cameron County drew a substantial portion of its energy—82%—from fossil fuels, reflecting the state's ongoing reliance on traditional energy sources like coal, natural gas, and petroleum. Nuclear power and renewable energy each contributed 9%. In Emporium, PA, and specifically the industrial site at 1 Airport Road, Just Energy serves both residential and industrial customers, offering power solutions backed by a comprehensive coverage network and dedicated outage resolution teams. There are a number of other electricity suppliers available to select from, providing for a more cost competitive market compared to other regions.

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 X RRI) is 4 out of 100.	**4**
Mitigation/Notching *RRL Mitigation (Notch)* No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100.	**4**

5.2.3 Water Availability

Risk Information: The Emporium Water Company primarily manages the public water supply for the area, sourcing water from the Salt Run Reservoir. Water is treated to meet the requirements set by the Pennsylvania Department of Environmental Protection (DEP) before distribution to the community. Cameron County has basic water treatment facilities that are designed to support the current population and light commercial needs. The Emporium Water Treatment Plant is capable of handling the local water demand for both residential and small-scale industrial use. The facility employs standard filtration, sedimentation, and chemical disinfection methods to ensure water quality.

Raw Risk Likelihood (RRL)	**Score**

[30] https://findenergy.com/pa/cameron-county-electricity/

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

5.2.4 Waste Disposal

Risk Information: Cameron County Solid Waste Authority is responsible for overseeing waste management, including organizing waste collection and landfill operations. Residents and businesses typically have curbside pickup options for municipal solid waste, and recycling programs encourage the reduction of landfill use by collecting materials like plastics, metals, and paper.

Emporium's wastewater is treated by the Emporium Borough Wastewater Treatment Plant, which is designed to handle residential and commercial sewage. The facility ensures that water is treated to meet state and federal regulations before being discharged into local water bodies. The plant uses standard treatment processes, including sedimentation, biological treatment, and chemical processes, to reduce contaminants and ensure the water is safe for the environment.

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **16**

5.2.5 Internet Availability

Risk Information: Windstream and Zito Media serve the county seat, Emporium, with both DSL and fiber connections. Fiber plans can reach speeds up to 1 Gbps, enabling high-speed access. Projects established in the vicinity of Emporium

are expected to have access to high-speed internet. Note that fiber is not universally available in all parts of the county, and mobile broadband connectivity is unreliable in many areas.	
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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**Score** **16**

5.3 Risk Factor: Transportation/Logistics

5.3.1 Road/Highway Access

Risk Information: Emporium, PA, is somewhat remote but offers key road access via state highways that connect it to larger transportation networks. The town is served primarily by Pennsylvania Route 120 (PA-120) and Pennsylvania Route 155 (PA-155). PA-120 runs through Emporium, connecting the town to nearby cities such as St. Mary's to the west and Lock Haven to the east. While not a major interstate, PA-120 is a crucial east-west route for the region.

Although no interstates run directly through Emporium, Interstate 80 (I-80) is about 40 miles south of the town, accessible via connecting routes like PA-120. I-80 is a major east-west corridor across Pennsylvania, allowing for broader connectivity across the region and country. Overall, while Emporium lacks immediate access to major interstate highways, the nearby state routes provide reasonable connectivity for freight and transportation.

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 X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**Score** **36**

5.3.2 Rail Access

Risk Information: Emporium benefits from its proximity to the Western New York & Pennsylvania Railroad (WNY&P) rail yard, located just two miles from the industrial site on Airport Road. While the site lacks a dedicated rail siding, close access to the rail yard significantly mitigates any logistical drawbacks. The short transmodal trip between the site and the rail yard allows for seamless integration of freight movement, making it easier to ship products and receive materials without the expense of installing a private rail spur on-site.

The WNY&P Railroad serves as a critical freight link in the region, providing connections to major rail networks and facilitating transportation to larger markets. For businesses located in the Airport Road industrial site, the Emporium rail yard provides a flexible, cost-effective solution for managing freight operations. This is especially advantageous for industries needing reliable rail services but lacking the scale or infrastructure to justify a dedicated siding.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

5.3.3 Airport Access

Risk Information: Bradford Regional Airport, located 38 miles from Emporium, offers commercial service via Southern Airways Express and full services for private aircraft, including business jets. Commercial services are also available at the Buffalo Niagara International Airport, located 100 miles away.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**

The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

5.3.4 Water Freight Access

Risk Information: Not relevant.

Raw Risk Likelihood (RRL)	**Score**
The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR).	**NR**
Raw Risk Impact (RRI)	**Score**
The risk impact is deemed not relevant, therefore the RRI is not rated (NR).	**NR**
Gross Risk Indicator (GRI)	**Score**
The Gross Risk Indicator (RRL X RRI) is not rated.	**NR**
Mitigation/Notching	**Notch**
The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated).	**NR**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated.	**NR**

5.4 Risk Factor: Social Infrastructure

5.4.1 Healthcare (Local)

Risk Information: Healthcare options in Cameron County provide a reasonable level of coverage for workforce attraction, although there are some limitations. The Cameron County Health Center in Emporium offers essential emergency and preventative medical services but lacks hospital beds, which may concern employees needing more extensive care. For full hospital services, Penn Highlands Elk in St. Mary's, located 19 miles from Emporium, serves as the nearest comprehensive facility, offering a wider range of medical services, including inpatient care, surgery, and specialized treatments.

Additional health clinics in Emporium help cover routine and urgent care needs, contributing to the overall healthcare infrastructure. While these options provide basic and preventive care locally, the lack of immediate access to full hospital services in Emporium itself could be viewed as a minor drawback for attracting labor. However, for a rural county, the combination of nearby hospital services, local clinics, and emergency care should generally meet the needs of employees and their families, especially those familiar with small-town living.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**36**

5.4.2 Education (Schools)

Risk Information: Cameron County offers a solid educational foundation that can be attractive to potential employees moving to the area. The county has two primary schools with an enrollment of ~400 students, offering a close-knit and supportive learning environment. The 94% graduation rate is well above the national average, reflecting the quality of education and commitment to student success.

For secondary education, the Northern Pennsylvania Regional College in Warren, PA (80 miles from Emporium) provides a wide range of programs, including workforce development programs (e.g., CDL, Industrial Maintenance). The nearest four-year college is the University of Pittsburg / Bradford campus, 38 miles to the north. This access to workforce and graduate training can be a key factor in attracting employees with a hands-on skill set or those seeking continuous learning and development in trades critical to industries such as manufacturing, bio-economy, forestry, and agriculture. The presence of vocational education ensures that local talent is well-equipped to meet the needs of emerging industries, adding to the county's appeal for new businesses looking to recruit skilled labor.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

5.4.3 Local Transportation

Risk Information: Local transportation services in Cameron County are limited to those provided by the Area Transportation Authority (ATA). The ATA provides public transport services to Cameron County and six other neighboring counties. Service out of Emporium is limited to a single line that runs to Dubois. Ride-sharing services are unavailable.

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 X RRI) is 36 out of 100.	**36**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch) No adjustment. *RRI Mitigation (Notch)*	**NN**

No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).	
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**36**

5.4.4 Public Safety (Local)

Risk Information: Emporium's violent crime rate stands at 12.1,[31] substantially below the national average of 22.7, indicating a relatively low risk of violent incidents. The property crime rate is 24.3, below the U.S. average of 35.4. Both the Emporium Police Department and the Cameron County Sheriff's Department are located in Emporium and are staffed for emergency and civil safety services.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

5.4.5 Housing/Cost of Living

Risk Information: The total cost of housing, food, childcare, transportation, healthcare, taxes, and other necessities is 29.0% lower in Emporium, PA,[32] compared to the U.S. national average and 24.9% higher than the average for Pennsylvania. It has an affordable two bedroom rent at $820 compared to the US average of $1,430. There are also plenty of options for grocery shopping as Cameron has a Grocery Cost Index of 96 compared to the US average of 100. Median home value is around $88,200 and the median household income is only about $48,000. This allows residents to enjoy a comfortable lifestyle without having to worry too much about their budget. Additionally, there are plenty of affordable housing options available, with rental prices being significantly lower than other nearby cities.

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 X RRI) is 4 out of 100.	**4**
Mitigation/Notching	**Notch**
RRL Mitigation (Notch)	**NN**

[31] https://www.bestplaces.net/crime/city/pennsylvania/emporium
[32] https://www.bestplaces.net/cost_of_living/city/pa/emporium

No adjustment. *RRI Mitigation (Notch)* No adjustment. The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).
Loaded RI Score — **Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. — **4**

5.5 Risk Factor: Labor

5.5.1 Workforce

Risk Information: The total workforce in Cameron County comprises approximately 1,900 individuals, 1,800 of which are working.[33] The workforce is predominantly made up of white-collar workers, who account for 63% of the working population. In contrast, blue-collar employees make up 37%. This distribution indicates a significant presence of professionals engaged in sectors such as administration, healthcare, and manufacturing. The unemployment rate in Cameron County was 3.8% as of September 2024, lower than the national average of 6.0%.

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 X 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) X (RRI Notch) is NN (No Notch).	**NN**
Loaded RI Score	**Score**
The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100.	**16**

5.5.2 Labor Costs

Risk Information: The minimum wage in Pennsylvania is $7.25 per hour,[34] which has been the rate since July 24, 2009. This is the same as the federal minimum wage. Pennsylvania has seen a growing movement to increase the minimum wage, with several bills introduced in the Pennsylvania General Assembly in 2023. These bills propose raising the minimum wage to $11 per hour in 2024, with further increases each year. As of Sep 2024, the average annual salary in Emporium is $41,486[35] ranking it just below the national average. This figure positions Emporium just below the national average.

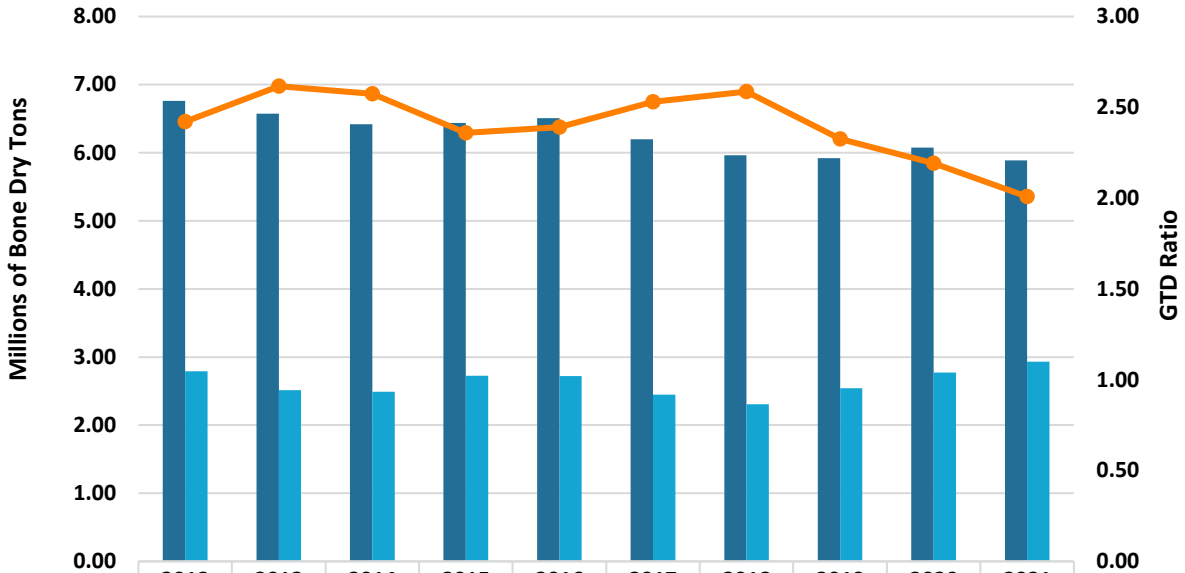
Overall, labor costs in Emporium are shaped by the existing minimum wage and ongoing discussions regarding wage increases. With an average salary slightly below the national average, the town faces both challenges and opportunities

[33] https://www.bestplaces.net/economy/city/pa/emporium
[34] ttps://www.dol.gov/agencies/whd/minimum-wage/state
[35] https://www.ziprecruiter.com/Salaries/-in-Emporium,PA

in its labor market. The potential rise in the minimum wage could enhance job attractiveness but may also require careful consideration by employers to manage increased labor 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 medium, therefore the RRI is 6 out of 10.	**Score** **6**
Gross Risk Indicator (GRI) The Gross Risk Indicator (RRL X 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) X (RRI Notch) is NN (No Notch).	**Notch** **NN**
Loaded RI Score The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100.	**Score** **36**

SECTION E: TABLES AND FIGURES

Figure E-1. Annual Net Growth, Harvesting Removals, and Growth-to-Drain Ratio for Trees >5" DBH



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Annual net growth	6.76	6.57	6.42	6.44	6.51	6.20	5.96	5.92	6.07	5.89
Annual harvest removals	2.79	2.51	2.49	2.73	2.72	2.45	2.31	2.54	2.77	2.93
Growth-to-Drain Ratio	2.42	2.62	2.57	2.36	2.39	2.53	2.59	2.33	2.19	2.01

Figure E-2. Timber Sales and Cut Volume from the Allegheny National Forest, 2014-2023

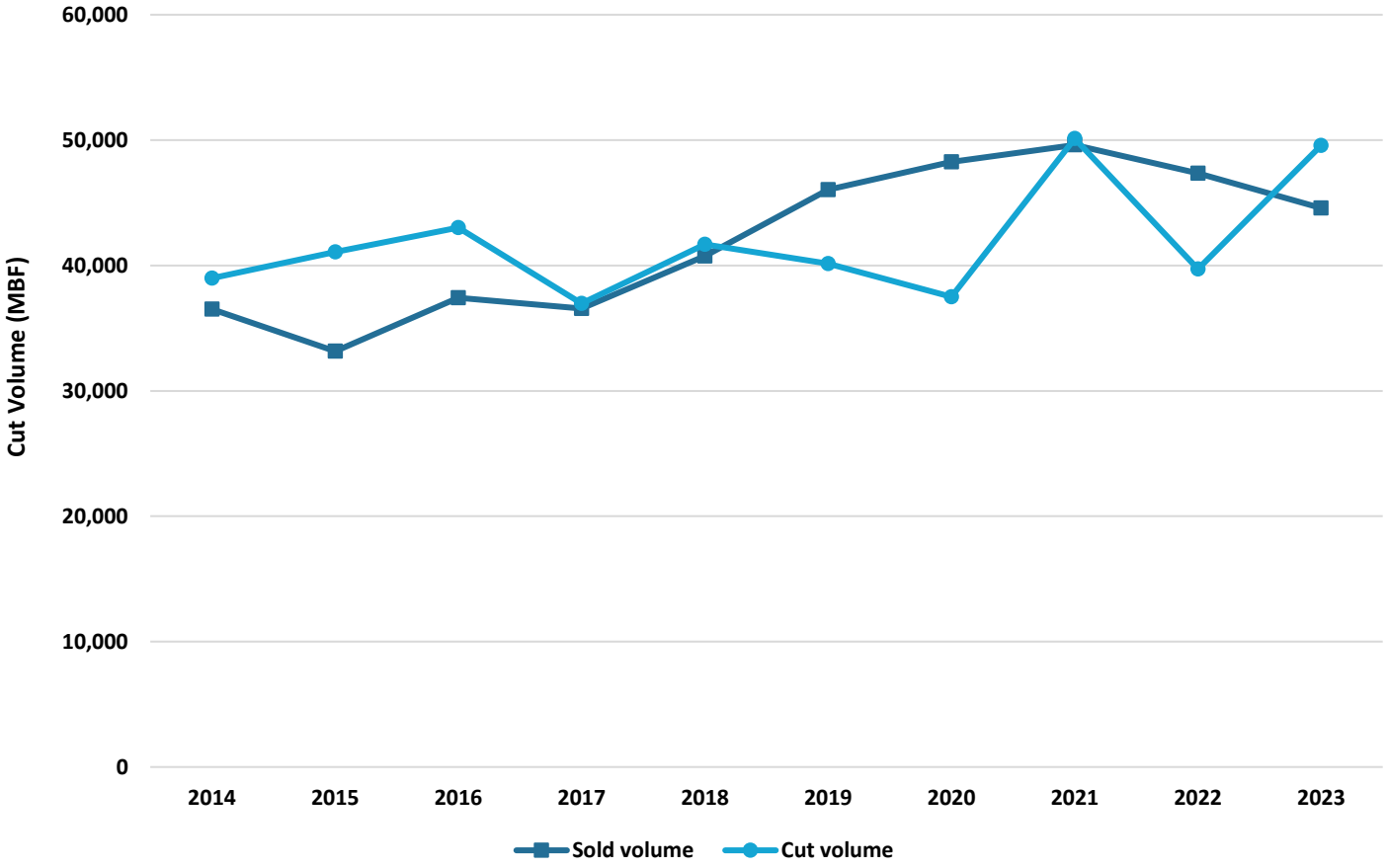


Figure E-3. Timber Sales and Cut Volume from State Forests in the BDO Zone, 2014-2023

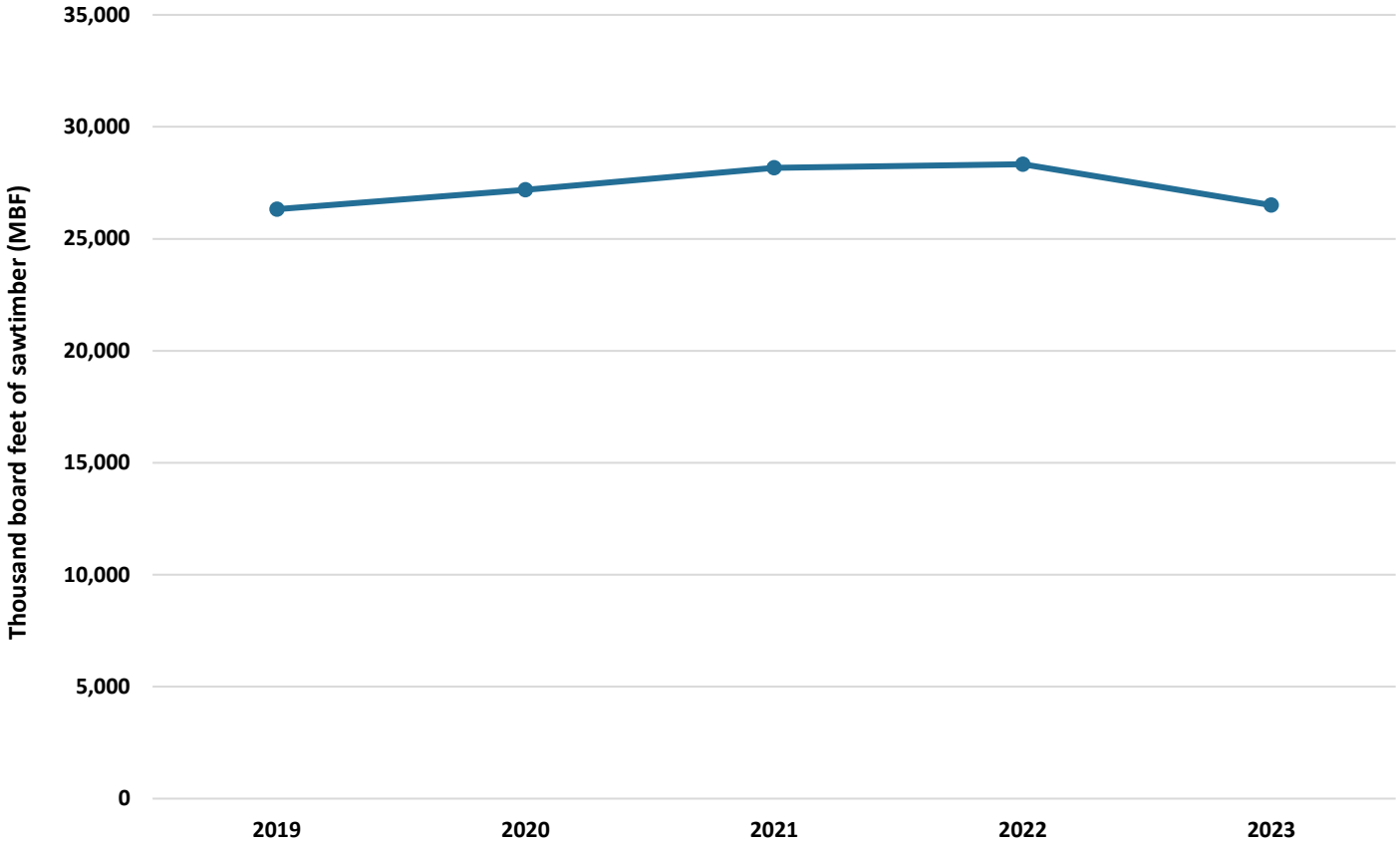


Figure E-4. Capacity of Pellet Mills Within a 150-Mile Drive Distance of Emporium, 2013-2024

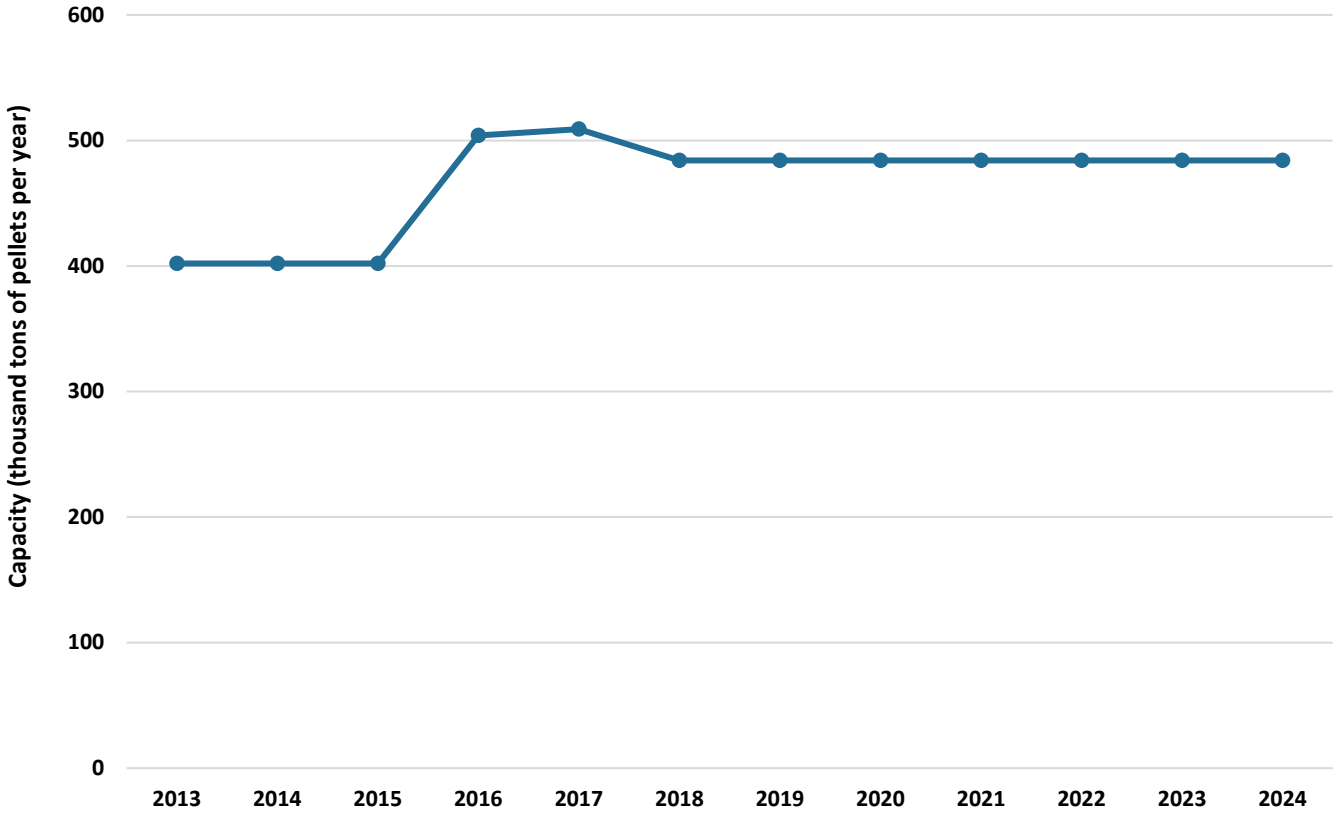


Figure E-5. Supply Curve of Total Potential Production of Pulpwood, Forest Residue, and Sawmill Residue Within a 75-Mile Drive Distance of Emporium

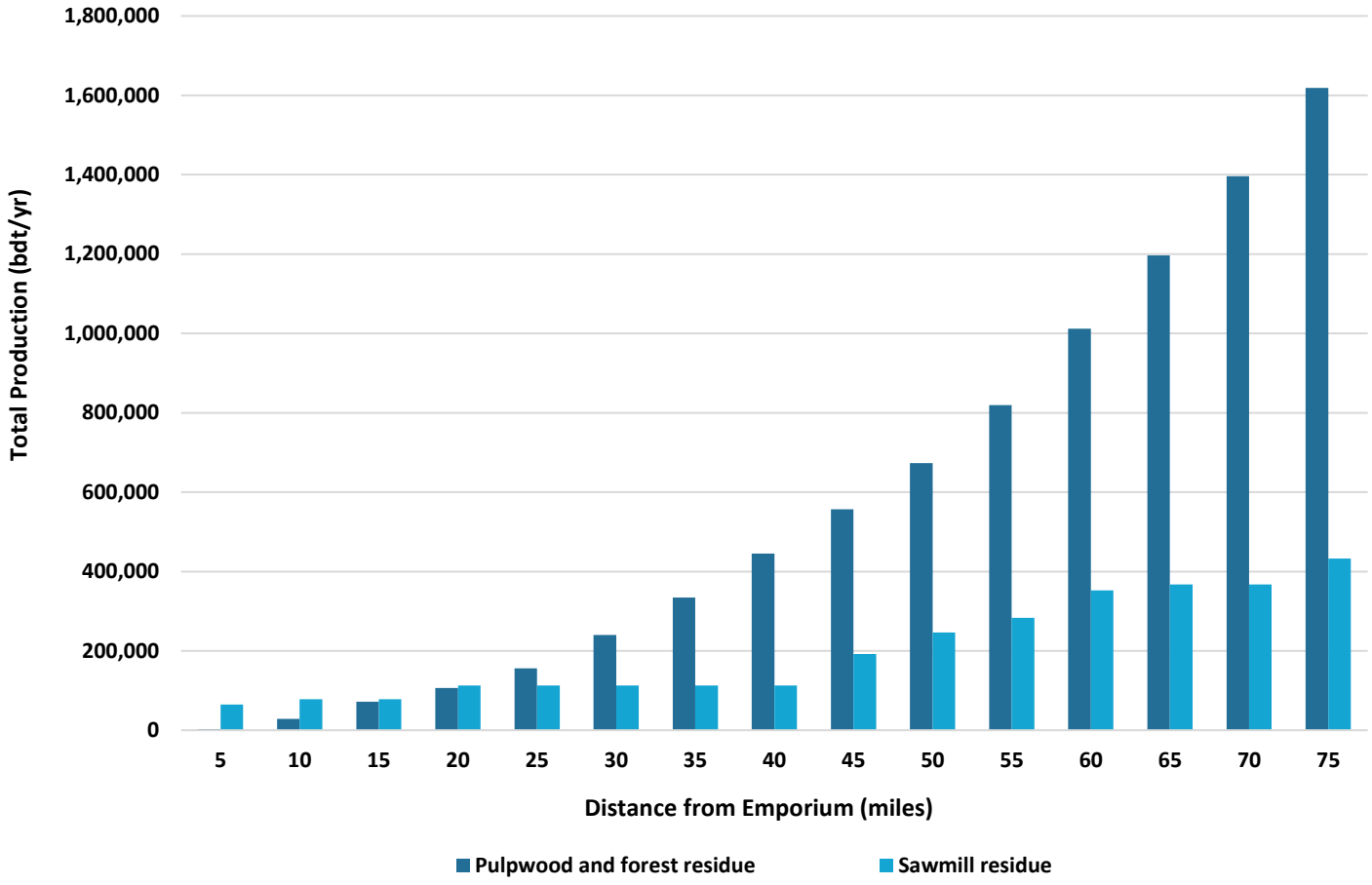


Figure E-6. Comparison of Diesel Prices in Central Atlantic PADD 2B and the USA, 2008-2023

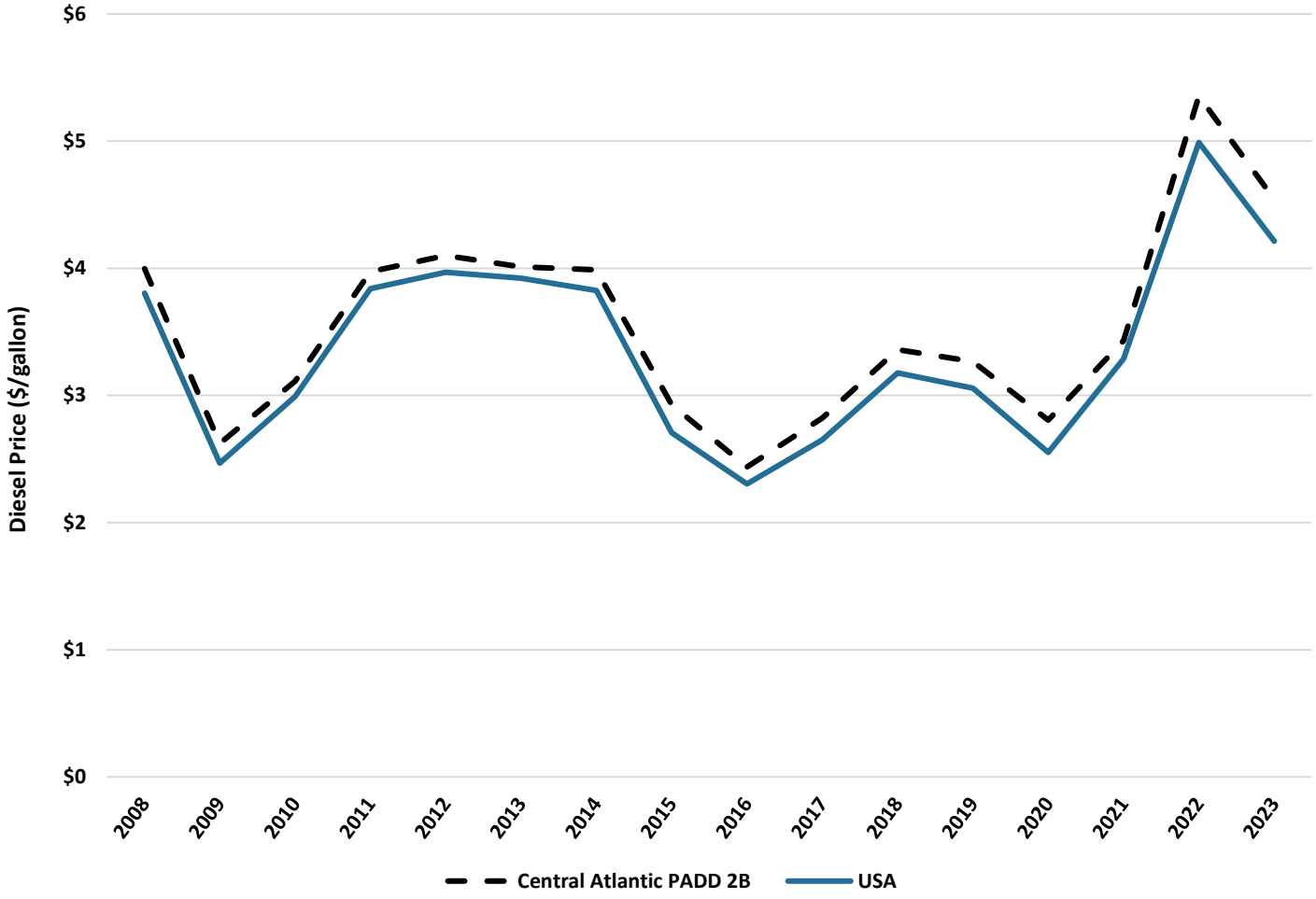


Figure E-7. Inflation-Adjusted Diesel Prices in the Central Atlantic PADD 2B, 2008-2023

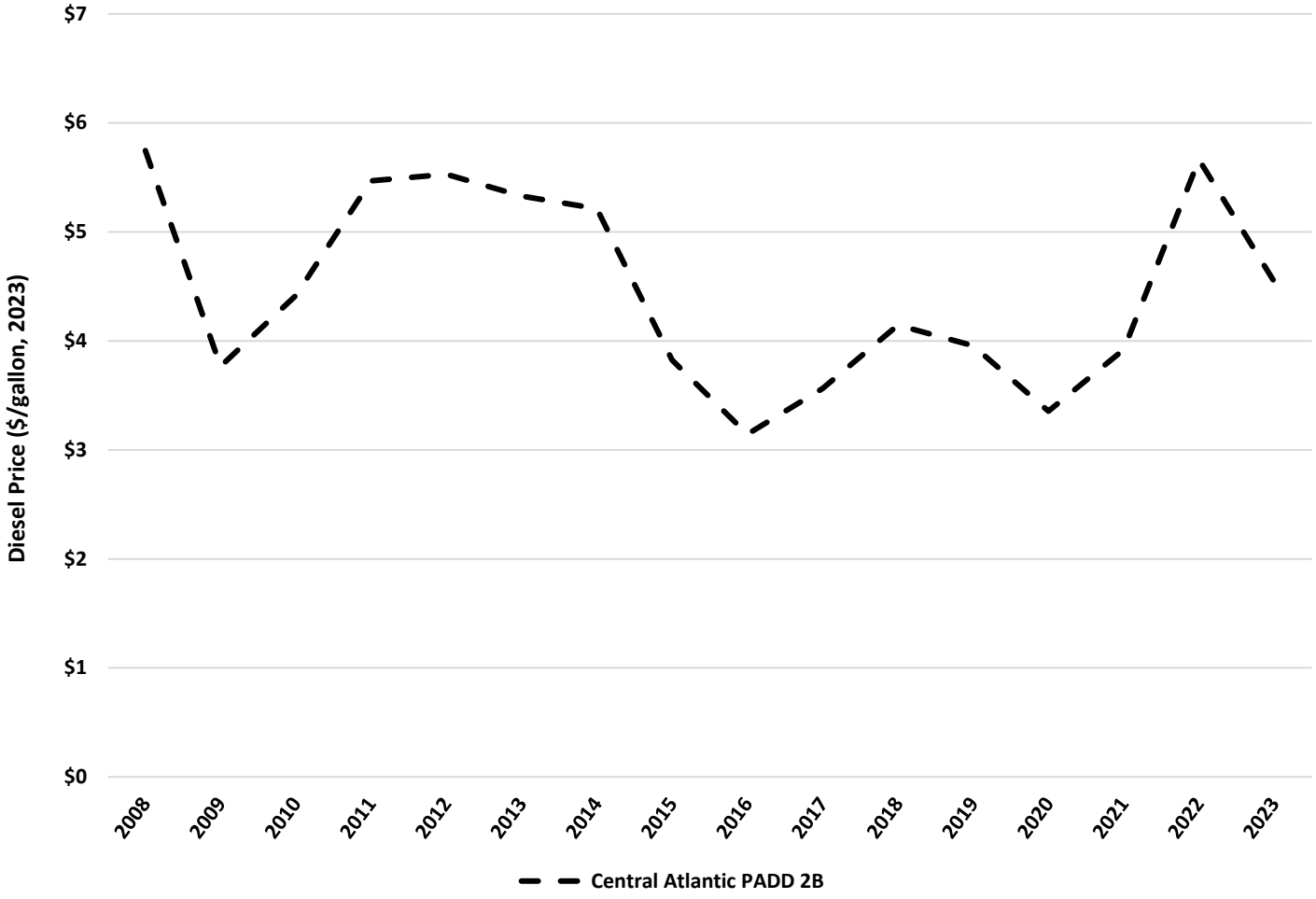


Figure E-8. Overview of Emporium, PA Showing 13-Acre Parcel



Figure E-9. Industrial Site – 1 Airport Road, Emporium, PA



SECTION F: LEGAL DISCLAIMER

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