Biofuel Development Opportunity Zone Risk Rating | BDO Zone Designation: Bon Wier, TX
Date of Issue: October 19, 2022
BDO Zone Rating: **'AA'**

Biofuel Development Opportunity Zone Risk Rating

'AA'

The Bon Wier, Texas Biofuel Development Opportunity Zone is rated 'AA'. Long-term outlook on feedstock quantity is deemed stable. Key supply chain risks are related to cyclic lumber markets and are likely addressable.

Rating Parameters:

Rated Quantity	Category	Cost	BDO Zone Size
2 million gt/yr	**Forest Residues**	**$26.19-$35.43/gt**	**75 miles ex. Bon Wier**
	Pulpwood	**$26.24-$35.50/gt**	
	Sawmill Residuals	**$15.04-$20.34/gt**	

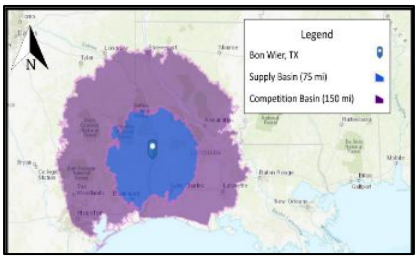
BDO Zone Assets

- **13.6 Mgt/yr of woody biomass assessed within the BDO Zone.**
- **Strong growth: 5.3% of standing inventory harvested annually.**
- **Relatively low demand: Within the BDO Zone, total demand for pine pulpwood is ~ 5 Mgt/yr.**
- **Forestry labor market is healthy. No anticipated labor or skill shortages.**

BDO Zone Liabilities

- **Significant variation in mill residue. Mill-produced biomass ranged from 170,000 to 500,000 gt/yr between 2007 and 2021.**
- **Multiple suppliers subject to the same external risk factors: slow lumber markets can negatively impact sawmill residual and forest residue generation.**

Bon Wier, TX BDO ZONE



BDO Zone Risk Rating

The Bon Wier, Texas Biofuel Development Opportunity Zone is rated 'AA', or *very low risk*.

Risk Rating Grades are defined as follows: AA (*very low*), A (*low*), Baa (*low-moderate*), Ba (*moderate*), B (*moderate-high*), or C (*high*).

Scoring and Ratings Methodology

In assessing the biomass supply chain risk for the Biofuel Development Opportunity (BDO) Zone in Bon Wier, Texas, 51 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 gauging feedstock risk within a BDO Zone.

Feedstock quantity is expressed in green tons per year (gt/yr). Feedstock cost is expressed in US dollars, at the site of generation. Maximum transport distance is based on a 75-mile drive distance supply zone.

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 RI** score based on the research and analysis conducted on the feedstock supply chain in the region. Raw RI Scores are scaled between 1 (*low risk*) and 10 (*high risk*).

Next, each Risk Indicator is discounted, or "notched", based on the degree to which the uncertainty drivers are deemed to be addressable, and whether there is a reasonable expectation that mitigation measures could be put into place within the price parameters for this rating. The **Notched Salience score** corresponds to the likelihood of each Risk Indicator's described risk materializing given the implementation of reasonable mitigation measures. To arrive at the Notched Salience score, Raw RI scores are reduced based on the efficacy of the likely mitigation measures. If applicable, notching occurs at one of 3 levels: 25%, 50%, or 75%.

Finally, the potential impact of each Risk Indicator on the supply chain is assessed and scored on a 10-point **Impact Level** scale, as either *low (3.33), moderate (6.66), or high (9.99).* Impact level scores are based on the assumption that key measures were implemented to mitigate uncertainty drivers in the BDO Zone but failed to do so.

The **Loaded RI** score for each Risk Indicator is then calculated as the product of Notched Salience and

Impact Level scores. For example, Risk Indicator 'Competitor Price and Price Sensitivity' is scored at a Raw Score of 4, a Notched Salience of 2, and Impact Level is moderate (i.e., 6.66). The final Loaded RI score for this risk indicator is $2 \times 6.66 = 13.32$ (out of 100).

Loaded RI scores of 33.33 or less are deemed *low risk*; scores greater than 33.33 and less than 66.66 are deemed *moderate risk*; and those that score 66.66 to 100 are deemed *high risk*.

The total risk rating for the BDO Zone is the average of all Loaded RI scores. The BDO Zone score for Bon Wier is ***14.84 out of 100, resulting in an 'AA' designation.*** All scoring and rationale for each Risk Indicator is provided in Appendix A.

Analyst Notes

Forestry is a major industry in the Texas-Louisiana belt in which the BDO Zone is located. The forestry industry in the Bon Wier BDO Zone is strong and has a long history of production and performance.

There is a significant surplus of woody biomass generated in the BDO Zone, defined by a 75-mile radius of Bon Wier with 13.6 million gt/yr of woody biomass generated, consisting primarily of pine pulpwood and sawtimber.

We estimate 5Mgt/yr of woody biomass currently consumed by large facilities located in the Bon Wier BDO Zone.

BDO Zone forestry labor market is healthy; we do not anticipate labor or skill shortages.

Evaluation of a demand case for nearly 2Mgt/yr of RFS2-qualified pine pulpwood indicated that the market penetration is possible with manageable risk in feedstock quantity and price. Sawmill residue production can vary substantially and depends on market demand from pulp and paper and housing industries.

The BDO Zone is characterized by a large number of potential suppliers' real estate investment trusts (REITs) and timber investment management organizations (TIMOs), non-industrial private forests (NIPFs), and government agencies.

The majority of current consumers of pine pulpwood in the Bon Wier BDO Zone are pulp and paper industries, accounting for 5 million gt/yr, only a small amount of which comes from within the BDO Zone.

Pine pulpwood harvest removals have varied in the BDO Zone since 2007 between 4.3 million gt/yr in 2013, 2016, and 2017) and 5.5 million gt/yr (2010). While pulp and paper account for the majority of demand, additional demand has come from an Estonia-based purchase and restart of a pellet facility and a greenfield OSB facility in Corrigan, Texas, that came online in 2018. An OSB company has also announced plans to build a second facility.

Harvest residue in the Bon Wier BDO Zone has decreased at an average rate of 27.20% per year since 2007 when 40,299 tons were removed and is aligned with the declining demand trends in the region.

Sawmill residuals have fluctuated over the years and are dependent on demand for the housing industry and have varied between 170,000 gt/yr (2016) and 500,000 gt/yr (2007) since 2007 with an average of 370,000 gt/yr.

In 2021, the price of delivered pine pulpwood averaged $30.87 per ton for the 4.8 million green tons supplied to the Bon Wier BDO Zone market, consisting of $8.19/ton paid as stumpage, $14.58/ton for handling, and $8.10/ton for freight. Since 2007, historical prices for pine pulpwood have varied between $27.12/ton (2009) and $31.76/ton (2015).

Delivered prices of harvest residues from the Bon Wier BDO Zone have averaged $30.81/ton, with $22.08/ton paid for chipped and loaded material ready for transport and $8.73/ton for freight. Historical prices for harvest residues since 2007 have varied between $22.33/ton (2013) and $30.81/ton (2021).

Delivered prices of mill residues from the Bon Wier BDO Zone have averaged $17.69/ton, consisting of $7.19/ton paid for chipped and loaded material ready for transport and $10.50/ton for freight. The historical prices for harvest residues since 2007 have varied between $17.59/ton (2020) and $22.84/ton (2012).

The price ranges in the Bon Wier BDO Zone rating parameters utilize estimates of 2021 fiber prices +/-15%.

We rate the BDO Zone for 2Mgt/yr as this quantity support intake of SAF-sized refineries and multiple other biofuels, renewable chemical, or bioproduct plants.

Given the strong growth to drain ratio in the Zone, broad access to additional supply beyond the Zone, strong harvest and delivery infrastructure, we see a high probability of a new woody biomass-based project successfully penetrating the current market.

Salient Risk Indicators

Year-to-year variation in sawmill residual generation is significant. However, sawmill residual demand is consistently low in the region.

Suppliers are subject to the same external risk factors. Sawmills and loggers/harvesters are subject to the same risks related to the lumber market. If the lumber market declines, it can significantly influence the availability of both sawmill residuals and forest residues. This risk, however, is mitigated by the large surplus of generated woody biomass in the BDO Zone above the rated quantity of 2M tons per year.

Competitors' locations and geographical influence on the market pose low risk. A total of 14 major competitors were identified within the 75-mile driving distance from the Bon Wier BDO Zone: 5 OSB plants, 5 pulp and paper companies, 1 pellet facility, 2 chip facilities, and 1 sawmill. Since over 13 million gt/yr of woody biomass is harvested each year with only 5 million gt/yr used in the vicinity, a high incentive exists to source locally and support new biomass-based industries.

Infrastructure Asset Profile

Bon Wier's infrastructure assets were scored on a scale of 0–10, with scores defined as follows: 0 (very good), 2 (good), 4 (reasonable), 6 (fair), 8 (poor), and 10 (insufficient). Among the top-rated assets are landfill access, sewage disposal trunk line, outdoor recreational activities, highway access, and land cost.

Overall, Bon Wier, Texas, presents a profile of positively rated infrastructure assets, with an average score of 2.76 out of 10. This score supplements Bon Wier's BDO Zone rating and supports its low-risk designation. The full infrastructure asset profile is detailed in Table 2.

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Figure 1 - Risk Indicators (Sorted by Risk Level)

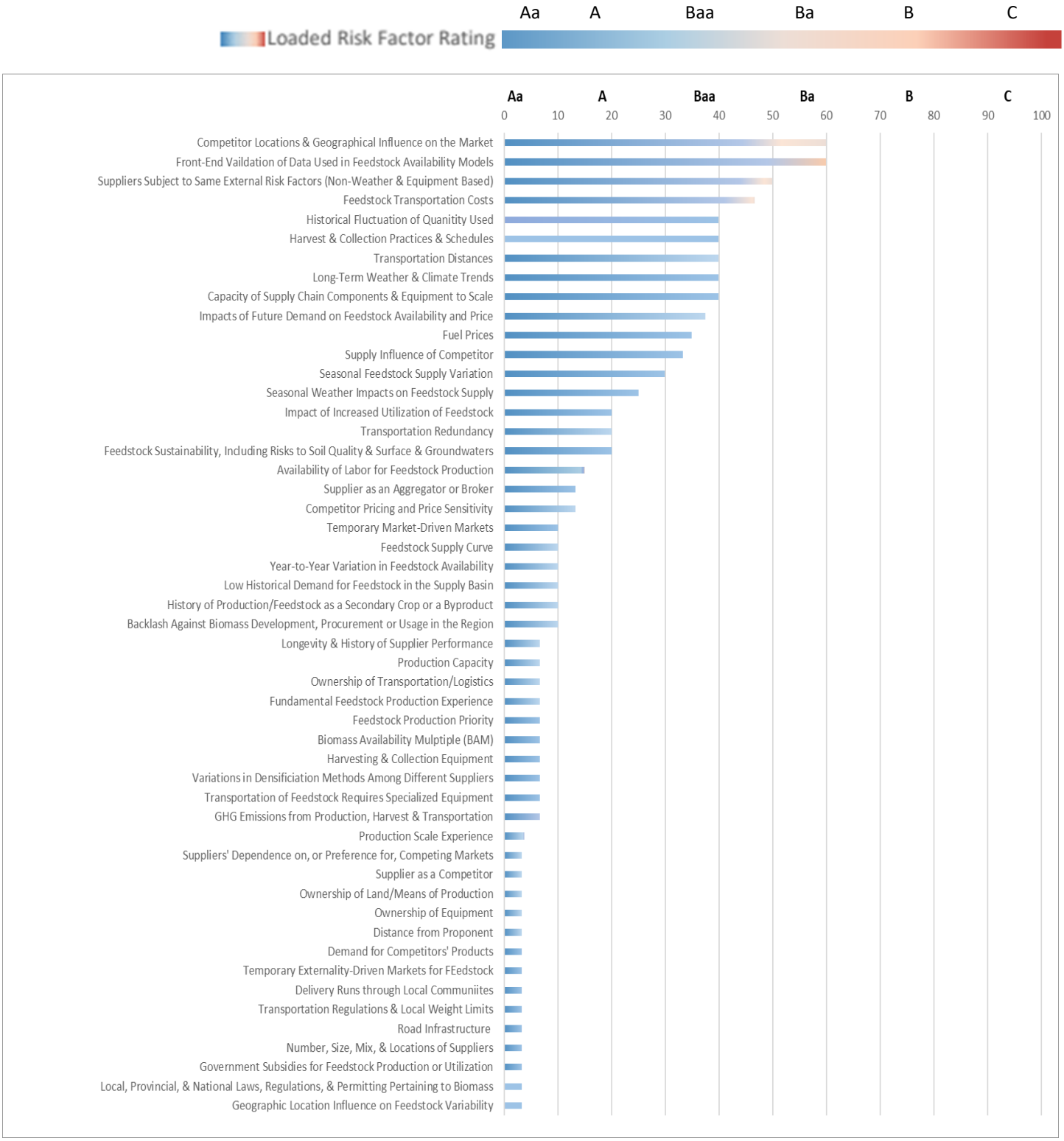


Table 1 - Risk Indicators

Feedstock Supply Chain Risk Indicators	Raw RI Score	Notched Salience	Impact Level	Loaded RI Score
Category 1: Supplier Risk				
Longevity & History of Supplier Performance	1	1	6.66	6.66
Production Capacity	1	1	6.66	6.66
Supplier's Dependence on, or Preference for, Competing Markets	1	1	3.33	3.33
Supplier as a Competitor	1	1	3.33	3.33
Ownership of Land/Means of Production	1	1	3.33	3.33
Ownership of Equipment	1	1	3.33	3.33
Ownership of Transportation/Logistics	1	1	6.66	6.66
Supplier as an Aggregator or Broker	4	1	3.33	3.33
Distance from Proponent	1	1	3.33	3.33
Fundamental Feedstock Production Experience	1	1	6.66	6.66
Production Scale Experience	1.5	1.13	3.33	3.75
Feedstock Production Priority	1	1	6.66	6.66
Category 2: Competitor Risk				
Competitor Locations & Geographical Influence on the Market	6	6	9.99	59.94
Historical Fluctuation of Quantity Used	4	4	9.99	39.96
Competitor Pricing & Price Sensitivity	4	2	6.66	13.32
Impacts of Future Demands on Feedstock Availability & Price	5	3.75	9.99	37.46
Supply Influence of Competitor	5	5	6.66	33.30
Temporary Market-Driven Markets	3	3	3.33	9.99
Demand for Competitors' Products	1	1	3.33	3.33
Category 3: Supply Chain Risk				
Biomass Availability Multiple (BAM)	2	2	3.33	6.66
Impact of Increased Utilization of Feedstock	3	3	6.66	19.98
Feedstock Supply Curve	3	3	3.33	9.99
Seasonal Feedstock Supply Variation	6	4.5	6.66	29.97
Year-to-Year Variation in Feedstock Availability	1	1	9.99	9.99
Front-End Validation of Data Used in Feedstock Availability Models	3	3	9.99	29.97
Low Historical Demand for Feedstock in the BDO Zone	3	3	3.33	9.99
History of Production/Feedstock is a Secondary Crop or a Biproduct	1	1	9.99	9.99
Fuel Prices	7	1.75	6.66	11.65
Harvest & Collection Practices & Schedules	6	6	6.66	39.96
Harvesting & Collection Equipment	2	2	3.33	6.66
Temporary Externality-Driven Markets for Feedstock	1	1	3.33	3.33
Variation in Densification Methods Among Different Suppliers	2	2	3.33	6.66
Availability of Labor for Feedstock Production	6	1.5	3.33	5.00
Feedstock Transportation Costs	7	7	6.66	46.62
Transportation Distances	4	4	9.99	39.96
Transportation of Feedstock Requires Specialized Equipment	1	1	6.66	6.66
Delivery Routes through Local Communities	1	1	3.33	3.33
Transportation Regulations & Local Weight Limits	1	1	3.33	3.33
Road Infrastructure	1	1	3.33	3.33
Transportation Redundancy	3	3	6.66	19.98
Number, Size, Mix, & Locations of Suppliers	1	1	3.33	3.33
Suppliers Subject to Same External Risk Factors (Non-Weather & Equipment Based)	5	5	9.99	49.95
Seasonal Weather Impacts on Feedstock Supply	5	2.5	9.99	24.98
Long-Term Weather & Climate Trends	6	6	6.66	39.96
Government Subsidies for Feedstock Production or Utilization	1	1	3.33	3.33
Local, Provincial, & National Laws, Regulations, & Permitting Pertaining to Biomass	1	1	3.33	3.33
Backlash Against Biomass Development, Procurement or Usage in the Region	1	1	9.99	9.99
Feedstock Sustainability, Including Risks to Soil Quality, & Surface & Groundwaters	3	3	6.66	19.98
GHG Emissions from Production, Harvest & Transport	2	2	3.33	6.66
Geographic Location Influence on Feedstock Variability	1	1	3.33	3.33
Capacity of Supply Chain Components & Equipment to Scale	1	1	9.99	9.99
Total Composite Loaded Risk Score				**14.84**

Table 2 - Asset Indicators

Infrastructure Assets	Overview	Score
Category 1: Physical Infrastructure		
1.1 Land Parcel	Ideal land parcel of 1604 acres located in Newton County (see Appendix B)	1
1.2 Industrial Land Use Zone	Bon Wier has many industrial land use lots available, including acres of undeveloped land, commercial lots, and large rural tracts.	2
1.3 Natural Gas Line	A gas line that runs across the property. It is approximately .25 miles from the warehouse (main) facility.	2
1.4 Electrical	There are two existing transmission lines at the site. One is a 138 kV line and the other is a 69 kV line. There is also a substation at the site.	2
1.5 Fresh Water Supply Line	There are 4 large water wells on the property. In 2005, the previous operating plant was permitted to pull approximately 600,000,000 gallons per year.	1
1.6 Sewage Disposal Trunk Line	This would be determined by the Texas Commission on Environmental Quality (TCEQ) depending on usage and type. There is a dedicated wastewater treatment facility.	2
1.7 Drainage	Waste-water treatment by Aquatech	2
1.8 Stormwater Management	Texas Water Development Board outlines guidelines for risk management during stormwater harvesting.	3
1.9 Available ICT Services	Good. Broadband internet connection options include VDSL, ADSL, satellite, and terrestrial fixed wireless from 6 different providers. You can get up to 200 Mbps download speeds via VDSL powered by Valor Telecommunications of Texas LP.	2
1.10 Available Land	Good. Various plots of land are available.	4
1.11 Cost of Land - Initial Cost	$5M for the plant site	4
1.12 Cost of Land - Property Tax, Utilities	The average property tax rate in Texas is 1.81%. The county tax rate is 0.99%, which is way below the state average.	1
1.13 Infrastructure - Landfill/waste disposal	No landfill/waste disposal in the immediate vicinity, but there is a transfer station in Newton County and a landfill in Williamson County	5
Category 2: Logistics		
2.1 Highway Access and Intersection	The site is located on Highway 363 between Kirbyville and Bon Wier. Bon Wier is approximately 3 miles east of the site with access to Highway 190 (east/west). Kirbyville is approximately 12 miles west of the site with access to Highway 96. The site is 7 miles east of the junction of Highway 363 and Highway 87 (north/south).	1
2.2 Proximity to Major Markets	There is no access to the waterway but the roads to the site are designed for heavy use.	3
2.3 Accessibility to Airport	Angelina County Airport-Lufkin (88 miles away) can be reached in 1 hour 33 minutes, and George Bush Intercontinental Airport (IAH) (146 miles away) can be reached in 2 hours 24 minutes. Local municipal airports are within 25 miles.	2
2.4 Railway Service	The site has approximately 4,500 feet of rail that is serviced by WATCO, which leases the rail from the BNSF. BNSF owns the main line.	2
2.5 Logistics - Construction Logistics	Reasonable. The site was handling 100 loads of logs at 80,000 lbs. each on a daily basis.	3
Category 3: Social Infrastructure		
3.1 Quality of Life	Family friendly. Bon Wier has a high walk score, which means that there are a lot of stores, restaurants, coffee shops, schools, and more nearby.	4
3.2 Education - Elementary & High School	Elementary, middle, and high schools are available in Newton County, as well as in neighboring counties. School districts covering Bon Wier have a 1.5-star rating, and are ranked #1840 in Texas.	6
3.3 Education - Post Secondary	Stephen F. Austin State University/Angelina College provides a university education. In this Opportunity Zone, 75% of the population has a high school diploma, which is 10% lower than the rate for the state of Texas.	4
3.4 Local Retail	There is good local retail in Bon Wier, adequate for the small population of the area.	3
3.5 Culture and Recreation	Adequate amenities and services within Jasper, Newton, Hardin, and Orange Counties	3
3.6 Hospital and Doctors	Good hospitals with all supplies, laboratory locations, and top ERs near Bon Wier.	3
3.7 Housing Availability	There is adequate housing in the Jasper area. The median Bon Wier rent is $999, which is below the national median rent of $1,469.	3
3.8 Crime Rate	The crime rate in Bon Wier is 53.79 per 1,000 residents, considered safe.	4
	Total	***2.76***


BIOFUEL DEVELOPMENT OPPORTUNITY ZONE INITITATIVE
'AA' RATING

APPENDIX A: RISK INDICATOR SCORING METRICS

CATEGORY 1: SUPPLIER RISK

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.

Raw RI Score: A steady supply of RFS2 sawmill timber is available in the Bon Wier BDO Zone region, which is located partially in east Texas and partially in western Louisiana[1]. The history of sawmills in Texas dates back to 1829[2]. By 1999, Texas was the tenth largest timber producing state in the United States[3]. About 54% of land in eastern Texas, which includes the study region and counties within the BDO Zone, is forestland, 99% of which is timberland[4]. Since the 1830s, the sawmill industry has seen several ups and downs along with changing availability of timber in the area controlled by changing balances in supply and demand. Several large mills in east Texas and surrounding states had permanently or indefinitely halted operations by 2010[5]. The history of the lumber industry in western Louisiana dates to 1726[6]. In 1980, forestry products **ranked second in contribution among 13 southern** states[7]. The forest products industry of Louisiana is comprised of over 900 firms in 45 parishes and directly employs over 25,000 people[8].	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact level is deemed *moderate*.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

[1] RFS2 Feedstock Supply Assessment. Bon Wier, Jan 7, 2022. A Forest2Market Report.
[2] Robert S. Maxwell (15 February 2012) [1976]. "Lumber Industry". Handbook of Texas. Texas State Historical Association.
[3] "Texas Timber Grows Up". Texas Comptroller of Public Accounts. October 1999. Texas is the nation's 10th biggest timber producer.
[4] https://tfsweb.tamu.edu/uploadedFiles/TFSMain/Data_and_Analysis/Forest_Economics_and_Resource_Analysis/Resource_Analysis/Resource_Analysis_publications/EastTexasforestlands.pdf. March 2010.
[5] https://tfsweb.tamu.edu/uploadedFiles/TFSMain/Data_and_Analysis/Forest_Economics_and_Resource_Analysis/Resource_Analysis/Resource_Analysis_publications/EastTexasforestlands.pdf. March 2010.
[6] G. A. Stokes, Lumbering and Western Louisiana Cultural Landscapes. *Annals of the Assoc of Amer Geographers.* Vol. 47, no.3, 1957, pp. 250–66.
[7] Wilbur R. Maki, Con H. Schallau, Bennet B. Foster, Clair H. Redmond, Louisiana's Forest Products Industry: Performance and Contribution to the State Cconomy, 1970 to 1980. Res. Pap. PNW-RP-371. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 22 pp.
[8] https://www.ldaf.state.la.us/forestry/. Accessed on 7/17/2022.

1.2. Production Capacity

Rationale: Supplier production capacity can be a strong indicator of long-term credit worthiness and future solvency. Higher production capacities can denote strength of operational elements, including cash flows, important to future solvency.	
Raw RI Score: Timberland in the 75-mile Bon Wier BDO Zone consists of about 5.7 million acres with about 258 million green tons of inventory, of which 208 million green tons are pine pulpwood. Pine pulpwood harvest removals have steadily increased by 0.2 million tons per year since 2016–17. Corporate owners supply most of the timber to the market in the Zone, **harvesting 10.4 million green tons of pine and hard wood annually, while NIPF owners harvest about 2.9 million green tons annually.** Risk associated with supplier production capacity is deemed low overall. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact level is deemed moderate.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

1.3. Suppliers' Dependence on, or Preference for, Competing Markets

Rationale: Supplier may have a vested interest in or preference for supplying specific competitors for biomass feedstock. Preferences may be due to historical, long-term, or personal relationships, less stringent feedstock quality requirements, more flexible operating hours by competing markets, or suppliers' dependences on competing markets to accept or purchase other products/by-products. During periods of feedstock shortage such suppliers may be more likely to allocate the scarce supply to a competitor, resulting in supply disruptions for the Proponent.	
Raw RI Score: The RFS2 biomass is in good supply in the Bon Wier BDO Zone. Current competition for RFS2 fuel comes from the paper and pulp industry, which purchases 5 million tons of pine pulpwood per year, only a portion of which originates in the Bon Wier supply zone**.** If demand rises, the basin has enough capacity to meet it, with over 10.3 million tons of pine pulpwood and sawtimber potentially available between 2022 and 2045. Feedstock shortage from current, out-of-the-basin suppliers can easily be met from local harvests as well. This is also true for sawmill residuals and forest residues. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**

Impact Level: Impact Level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

1.4. Supplier as a Competitor

Rationale: The risks of feedstock costs going up and availability going down increase if a supplier is also a competitor to the Proponent. In times of feedstock shortage, the risk that supply commitments will not be met increases.

Raw RI Score: **Sawmill Residuals:** Sawmill residual markets are currently mature and any new facility looking to source this material can expect material barriers to securing it. It is common for sawmills to use sawmill residuals, most often Sawdust and Bark, as fuel for internal operations. Most sawmills burn a fraction of the sawmill residuals they generate, but some burn most of their sawdust and bark. Although not foreseeable in the near future, if natural gas prices increased to a point where mills relied more on their own residuals, this would drive scarcity and put upward pressure on price. **Forest Residues and Pulpwood:** Suppliers do not act as potential competitors for forest residues and pulpwood. The Bon Wier BDO Zone produces RFS2 qualified pulpwood. Current markets and current demand for RFS2-qualified pulpwood is not high. Over 5 million tons are available in the basin and only 5 million tons, of which a small portion comes from the basin, are used by the pulp and paper industry in the basin. Therefore, if demand for RFS2-qualified pulpwood were to increase from current suppliers becoming competitors, redundancy is available over distance: a new plant in Bon Wier can go beyond the 75-mile Zone to access RFS2-qualified pulpwood. In short, we see strong supply redundancy in the Zone and surrounding area that will ensure supply commitments are met. Risks related to suppliers acting as competitors is overall low. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: Impact Level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

1.5. Ownership of Land/Means of Production

Rationale: Suppliers that own land where feedstock is produced, or a production facility, tend to have better control of supply chains and present lower degrees of supply risk.	
Raw RI Score: **Forest Residues:** Though neither sawmills nor fiber producers/harvesters typically own the land they harvest, we do not find this poses a risk to the availability of forest residues. Historical data show that timber in this area is available for harvest continually year-to-year, particularly in the last few decades, and forest management practices ensure availability for the next 40 to 50 years. We deem risks related to ownership of land and means of production as low. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: Impact Level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33 out of 100.	**Score 3.33**

1.6. Ownership of Equipment

Rationale: In most cases, suppliers that own or lease equipment for harvest, collection, and processing feedstock are lower risk than those who do not. For example, third-party harvesting equipment may not be available when required. Short harvest windows may be missed if a farmer and contractor cannot schedule harvest times that are convenient and quantity shortages can result.	
Raw RI Score: We see no significant risk through equipment ownership from sawmills. Producers in the BDO region either own the equipment necessary to harvest and collect timber and other forest products, including forest residues, or have easy access to it. Risk may be introduced where new equipment is needed to accommodate unusual plant specifications. REITs, NIPFs, and TIMOs, who together own most of the timberland, have developed pricing, harvesting, and hauling policies that take into account their unique financial structures and are able to manage risks through careful adjustment of pricing and contracting policies for harvesting and hauling. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low*.	**Score 3.33**

Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

1.7. Ownership of Transportation/Logistics

Rationale: In most cases, suppliers that own or lease equipment necessary to transport biomass from forest or field are lower risk than those who do not. However, in some circumstances, reliance on third parties to transport biomass is a common practice and does not contribute to risk.	
Raw RI Score: The pricing, harvesting, and hauling policies of REITs, TIMOs, and NIPFs differ based on how their financials are reported and whether they are owned by shareholders or corporations. For example, TIMOs sell timber on a stumpage basis without harvesting or haulage contracts; REITs are earnings focused, so they control all aspects up to delivery including harvesting and hauling; NIPFs are more flexible in their pricing, hauling, and harvesting because they use a mix of brokers who buy on stumpage basis or harvest and may haul themselves if stumpage cost is too low. Risks associated with transportation/logistics are deemed low. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. Given existing infrastructure of available trucking contractors, it is very likely that distribution and transportation needs can be met.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *moderate*.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66 out of 100.	**Score 6.66**

1.8. Supplier as an Aggregator

Rationale: Aggregators may effectively provide supply chain redundancy and eliminate the risk and complexity of dealing with multiple sources of supply by combining supplies into a single master contact. Aggregators can add much needed stability in BDO Zones by increasing offtake stability for both suppliers and markets. An aggregator can be a more reliable long-term offtake for suppliers by virtue of having multiple markets and can be a more reliable long-term supplier for markets by virtue of having multiple suppliers. Further, when a single supplier breaches, the aggregator can source from another.	
Raw RI Score: We know of no current aggregators or fiber brokers in the supply zone**.** Sawmills and other fiber producers deal with markets directly. Risk associated with suppliers as aggregators or brokers is deemed moderate. Raw RI Score is 4 out of 10.	**Score 4**
Notched Salience: Despite this fact, we see direct supply as fundamentally reliable with adequate redundancy from a robust group of producers in case of individual supplier failure. Raw RI Score is notched by 75%: Notched Salience is 1.	**Score 1**
Impact Level: RI Impact Level is deemed *low*.	**Score 3.33**

Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 13.32 out of 100.	**Score 13.32**

1.9. Distance from Proponent

Rationale: The greater the distance from a supplier to a plant, the more exposure it has to weather and fuel cost risks, and the greater the competitive pressure (to breach) that a closer competitor can exert.

Raw RI Score: Within a supply zone of 100 miles, adequate supply of RFS2 pulpwood and harvest and sawmill residuals exists and is estimated to be maintained at least until 2045 based on forest management practices in place for REIT, NIPF, and TIMO owned timberlands and sawmills in the area. Cost risks pertaining to distance are deemed manageable. We see approximately 258 million green tons of timberland inventory available in the Bon Wier BDO Zone. Five million green tons of pine pulpwood harvest removals have occurred each year between 2007 and 2020. Between 2007 and 2021, from 170,000 to 500,000 gt/yr of mill residues have been available to the market within the Zone. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 3.33 out of 100.	**Score 3.33**

1.10. Fundamental Feedstock Production Experience

Rationale: Risk is higher when a supplier has limited experience with harvesting/processing and/or collecting biomass. Where experience is lacking, Proponent should show that steps have been taken to ensure proper training, knowledge dissemination, and monitoring.

Raw RI Score: Supply of pulpwood harvest, harvest residues, and sawmill residuals in the Bon Wier BDO Zone is well established, as evidenced by the available inventory, annual harvesting rates since 2007, and absorption of that material by current markets. Forest residues are a by-product of roundwood timber production and fiber and producers in the area have deep knowledge of and experience with all aspects of generation. Most production in the area is controlled by TIMOs and REITs (63%) and managed commercially. Only 26% is managed by NIPF, whose production of pulpwood has been consistent from 2007 to 2021.	**Score 1**

Raw RI Score is 1 out of 10.

Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *moderate*.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66 out of 100.	**Score 6.66**

1.11 Production Scale Experience

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

Raw RI Score: Both biomass supply and market demand are currently in good balance, with significant pulpwood being consumed by the pulp and paper industry. If demand were to increase for RFS2 pulpwood by a biopower entity, current supply can meet that demand by diverting the supply from the pulp and paper industry, which would likely meet their demand by going to non-RFS2 suppliers within the 100-mile radius. Inventory and harvesting projections to meet demands of a proposed cellulosic biofuels facility and a wood-fired power generating facility are based on the ratio of inventory growth to harvest removal (GRR) averaging 1.16 between 2021 and 2045. Scale-up therefore does not seem to present a problem unless demand increases even further, resulting in a reduction of GRR. Current silviculture practices ensure that pulpwood availability for various diameter trees would continue to be strong for the foreseeable future. The GRR does not fall to 0.94 until the latter part of the 2021–2045 period. Raw RI Score is 1.5 out of 10.	**Score 1.5**
Notched Salience: As GRR declines only in the latter part of the assessment period, its growth and removal in the early part could result in GRR above 1 in the latter years. Raw RI Score is notched by 25%: Notched Salience is 1.13.	**Score 1.13**
Impact Level: RI Impact Level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.75 out of 100.	**Score 3.75**

1.12. Feedstock Production Priority

Rationale: When biomass feedstock is a secondary or non-core line of business, or when it is a by-product or a residual from a more valuable primary product, then suppliers may not put in sufficient

effort to consistently produce it. Risk of breach increases when production and/or delivery of feedstock compromises a supplier's ability to make a primary product.	
Raw RI Score: We do not expect a negative impact on primary forest sector harvesting or production from increasing biomass production. Sixteen major suppliers are comprised of **63% TIMOs and REITs and 26% NIPF** whose production history has been able to support the market of over 12 million gt/yr of pulpwood and hardwood for several years since 2007. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *moderate*.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66 out of 100.	**Score 6.66**

CATEGORY 2: COMPETITOR RISK

2.1. Competitor Locations and Geographical Influence on the Market

Rationale: Competitors' locations relative to a Proponent plant can affect the viability of procuring feedstock and the cost of that feedstock. Accurate and detailed competitor mapping provides an understanding of the geographical influence a competitor may have, including competitive advantages such as short-hauling.	
Raw RI Score: Fourteen major competitors have been identified for pulpwood and chips in the Bon Wier BDO Zone: 5 are paper facilities, 5 OSB facilities, 1 pellet facility, 2 chip producers, and 1 sawmill. Current competitors are not competing for RFS2 pulpwood and can easily divert their supply to non-RFS2 wood. Projected supply for additional plants using RFS2 wood suggests competition can be managed without significant impacts. We note that additional demand could drive up the price of pulpwood and residues in the short run to account for uncertainty in the assumption that demand could be easily diverted with price pressure, RI score is 6 out of 10.	**Score 6**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *high*.	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 29.97 out of 100.	**Score 59.94**

2.2. Historical Fluctuation of Quantity Used

Rationale: Clear understanding of key competitors' consumption of each type of feedstock utilized by the Proponent is essential to quantifying the risks associated with each competitor.	

Understanding 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 also enable more accurate estimates of the sensitivity of feedstock availability to potential future consumption levels or to the impact of external events (e.g., weather events, structural economic changes, seasonality, or policy change).	
Raw RI Score: A reasonable understanding of historical consumption of pulpwood, forest residues, and sawmill residuals in the Bon Wier BDO Zone suggests that fiber consumers have relied on feedstock generated both within and outside of the Zone to fulfill demand and that consumption patterns have varied materially. Having reviewed assessments up to 2049, we find it reasonable to expect that supply availability can withstand fluctuations in biomass demand. However, to account for uncertainty in the increase in demand because of an increase in climate-change-related assistance from the federal government, Raw RI Score is 4 out of 10.	**Score** 4
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *high*.	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 39.96 out of 100.	**Score 39.96**

2.3. Competitor Pricing and Price Sensitivity

Rationale: Understanding how much competitors pay for different feedstock types is an essential step in determining competitiveness of Proponent. Historical prices paid by competitors provide insight into their procurement behaviors and ability/willingness to pay premiums for feedstock and exert pressure on Proponent's suppliers during times of feedstock shortage. Competitors who are able to offer higher prices for feedstock during feedstock shortages can pose significant risks to Proponent.	
Raw RI Score: We see material risk in large mills competing for sawmill residuals: these facilities are well established and may be able to tolerate higher prices temporarily in order to exert pressure on new competitors. Our price projection modeling and data suggest that new market entrants could drive fiber cost; however, increases in cost are expected to be reasonable for new bio-based facilities. Because of uncertainty in such projections, Raw RI Score is 4 out of 10.	**Score 4**
Notched Salience: The large number of commercially owned and operated forests (63% are owned by REITs and TIMOs) creates sufficient redundancy for new entrants to mitigate the impact of local price movements. Raw RI Score is notched by 50%: Notched Salience is 2.	**Score 2**
Impact Level: RI Impact Level is deemed *moderate*.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 13.32 out of 100.	**Score**

	13.32

2.4. Impacts of Future Demands on Feedstock Availability and Price

Rationale: Future competitors for feedstock, or expansion of feedstock demand by current competitors, can cause feedstock market disruption.	
Raw RI Score: Analysis of a new plant requiring 1,962,000 gt/yr of RFS2 woody biomass and 956,200 gt/yr of harvest and sawmill residuals in the Bon Wier BDO Zone suggests that while some price readjustments could occur, there is sufficient supply within and outside the Zone to support future competition until 2049. Current consumption of approximately 5 million gt/yr is only partially supplied from the Zone. Silviculture practices in the Zone also suggests that pulpwood availability can be sustained or sustainably be increased within the Zone to meet increased demand. However, because of uncertainty in how much the demand could increase as a result of federal subsidies to climate-friendly biomass-based energy production, Raw RI Score is 5 out of 10.	**Score 5**
Notched Salience: Proponents in need of sawmill residuals may have to engage in price competition with existing markets, with uncertain parameters around pricing pressures that competitors may be able to exert. Increase in demand from existing competitors over time is a salient possibility for sawmill residuals. We see a significant first mover advantage to decreasing the risk of future demands on forest residues and pulpwood. Raw RI Score is notched by 25%: Notched Salience is 3.75.	**Score 3.75**
Impact Level: RI Impact Level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 37.46 out of 100.	**Score 37.46**

2.5. Supply Influence of Competitor

Rationale: In some cases, competitors may be able to exert high degrees of pressure on local suppliers, effectively enabling them to control feedstock, especially during periods of shortage. This control can derive from long previous relationships between suppliers and competitors, from verbal or "understood" agreements, or from a competitor being able to assist suppliers in times of surplus by maintaining large inventories that enable suppliers to continue supplying when other markets impose quotas. Understanding and planning around such soft risk factors is important. If such relationships exist in the Proponent's procurement area, they may indicate increased risk of feedstock shortage or pricing changes.	
Raw RI Score: Models of a projected increase in demand for pulpwood harvest of 1,960,000 gt/yr suggest that the Bon Wier BDO Zone can accommodate new entrants without supply from outside the Zone. However, due to uncertainty in future demand from increased federal support for bioenergy production, Raw RI Score is 5 out of 10.	**Score 5**

Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *moderate*.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 33.30 out of 100.	**Score 33.30**

2.6. Temporary Market-Driven Markets

Rationale: Alternative, non-traditional, market-driven competitors for feedstock can increase feedstock demand in unusual circumstances.	
Raw RI Score: Federal incentives to promote bioenergy production in order to slow the pace of climate change could introduce new competition and increase demand at least temporarily. Uncertainty will pertain regarding quanta and duration of the increase in demand. However, we see fiber supply in the Bon Wier BDO Zone to be resilient to an increase of 1,960,000 gt/yr of pulpwood biomass. Raw RI Score is 3 out of 10.	**Score 3**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 9.99 out of 100.	**Score 9.99**

2.7. Demand for Competitors' Products

Rationale: Increased demand for a competitor's product can cause greater demand for feedstock by the competitor. For example, greater demand for biofuels due to a clean fuels policy can cause increased biofuel production by the competitor, thereby increasing demand for feedstock.	
Raw RI Score: Currently OSB and papermills constitute the primary competition to growth in bioenergy. Bioenergy production necessitates increase in the supply of RFS2-qualified pulpwood, which is abundant in the Bon Wier BDO Zone. Current competition does not tap the Zone for all of its needs and, in any case, does not require RFS2-qualified feedstock. We do not see a material short- or long-term threat from traditional producers, even with a rise in demand for competitor's products. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**

Impact Level: RI Impact Leve is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33 out of 100	**Score 3.33**

CATEGORY 3: SUPPLY CHAIN RISK

3.1. Biomass Availability Multiple (BAM)

Rationale: Biomass Availability Multiple (BAM) indicates the degree of redundancy in a Proponent's supply chain. BAM is the ratio of biomass feedstock available to a project, at costs, timing, and in quality feasible for the Proponent, divided by the project's feedstock requirements. BAM is a strong indicator of supply chain resilience when stressed by supply shortage and/or supplier breach.

Raw RI Score: A BAM indicates redundancy of available feedstock within the Bon Wier BDO Zone for a pre-defined project intake capacity. Forest residues, pulpwood, and sawmill residuals constitute feedstock in this analysis. **Score 2**

The annual generation of woody biomass (pulpwood and sawtimber) in the Zone was estimated at 10.3 million gt/yr, defined by a 75-mile drive distance from the center of the Zone. Harvest residues generation was estimated at 1.89 million gt/yr. Current consumption in the Zone is about 5 million gt/yr of pulpwood biomass, leading to a BAM of 2.1. For a proposed cellulosic biofuels facility that requires about 1.96 million gt/yr of pulpwood biomass from 10–24-year-old stands and for a wood-fired power production, 1 million gt/yr of harvest and sawmill residuals would be required until 2049. Of the 10.3 million gt/yr available in the Zone, about 4.8 million tons are comprised of 10–24-year-old stands. Since current consumers do not depend on the Zone, even at current harvest removal rates the BAM for the new facility exceeds 2X.

Analysis of silviculture practices indicate that until 2049, adequate supply of pulpwood of the desired stand age would be available for increased capacity from the biofuel and biopower facilities for both the new facilities and existing consumers. We see slack in supply for the current consumers to divert demand for pulpwood from 10–24-year-old stands to other age groups. Thus, the BAM value would consistently be above 2X.

On the other hand, as the federal government increases incentives to produce biofuels to slow climate change, fiber demands could go even higher, leading to increased uncertainty in future estimates of BAM. Raw RI Score is 2 out of 10.

Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 6.66 out of 100.	**Score 6.66**

3.2. Impact of Increased Utilization of Feedstock

Rationale: Feedstock utilization in a Bon Wier BDO Zone can change over time. Existing consumers of feedstock can expand operations or new facilities can enter the market. Increased utilization puts additional pressure on feedstock and can lead to higher prices, feedstock disruptions, shortages, or supplier breach.

Raw RI Score: With a current BAM of 2.1, we see space in the market for increased feedstock utilization without risking oversaturation and consequent upward pressure on prices, particularly for forest residues and pulpwood, which constitute the majority of currently unutilized feedstock. Current silviculture practices suggest increased availability of pulpwood until 2049. Increased utilization of forest residues and pulpwood would likely not impact forest health, as long as removals are carried out according to local, state, and federal regulations; removal of pulpwood-sized material often improves forest stand quality and is viewed as beneficial. As federal government increases incentives to produce biofuels to slow climate change, it is possible demand could go even higher, leading to increased uncertainty in future estimates of BAM. Raw RI Score is 3 out of 10.	**Score 3**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *moderate*.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 19.98 out of 100.	**Score 19.98**

3.3. Feedstock Supply Curve

Rationale: The greater the feasible transport distance, the more feedstock is accessible to the Proponent, but at a higher delivered cost. The feedstock supply 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.

Raw RI Score: Current value supports substantial availability of feedstock in the Bon Wier BDO Zone. Analysis of a high-demand case involving a cellulosic biofuel plant consuming primarily pulpwood and a wood-fired power generation facility consuming residues from pulpwood harvest and sawmill indicates that adequate supply of pulpwood and harvest residues would be available in the Zone until 2049 with some increase in price. The impact on prices of pulpwood and residues from both pulpwood harvest and sawmill will not be severe enough to significantly disrupt the market. For the high-demand case, the demand for pine pulpwood will increase 36.1% from 2022	**Score 3**

to 2045, while delivered costs would increase by 13.7%. Prices of harvest residues and mill residues increased by 6.1% and 6.3% for the high demand-case during the same period. Current average haul distance for pine pulpwood is 44 miles, projected increase for the high-demand case was estimated as 48 miles; however, the delivered price did not correlate well with the distance because of excess availability in the region. As a supply curve was not directly available for the high-demand case, Raw RI Score is 3 out of 10.

Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 9.99 out of 100.	**Score 9.99**

3.4. Seasonal Feedstock Supply Variation

Rationale: Biomass supply can present significant seasonal supply variations that in combination with limitations associated with longer-distance transportation and storage can lead to regional biomass supply imbalances (Golecha & Gan 2016) and manifest in shortages and higher costs for Proponents.

Raw RI Score: Minor temporary delays in timber delivery to sawmills can occur during periods of heavy rainfall or major snow events, when fiber producers are unable to clear trees from timberland and/or dirt roads are impassable. These delays can cause variations in sawmill residuals and forest residues as well as pulpwood feedstock production. These delays (and therefore feedstock generation variations) typically do not last more than several weeks. However, long-term impact of climate change on this RI are unknown and, as such, represent a minor but material degree of risk. Raw RI Score is 6 out of 10.	**Score 6**
Notched Salience: Potential facilities could mitigate the risk associated with feedstock shortages during periods of inclement weather by maintaining moderate inventories (two to three weeks) of feedstock reserves on-site. With sufficient inventory, much of the risk associated with delays in feedstock production brought on by weather could be mitigated. Raw RI Score is notched by 25%: Notched Salience is 4.5.	**Score 4.5**
Impact Level: RI Impact level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 29.97 out of 100.	**Score 29.97**

3.5. Year-to-Year Variation in Feedstock Availability

Rationale: Biomass can have significant fluctuations in year-to-year supply due to variability in yield from biomass harvesting operations.

Raw RI Score: Pine pulpwood harvest removals varied between 4.5 and 5.5 million gt/yr between 2007 and 2020. This does not represent a significant variability. Coupled with the potential to increase harvest yields from the Zone as needed, and the ability of current consumers to procure pulpwood from outside the Bon Wier BDO Zone, the year-to-year variation in pulpwood feedstock availability does not represent a significant threat to new bioenergy development in the Zone. Removal of harvest residue, however, varies considerably from year-to-year in the Zone; but as it closely tracks year-to-year variation in demand, not availability, it is not deemed a material risk. Mill produced biomass has varied from 170,000 to 500,000 gt/yr in the Zone between 2007 and 2021. It shows a cyclic trend, and the high variation reflects the single sawmill operating in the Zone. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 9.99 out of 100.	**Score 9.99**

3.6. Front-End Validation of Data Used in Feedstock Availability Models

Rationale: Feedstock supply models can be complex. Lack of clarity about model assumptions and baseline data can result in confusion on the part of the capital markets and drive financing costs for biomass projects. The adequacy and credibility of assumptions and baseline data is paramount to credible model outputs.	
Raw RI Score: For feedstock availability models, we rely on recent analyses conducted for the evaluation of siting a cellulosic biofuels plant and a wood-fired power plant using resources from the Bon Wier BDO Zone,[9] including macroeconomic models to make projections of supply, demand, and pricing for a 20-year period ending in 2049. The assumptions of the model are clearly stated, and a hard case (conservative) was selected to support adequacy of the Zone as the primary driver for bioenergy production. Data comes from credible sources; however, we did not validate the accuracy of the data that was fed into some of the third-party projections used in this rating: modeling accuracy questions always persist for long-term prediction. Raw RI Score is 3 out of 10.	**Score 3**
Notched Salience: No adjustment.	**Score Unnotched**

[9] RFS2 Feedstock Supply Assessment. Bon Wier, Jan 7, 2022. Confidential.

Impact Level: RI Impact Level is deemed *low.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 6.66 out of 100.	**Score 29.97**

3.7. Low Historical Demand for Feedstock in the BDO Zone

Rationale: If Proponent 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 early on.

Raw RI Score: Use of biomass is substantial in the Bon Wier BDO Zone. A total of 14 potential competitors were identified within the 75-mile drive distance Competition Zone. Major competitors include OSB manufacturers, paper manufacturers, a pellet mill, two chip manufacturers, and a sawmill. They have consumed about 5 million gt/yr since 2007. About 63% of feedstock is produced by TIMOs and REITs, indicating a strong history of commercially managed production and marketing. About 26% of feedstock is produced by NIPF owners, who rely on contracts with local harvesters based on pulpwood price and demand. TIMOs and REITs remove about 10.4 million gt/yr and NIPFs remove about 2.9 million gt/yr of pine and hardwood, suggesting a well-established system of silviculture in the area that can respond to both short- and long-term demands. The variety and magnitude of competitor intake is a testament to the fact that feedstock collection practices are well established and at low risk for changing. Because current paper and pulp industry consumers of pine pulpwood get a large portion of the pine pulpwood demand of 5 million tons from outside the basin, some uncertainty exists. Raw RI Score is 3 out of 10.	**Score 3**

Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 9.99 out of 100.	**Score 9.99**

3.8. History of Production/Feedstock is a Secondary Crop or a Byproduct

Rationale: If feedstock is a new/secondary crop or a by-product, suppliers may either lack sufficient experience to mitigate risk or be unable to react to such risk, and producers may be less likely to prioritize production. If feedstock is a secondary crop, then production can be subject to variables beyond suppliers' control.

Raw RI Score: Forest residues, sawmill residuals, and pulpwood are by-products of sawtimber harvest and production in the Bon Wier BDO Zone. However, logging and wood products	**Score 1**

manufacturing are stable with a long history of operation and a history of tolerable variance in quantities produced in the Zone.

Even if the demand for pulpwood were to crash due to the shutdown of local mills, the silviculture is well enough established that it can divert the harvests to bioenergy production while maintaining parts of the forests for lumber-grade trees. Bioenergy production thus provides a major stabilizing market for producers during lumber-induced crisis. Because of this, Raw RI Score is 1 out of 10.

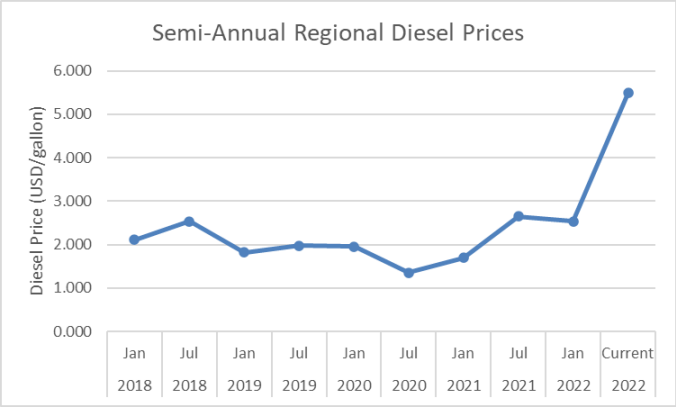
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *high*.	**Score 9.99**
Loaded RI Score: (Notched Salience × Impact Level) is 9.99 out of 100.	**Score 9.99**

3.9. Diesel Prices

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

Raw RI Score: Regional data from the US Energy Information Administration's Diesel database show that diesel prices are volatile, hard to predict, and currently rising significantly[10].	**Score 7**

Semi-Annual Regional Diesel Prices, 2018–2022



Raw RI Score is 7 out of 10.

Notched Salience: Given the large availability multiples in the region, access to increasing multiples of redundant feedstock with moderate increase to transportation costs, as well as access to fiber via	**Score 1.75**

[10] EIA's Monthly Retail Gasoline and Diesel Prices: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMD_EPD2DXL0_PTE_R1Z_DPG&f=M.

barge from various locations up the Mississippi, we significantly notch this RI. Raw RI Score is notched by 75%: Notched Salience is 1.75.	
Impact Level: RI Impact Level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 34.97 out of 100.	**Score 11.65**

3.10. Harvest & Collection Practices & Schedules

Rationale: Differences in harvest timing and practices can create risks for 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.	
Raw RI Score: Harvest, collection, and scheduling practices are well established and robust in the supply chain. Foresters and fiber producers have established procedures for forest management practices and the resulting timber harvest. However, risk is introduced when unforeseen factors such as inclement weather or extended periods of impassable roads occur. Raw RI Score is 6 out of 10.	**Score 6**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 39.96 out of 100.	**Score 39.96**

3.11. Harvesting & Collection Equipment

Rationale: Different types of harvesting and collection equipment used by suppliers can have a significant impact on the quality and availability of feedstock. Use of different types and combinations of harvesting, collection, and processing equipment can lead to non-homogeneous feedstock. Equipment that is not designed specifically for biomass cultivation, harvesting, and collection can increase feedstock quality risks. Type of equipment should be specified for the sake of product consistency and risk reduction.	
Raw RI Score: It is industry standard that fiber producers own and operate all their harvesting and collection equipment. However, some suppliers may need to make additional equipment purchases. In the Bon Wier BDO Zone, 63% of landowners are TIMOs or REITs who manage forest operations commercially and use the most efficient technologies to get the best return on investment or value	**Score 2**

for shareholders. The NIPF owners sell feedstock on a stumpage basis, employing professional harvesters who use efficient practices according to market needs. Well-established silviculture practices and the presence of professional harvesters make it unlikely that improper or substandard equipment would be used. Raw RI Score of 2 out of 10.

Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66 out of 100.	**Score 6.66**

3.12. Temporary Externality-Driven Markets for Feedstock

Rationale: Alternative, non-traditional, externality-driven competitors for feedstock can drive feedstock demand (and cost) in unusual circumstances.

Raw RI Score: No temporary externality-driven markets for sawmill residuals, forest residues, or pulpwood feedstocks were identified. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 3.33 out of 100.	**Score 3.33**

3.13. Variations 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.

Raw RI Score: Densification methods among different suppliers do not vary significantly. While the quality of the feedstock will vary depending on the wood source and stage in processing, collection methods are typically industry standard. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 6.66 out of 100.	**Score 6.66**

3.14. Availability of Labor for Feedstock Production

Rationale: Skilled labor shortages can be difficult to remedy in the short term. Availability of suitable labor in an area can impact the ability to procure sufficient feedstock quantities on schedule. Labor risks are higher for facilities where supply chains are not yet active; or for Proponent's for whom large feedstock requirements, or development of new (or expanded) supply chains, demand significant additions to the local labor force.	
Raw RI Score: Our research indicates that finding labor for feedstock acquisition will not be difficult. However, post-pandemic, there have been labor shortages in multiple industries across the United States for a variety of reasons, so this risk cannot be treated as minor and its duration is unpredictable. We see moderate short-term risk in scaling logistics/transportation as the market grows**.** Raw RI Score is 6 out of 10.	**Score 6**
Notched Salience: We note that financing and construction for a major plant in the BDO Zone is at least 3 years; after that time period, we find it reasonable that post-pandemic labor issues will self-resolve Raw RI Score is notched by 75%: Notched Salience is 14.5.	**Score 1.5**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 14.99 out of 100.	**Score 5.00**

3.15. Feedstock Transportation Costs

Rationale: Transportation can be one of the most significant cost components of biomass supply chains. The average transportation cost and percentage of total feedstock cost attributable to transportation should be known.	
Raw RI Score: Transportation costs are primarily a function of fuel cost, distance, and labor cost. Fuel costs have experienced considerable upsurge in 2022 for geopolitical reasons. Until geopolitical stability is reestablished, this uncertainty will continue to affect transportation costs. Raw RI Score is 7 out of 10.	**Score 7**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 46.62 out of 100.	**Score 46.62**

3.16. Transportation Distances

Rationale: Transport distances of 40–80 miles for biomass feedstocks are typical but larger distances can be common. Where average transport distance from suppliers to Proponent 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 feedstock from competitors closer to the source. Understanding average transport distance can help flag higher-risk suppliers where transport distance materially exceeds the average.	
Raw RI Score: Analysis shows that bioenergy production can be well supported from resources produced within the Zone. We see most impacts related to increased demand within the Zone to be mitigatable with minor reliance on an extended 100-mile radius supply zone. Raw RI Score is 4 out of 10.	**Score 4**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 23.31 out of 100.	**Score 39.96**

3.17. Transportation of Feedstock Requires Specialized Equipment

Rationale: Requirements for specialized transport equipment can increase supply chain risk. Where there is low availability in required transportation equipment, equipment owners have increased leverage over transportation prices and supply chain resiliency can be lower.	
Raw RI Score: Transportation of the woody biomass in the Bon Wier BDO Zone does not inherently require specialized equipment. Most of the feedstock presently moved within the Zone is transported by professionally managed TIMOs and REITs. Even for NIPF owners, transportation is carried out by professionals who rely on minimizing costs to improve their margins. With nearly 5 million gt/yr of pulpwood harvests transported, equipment usage is very likely well established and standardized. The nature of feedstocks hauled has remained the same for the last several years, so it is reasonable to believe that equipment has been standardized as well. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: While we expect local infrastructure to be able to scale as necessary to accommodate the specific transport needs (if any) of a new project, it could take some time to do so. RI Impact Level is deemed *moderate.*	**Score 6.66**

Loaded RI Score Loaded RI Score (Notched Salience × Impact Level) is 6.66 out of 100.	**Score 6.66**

3.18. Delivery Routes through Local Communities

Rationale: Transportation of biomass can become a nuisance to local communities, especially if a large number of trucks passes through residential and school areas. Local communities often have the power to force regulations regarding truck transport, impeding a Proponent's ability to transport feedstock. This risk is greater in greenfield projects than operational ones.

Raw RI Score: Forestry has been one of the most prominent industries in the Bon Wier BDO Zone for the last several years and in multiple decades of the twentieth century and is a major employer in local communities in the Zone. Therefore, delivery routes are well established and accepted by communities. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 3.33 out of 100.	**Score 3.33**

3.19. Transportation Regulations & Local Weight Limits

Rationale: In many regions, 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.

Raw RI Score: Considering the volume and mass of timber currently transported in the Bon Wier BDO Zone, we deem it highly unlikely that transportation regulations could hinder feedstock acquisition or transportation. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 3.33 out of 100.	**Score 3.33**

3.20. Road Infrastructure

Rationale: Feedstock cost and availability can be a function of the accessibility of road infrastructure**.** Problems with road networks will translate directly to risks to feedstock supply.

Raw RI Score: Road infrastructure is good (although aged) and maintained at regular intervals. There is a proven track record of supporting the needs of a vibrant forest products and forest management network of activities. The infrastructure could easily support transportation from additional bioenergy business. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 3.33 out of 100.	**Score 3.33**

3.21. Transportation Redundancy

Rationale: Transport equipment redundancy is important for dealing with seasonally variable feedstock supplies, as well as the risk of equipment breakdowns.	
Raw RI Score: Within the Bon Wier BDO Zone, REITs and TIMOs manage timberlands and control costs well, particularly by maintaining their transportation equipment. NIPF owners use professional haulers who also ensure cost-control by using well-maintained equipment. Yet some uncertainty can be attributed to the use of small hauling firms who may not have the capacity to conduct regular maintenance, thus affecting their costs to the market. Transportation redundancy in the Bon Wier supply chain is low risk. Raw RI Score is 3 out of 10	**Score 3**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: Impact Level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 9.98 out of 100.	**Score 19.98**

3.22. Number, Size, Mix, & Locations of Suppliers

Rationale: In general, a portfolio of multiple suppliers of various sizes 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, a large number of small suppliers is less likely to have the capacity to withstand internal disruptions and may be more likely to breach. Here, risk of disruption is higher, but the likely impact is lower. The number of suppliers and the ratio of small to large suppliers should be optimized.	

There is no pre-determined number or optimal ratio of suppliers—either too many or too few can pose higher degrees of risk.	
Raw RI Score: Sixteen major suppliers (7 wood suppliers, 8 TIMOs, and 1 REIT) haven been identified in the Bon Wier BDO Zone. TIMOs and REITs typically remove over 10 million gt/yr of pine and hardwood, while NIPFs typically remove over 2 million gt/yr. NIPFs use different contractors to harvest depending on the market they supply in a year. TIMOs and REITs use their own equipment or contractors. The number of wood suppliers in comparison to landowners (TIMOs, REITs, and NIPFs combined) suggests multiple suppliers/contractors in the region. Therefore, disruption in supply is highly unlikely. The number and mix of potential suppliers in the Zone are highly advantageous for bio-based projects looking to site there. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33 out of 100.	**Score 3.33**

3.23. Suppliers Subject to Same External Risk Factors (Non-Weather & Equipment Based)

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 their locations, production practices, and other elements of supply chain structure such that the impact of single, high-risk events have varying impacts on suppliers.	
Raw RI Score: Suppliers in the Bon Wier BDO Zone are subject to many of the same external risk factors. Logging in the Zone is dependent on macroeconomic factors such as the housing markets. Downturns can threaten sawmill viability and consequently impact the harvest of sawtimber and forest residues. However, if bioenergy plants can be established here, logging could be directed at different stand-age trees, preserving more aged trees for when the housing market picks back up. Since silviculture is actively managed by TIMOs, REITs, and NIPFs according to markets, flexibility in management is already in place and diversity in the market would lower the risk from external risk factors. Raw RI Score is 5 out of 10.	**Score 5**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: Impact level is deemed *high.*	**Score 9.99**

Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 49.95 out of 100	**Score 49.95**

3.24. Seasonal Weather Impacts on Feedstock Supply

Rationale: Seasonal weather impacts are defined as 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.	
Raw RI Score: Temporary delays can occur during periods of heavy rainfall or snows, when fiber producers are unable to clear trees from timberland, or dirt roads are impassable. These delays cause variations in all sources of feedstock production, but the delays (and therefore feedstock generation variations) typically do not last more than a few weeks. There can be seasonal delays in forest residue and pulpwood generation, particularly in the spring. Raw RI Score is 5 out of 10.	**Score 5**
Notched Salience: Since seasonal delays typically last days or weeks, having a modest but well-maintained feedstock reserve on site would significantly reduce the risk. Raw RI Score is notched by 50%: Notched Salience is 2.5.	**Score 2.5**
Impact Level: RI Impact Level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 24.98 out of 100.	**Score 24.98**

3.25. Long-Term Weather and Climate Trends

Rationale: In certain regions, climate trends and significant potential changes to future weather patterns can create feedstock risk.	
Raw RI Score: Increased frequencies of hurricanes and associated strong winds constitute the biggest threats in the Bon Wier BDO Zone and could hold up transportation for a period of days to weeks, destroy inventory from ensuing floods, or destroy trees. The frequency and intensity of hurricanes is increasing. Future impacts due to climate change are inherently unpredictable and pose a salient degree of risk. However, the sheer volume of timber available and the wide geographic area of the Zone can somewhat mitigate the effects of severe storms. Past data on harvest removals between 2007 and 2021 do not indicate wide variations from year to year because of hurricanes. Due to the size of the available forest resource in the Zone, Raw RI Score is 6 out of 10.	**Score 6**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *moderate.*	**Score 6.66**

Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 26.64 out of 100.	**Score 39.96**

3.26. Government Subsidies for Feedstock Production or Utilization

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

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

Raw RI Score: There are no government subsidies for harvesting fiber in the Bon Wier, BDO Zone. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 6.66 out of 100.	**Score 3.33**

3.27. Local, Provincial, & National Laws, Regulations, & Permitting Pertaining to Biomass

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

If utilization of biomass requires specific permits (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.

Raw RI Score: We identified no local or state laws or regulations that would prevent or restrict biomass removal from Bon Wier BDO Zone forests**.** Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**

Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 3.33 out of 100.	**Score 3.33**

3.28. Backlash Against Biomass Development, Procurement or Usage in the Region

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

Raw RI Score: We have not identified any past negative reaction to the wood products industry in the Bon Wier BDO Zone. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 9.99 out of 100.	**Score 9.99**

3.29. Feedstock Sustainability, Including Risks to Soil Quality, & Surface & Groundwaters

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

Soil sustainability can be defined as management of soil in a way that does not exert any negative or irreparable effects on the soil or any other systems. There is a diversity of approaches to soil sustainability in jurisdictional guidelines for biomass harvesting and production. Different feedstock types have unique thresholds at which feedstock removal causes significant negative consequences on soil.

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.

Raw RI Score: We assume that fiber harvest in the Bon Wier BDO Zone is carried out according to local regulations, which have strong sustainability protocols. Raw RI Score is 3 out of 10.	**Score 3**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *moderate.*	**Score 6.66**

Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 19.98 out of 100.	**Score 19.98**

3.30. GHG Emissions from Production, Harvest, & Transport

Rationale: Understanding a project's overall emissions and the carbon intensity throughout the feedstock supply chain is essential to reducing risks related to carbon pricing mechanisms and related regulations

Greenhouse gas (GHG) emissions from production, harvest, and transportation can be a significant challenge to Proponent claims of carbon neutrality for biomass projects. Carbon emissions from harvested soils, as well as emissions from harvesting machinery or delivery trucks, can make it difficult to achievement net-zero GHG emissions. If a Proponent's financial model relies on carbon neutrality/GHG regulatory pricing frameworks, it is essential to investigate the feedstock's carbon emission status.

Raw RI Score: If we assume that: 1) trucks average 6.5 miles per gallon[11]; 2) all feedstocks must be transported 75 miles; 3) trucks can carry 22 tons per delivery; 4) facility intake requirement is 100,000 tons per year; and 5) 19.64 pounds of CO_2 are emitted per gallon of fuel used[12], approximately 1,545 tons of CO_2 would be emitted per year in feedstock transport. However, average CO_2 carbon sequestration for pine trees is approximately 11 tons per acre of new tree growth[13], meaning only 140 acres of new trees would have to be grown per year to sequester all the carbon emitted from feedstock transportation. Given the scale of the forestry industry in the Bon Wier BDO Zone, net positive carbon sequestration in relation to transport is deemed likely. GHG emissions stemming from feedstock production and harvest are more difficult to model and will depend on the size of the intake of a new plant in the Zone. However, we note the positive growth-to-drain ratio for fiber in the Zone at the present time and on average until 2045. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Notched Salience) is 6.66 out of 100.	**Score 6.66**

[11] Arrow Truck: https://www.arrowtruck.com/blog/2016/06/21/manage-your-semi-trucks-fuel-use-with-these-tips/.
[12] US Energy Information Administration: http://www.patagoniaalliance.org/wp-content/uploads/2014/08/How-much-carbon-dioxide-is-produced-by-burning-gasoline-and-diesel-fuel-FAQ-U.S.-Energy-Information-Administration-EIA.pdf.
[13] GoTree Quotes: https://www.gotreequotes.com/how-much-co2-do-trees-absorb/.

3.31. Geographic Location Influence on Feedstock Variability

Rationale: Feedstock from different regions may differ in quality due to variations in soil quality, topography, harvest practices, weather, fertilizer applied, etc.	
Raw RI Score: Geographic location within the Bon Wier BDO Zone does not impact feedstock variability. While there is topographic variation throughout the forests in the Zone, it is not expected to impact the current heterogeneity of the categories of feedstock. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Raw RI × Impact Level) is 3.33 out of 100.	**Score 3.33**

3.32. 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 Proponent feedstock requirements and throughput capacity. Capacity to scale should be demonstrated.	
Raw RI Score: Supply chain equipment is capital intensive, and scaling capacity would require capital investments from potential suppliers. We note, however, that 63% of forest management in the region is by TIMOs and REITs; the capital resources should be abundant. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score Unnotched**
Impact Level: RI Impact Level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 39.96 out of 100.	**Score 9.99**

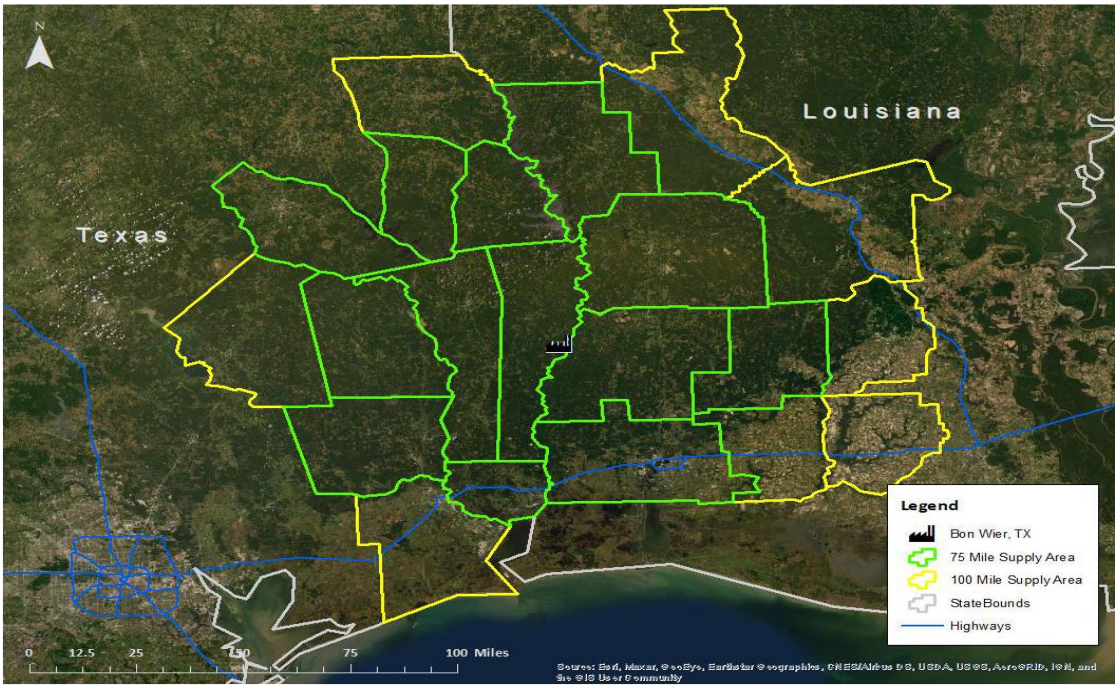
APPENDIX B: INFRASTRUCTURE

Site selection of Bon Wier, Texas

Location

- Existing property and facility have excellent infrastructure including roads, rail, power, natural gas and water.
- Bon Wier is adjacent to Highway 363 between Kirbyville and Bon Wier, Texas. Bon Wier is approximately 12 miles west of the site with access to Highway 96, and 7 miles east of Highway 363 and the Highway 87 junction.
- An incentive package has been provided by state and local jurisdictions.

Map 1: Satellite Image of Bon Wier Supply Zone



Population

Newton County has a population of median age and the Rural 12-county area has a population of approximately 386,000.

Education

Stephen F. Austin State University/Angelina College provides a university education. In the Bon Wier BDO Zone, 75% of the population has a high school diploma, which is 10% lower than the rate for the state of Texas.

Employment

The labor force participation rate is the percentage of the population that is either employed or seeking employment. The labor force is strong, with approximately 11,632 employees in the petrochemical industry and approximately 3,280 petrochemical operators. Regional annual mean wages in system operator occupations range from $58,840 to $90,029 compare to the national mean wage range of $62,710 to $73,830.

Site Selection

The proposed Bon Wier BDO Zone project site is approximately 1,604 acres. Current owner is the Mike Bruce Family Ranch, L.P. The site was originally owned by Louisiana-Pacific as a plywood manufacturing mill; the mill was traded to Georgia-Pacific, which subsequently sold the property to Koch Holdings I LLC.

Property features a large existing building that could be used for wood storage and water storage tanks. Site is laid out to allow for consistent ingress and egress of trucks.

Map 2: Aerial View of The Property with the Existing Structure and Service Road



On-site infrastructure includes:

- Four (4) water wells on site with a small well dedicated to the existing building. Permits will be reissued from the Southeast Texas Ground Water Conservation District.
- Entergy Texas Inc (ETI) will provide approximately 5 MW and backup power for 35 MW with information on the benefits of ETI serving the total potential load of 40 MW. Currently, there are two transmission lines (138KV and 69 KV) on site along with a substation owned by ETI.

- Natural gas provided by EnerFin Resources. The transmission line is 4" and is 0.25 miles from the existing manufacturing site.
- Internet connection by Windstream, which has telecom fiber 6 miles from the site and is in the engineering stage of providing service to the site.
- Deep East Texas Council of Governments (DETCOG) has a proposed fiber line 6,000 feet from the site.
- The site has approximately 4,500 feet of rail serviced by WATCO and leased from BNSF. BNSF owns the main line.
- The property is located within a federal Opportunity Zone.

Transportation Infrastructure

Roads

- Bon Wier BDO Zone site is near Highway 363 between Kirbyville and Bon Wier. The site is approximately 12 miles west of the site with access to Highway 96 and 7 miles east of Highway 363 and the Highway 87 junction.
- Network of roads gives ready access to Highway 191 and Highway 87, providing excellent connections throughout the region.

Rail

- Site has approximately 4,500 feet of rail spur entering on the northwest edge of the property serviced by WATCO, which leases the rail from BNS.
- BNSF owns the main line.
- Lone Star Rail Storage Facility with 350 car storage capacity on-site and over 1300 off-site.

Ports:

Bon Wier is within 150 miles of three ports on the Gulf of Mexico:

- ✓ 75 miles to Port of Port Arthur
- ✓ 61 miles to Port of Lake Charles / Cameron
- ✓ 146 miles to Port of Houston

Air:

- ✓ 70 miles to Lake Charles Regional Airport
- ✓ 81 miles to Jack Brooks Regional Airport
- ✓ 95 miles to Alexandria International Airport
- ✓ 134 miles to Lafayette Regional Airport
- ✓ 147 miles to George Bush Intercontinental Airport
- ✓ 153 miles to East Texas Regional Airport
- ✓ 156 miles to William P. Hobby

APPENDIX C: LEGAL DISCLAIMER

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

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