BDO Zone Rating: **'A'**

Biofuel Development Opportunity Zone Risk Rating

'A'

The Summit County, Utah BDO Zone is rated 'A.' Long-term outlook on feedstock quantity is deemed stable. Key supply chain risks are related to logging capacity, estimation models, feedstock production priority.

Rating Parameters:

Category	Rated Quantity	Delivered Cost	BDO Zone Size
Forest Residue	45,000 bdt/yr	$50-$55/bdt	45-mile drive distance from Wanship, Utah
Pulpwood	55,000 bdt/yr	$50-$75/bdt	

BDO Zone Assets

- **No significant competitors for pulpwood or forest residue exist in the region.**
- **External funding earmarked for highly desired forest fuels reduction treatments means increased woody feedstock for the next 5 to 10 years.**
- **Potential additional supply in the form of standing dead timber.**

BDO Zone Liabilities

- **The number of logging companies and their capacities are limited. Scale-up can take time.**
- **Forest residue production not a priority to loggers.**
- **Likelihood of errors in the biomass availability models.**

BDO Zone Risk Rating

The Summit County, Utah Biofuel Development Opportunity Zone is rated 'A,' or 'high quality.'

Risk Rating Grades are defined as follows: AAA (*highest quality*), AA (*very high quality*), A (*high quality*), and BBB (*good quality*).

Summit County, UT BDO Zone



Scoring and Rating Methodology

In assessing the biomass supply chain risk for the Biofuel Development Opportunity (BDO) Zone in Summit County, Utah, 52 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 bone dry tons per year (bdt/yr). Feedstock cost is expressed in US dollars delivered to Wanship, UT. Maximum transport distance is based on a 45-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 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 assumptions 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 calculated as the product of Notched Salience and Impact Level scores. For example, Risk Indicator 'Government Subsidies for Feedstock Production or Utilization' is scored at a Raw Score of 7, a Notched Salience of 3.5, and Impact Level is high (i.e., 9.99). The final Loaded RI score for this risk indicator is 3.5 × 9.99 = 34.96 (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 Summit County is ***13.51 out of 100, resulting in an 'A' designation.*** All scoring and rationale for each Risk Indicator are provided in Appendix B.

Analyst Notes

Our analysis has determined that sawmill residuals in the BDO Zone are a high-risk source of feedstock for potential projects. This is due to the relatively low quantity of sawmill residuals generated, their relatively high price compared to pulpwood and forest residue, and the fact that over 90% of available sawmill residuals are generated by one sawmill, which currently has all material contracted out.

Our analysis has identified a surplus of approximately 70,000 bdt/yr of pulpwood in the BDO Zone. Accounting for potential disturbances and sustainability concerns with a 20% redundancy factor, we estimate that there are potentially 56,000 bdt/yr of pulpwood available for a new bio-project. The dominant tree types for pulpwood are aspen (hardwood), spruce, and lodgepole pine (softwood). We estimate pulpwood pricing to be between $50 and $75/bdt delivered.

Our estimation suggests that harvesting operations in the BDO Zone generate approximately 34,000 bdt/yr of forest residue, of which we believe 25,600 bdt/yr can be feasibly collected and processed. Additionally, Utah's Wildland-Urban Interface (WUI) fuel reduction program generates around 27,625 bdt/yr of forest residue. Applying redundancy factors of 50% and 20% for harvest residue and fuel treatment residue, respectively, we estimate that there is a total of 47,750 bdt/yr of forest residue potentially available. Based on feedback from local experts, we estimate the average cost to acquire this quantity of forest residue to be between $50 and $55/bdt delivered.

Opportunities in the BDO Zone

No significant competitors have been identified in the region for pulpwood or forest residue. Furthermore, no proposed facilities have been identified at this time. As a result, any new bio-project in the area is expected to encounter minimal competitive pressure in the market. The absence of direct competition provides favorable conditions for the establishment and operation of a new venture within the sector.

The Uinta-Wasatch-Cache National Forest, which surrounds the BDO Zone, has suffered through infestation which resulted in large swaths of dead trees. To mitigate the wildfire risk posed by these dead trees, the US Forest Service is implementing forest fuel removal programs. Effectively, these programs result in subsidized

feedstock. The US Forest Service foresees the program to continue for at least five more years, and potentially up to ten years. The presence of a new bio-project that serves as a significant consumer of the fuels treated under this program would likely incentivize the US Forest Service to further expand and support the initiative.

Our analysis, which indicates 100,000 bdt/yr of woody biomass available at low risk, does not take into account the standing dead timber. Although most of this dead timber is large enough to be sold to local sawmills, there is a large quantity of it which could be utilized by a bio-project. USFS indicates that the dead stock will last for about 20 years, after which, if not harvested or burned by a wildfire, it would give way to new generations of trees. Therefore, the dead stock can be considered as a supplementary source of feedstock, serving as a backup resource for a bio-project.

We do not expect any backlash from local communities with regards to bio-project development. In fact, due to the wildfire risk, a bio-project utilizing woody biomass would be positively perceived by local communities.

Risk Areas

The Uinta-Wasatch-Cache National Forest has a large infestation, resulting in extensive areas of dead trees that are highly prone to wildfires. Current efforts to remove these trees and reduce fuel are insufficient, leaving a significant number of dead trees untouched. As a result, the risk of a major wildfire outbreak will remain high for at least ten years.

The accuracy of woody biomass availability models carries a certain level of risk. Despite our best efforts to validate the models, incorporating feedback from the US Forest Service and accounting for potential errors with redundancy factors (such as the Biomass Availability Multiple), there is still a possibility of significant errors. Consequently, project proponents should further refine the estimates of feedstock availability.

Pulpwood and forest residue production requires logging capacity. Logging capacity in Utah has been historically low with logging crews being imported from other states. Therefore, in the short-term, there is a real risk of a shortage of local logging labor.

After logging, forest residue is usually dispersed or stacked on the forest floor, which can inconvenience loggers who need to modify their operations to collect it at the roadside. Taking this into consideration, we acknowledge that prioritizing forest residue production carries some level of risk.

Infrastructure Asset Profile

Summit County'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, access to hospitals and doctors, housing availability, and industrial zone availability.

While there are some challenges with forestry and logging workforce availability, the Summit County BDO Zone overall presents a profile of positively rated infrastructure assets, with an average score of 2.33 out of 10. This score supplements the Summit County BDO Zone rating and supports its low-risk designation. The full infrastructure asset profile is detailed in Table 2.

Technical Contact

Marcin Lewandowski
Senior Director, Operations & Risk
Ecostrat Inc.
marcin@ecostrat.com

Business Contact

Jordan R. Solomon
President & CEO
Ecostrat Inc.
jordan.solomon@ecostrat.com

Figure 1: Risk Indicators (Sorted by Risk Level)

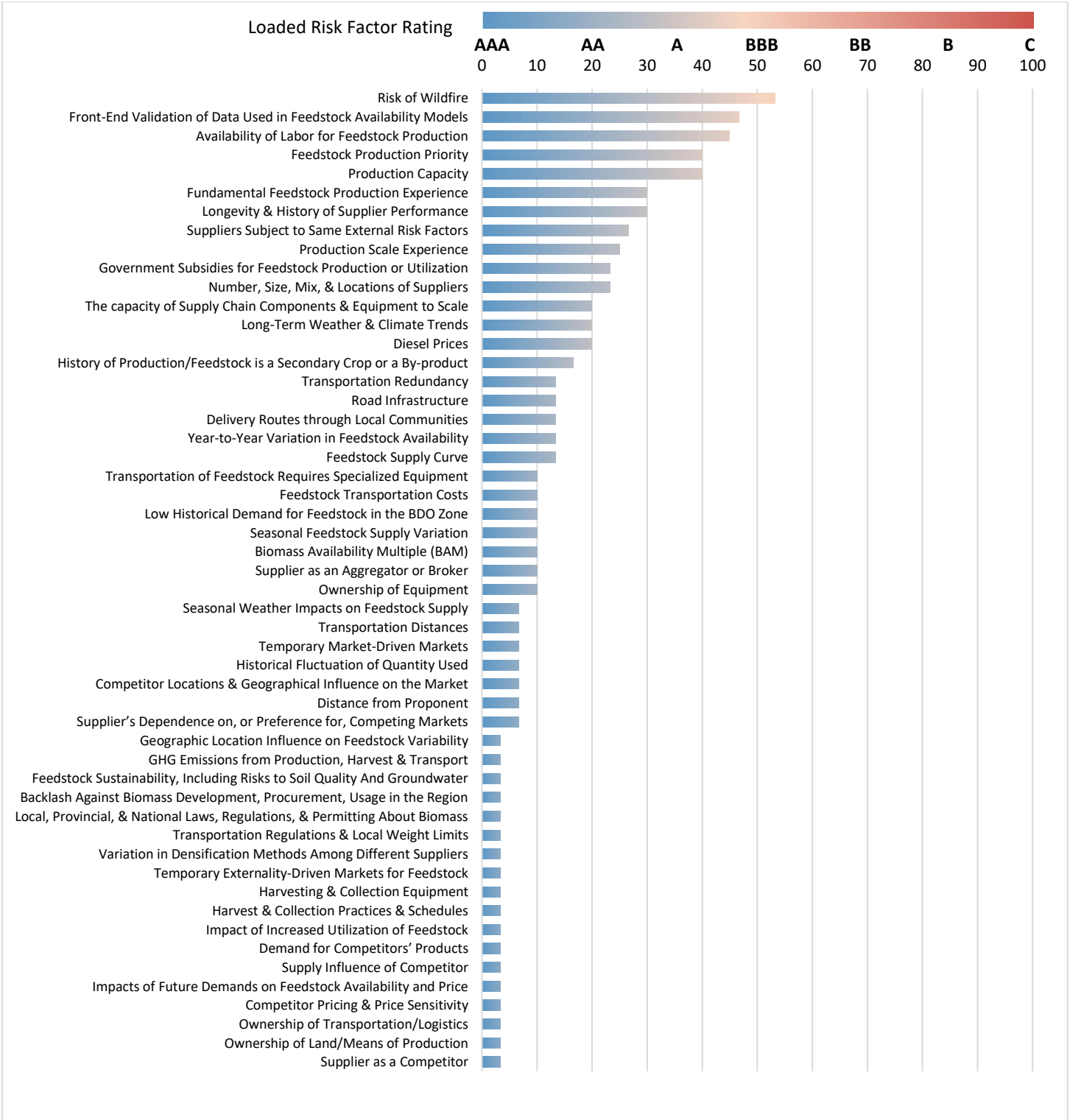


Table 1: Risk Indicators and Associated Scores

	Feedstock Supply Chain Risk Indicators	Raw RI Score	Notched Salience	Impact Level	Loaded RI Score
	Category 1: Supplier Risk				
1.1	Longevity & History of Supplier Performance	9	9.0	3.33	29.97
1.2	Production Capacity	8	4.0	9.99	39.96
1.3	Supplier's Dependence on, or Preference for, Competing Markets	1	1.0	6.66	6.66
1.4	Supplier as a Competitor	1	1.0	3.33	3.33
1.5	Ownership of Land / Means of Production	1	1.0	3.33	3.33
1.6	Ownership of Equipment	4	3.0	3.33	9.99
1.7	Ownership of Transportation/Logistics	1	1.0	3.33	3.33
1.8	Supplier as an Aggregator or Broker	3	3.0	3.33	9.99
1.9	Distance from Proponent	1	1.0	6.66	6.66
1.10	Fundamental Feedstock Production Experience	6	3.0	9.99	29.97
1.11	Production Scale Experience	5	2.5	9.99	24.98
1.12	Feedstock Production Priority	4	4.0	9.99	39.96
	Category 2: Competitor Risk				
2.1	Competitor Locations and Geographical Influence on the Market	1	1.0	6.66	6.66
2.2	Historical Fluctuation on Quantity Used	1	1.0	6.66	6.66
2.3	Competitor Pricing and Price Sensitivity	1	1.0	3.33	3.33
2.4	Impacts of Future Demand on Feedstock Availability and Price	1	1.0	3.33	3.33
2.5	Supply Influence of Competitor	1	1.0	3.33	3.33
2.6	Temporary Market-Driven Markets	2	2.0	3.33	6.66
2.7	Demand for Competitors' Products	1	1.0	3.33	3.33
	Category 3: Supply Chain Risk				
3.1	Biomass Availability Multiple (BAM)	1	1.0	9.99	9.99
3.2	Impact of Increased Utilization of Feedstock	1	1.0	3.33	3.33
3.3	Feedstock Supply Curve	2	2.0	6.66	13.32
3.4	Seasonal Feedstock Supply Variation	3	1.5	6.66	9.99
3.5	Year-to-Year Variation in Feedstock Availability	2	2.0	6.66	13.32
3.6	Front-End Validation of Data used in Feedstock Availability Models	7	7.0	6.66	46.62
3.7	Low Historical Demand for Feedstock in the BDO Zone	6	3.0	3.33	9.99
3.8	History of Production/Feedstock in a New/Secondary Crop or a By-Product	5	2.5	6.66	16.65
3.9	Diesel Prices	6	6.0	3.33	19.98
3.10	Harvest & Collection Practices & Schedules	1	1.0	3.33	3.33
3.11	Harvesting and Collection Equipment	1	1.0	3.33	3.33
3.12	Temporary Externality-Driven Markets for Feedstock	1	1.0	3.33	3.33
3.13	Variation in Densification among Different Suppliers	1	1.0	3.33	3.33
3.14	Availability of Labor for Feedstock Production	9	4.5	9.99	44.96
3.15	Feedstock Transportation Costs	3	3.0	3.33	9.99
3.16	Transportation Distances	1	1.0	6.66	6.66
3.17	Transportation of Feedstock Requires Specialized Equipment	6	3.0	3.33	9.99
3.18	Delivery through Local Communities	2	2.0	6.66	13.32
3.19	Transportation Regulations & Local Weight Limits	1	1.0	3.33	3.33
3.20	Road Infrastructure	4	4.0	3.33	13.32
3.21	Transportation Redundancy	8	4.0	3.33	13.32
3.22	Number, Size, Mix, and Locations of Suppliers	7	3.5	6.66	23.31
3.23	Suppliers Subject to Same External Risk Factors	4	4.0	6.66	26.64
3.24	Seasonal Weather Impacts on Feedstock Supply	4	2.0	3.33	6.66
3.25	Long-Term Weather and Climate Trends	4	3.0	6.66	19.98
3.26	Government Subsidies for Feedstock Production or Utilization	7	3.5	6.66	23.31
3.27	Local, Provincial, and National Laws, Regulations, and Permitting pertaining to Biomass	1	1.0	3.33	3.33
3.28	Backlash against Biomass Development, Procurement or Usage in the Region	1	1.0	3.33	3.33
3.29	Feedstock Sustainability, including risks to soil quality and surface and groundwaters.	1	1.0	3.33	3.33
3.30	GHG Emissions from Production, Harvest & Transport	1	1.0	3.33	3.33
3.31	Geographic Location Influence on Feedstock Variability	1	1.0	3.33	3.33
3.32	Capacity of Supply Chain Components and Equipment to Scale	4	2.0	9.99	19.98
3.33	Risk of Wildfire	8	8.0	6.66	53.28
				Average	**13.51**

Table 2: Infrastructure Asset Indicators

Infrastructure Assets	Overview	Score
Category 1: Physical Infrastructure		
1.1 Land Parcel	Summit County, UT has a land area of 1,882 sq miles (4,870 km^2).	1
1.2 Industrial Land Use Zone	There are two industrial sites in Summit County - (1) Site adjacent to N Henefer Landfill Rd is 614 acres (0.96 sq miles); (2) Site adjacent to W Three Mile Canyon Rd is 2080 acres (3.25 sq mi).	1
1.3 Natural Gas Line	Natural Gas service is provided by Dominion Energy and Hildale in the region.	2
1.4 Electrical	Electrical energy in currently provided by Rocky Mountain Power. Summit County has signed a Power Purchase Agreement with Enyo Renewable Energy Project, a solar farm in Tooele County, to purchase 5.8 MW after the completion of the project in 2022. The County aims to achieve Net 100% Renewable Electrical Energy for Summit County Government operations by 2032.	2
1.5 Fresh Water Supply Line	Gorgoza Mutual Water Co., High Valley Water Co., Summit Water Distribution Co., Mountain Regional Water Co., Jordanelle Special Services and Town of Hideout are some of the utility companies providing water service in the region.	2
1.6 Sewage Disposal	The East Canyon and Silver Creek Water Reclamation facilities function with the Snyderville Basin Water Reclamation District, and they provide state-of-art wastewater collection and reclamation services to the greater Park City area and unincorporated Summit County within the Snyderville Basin. In Eastern Summit County - Henefer, Francis, and Kamas treat the sanitary waste using sewer lagoons; Oakley with membrane bioreactor plant; Coalville with a mechanical plant; and the unincorporated Summit County with septic systems combined with drain fields.	2
1.7 Drainage	The majority of Summit County has swales and ditches, however, the storm water from Snyderville Basin, Kimball Junction area, Silver Springs, Kamas Valley, and Uinta Mountains flow into the creeks and then join the rivers.	2
1.8 Stormwater Management	Summit County has been allocated a separate Municipal Storm Sewer System by the Utah Department of Environmental Quality. The county has a Storm Water Management Plan with six control measures aimed at reducing harmful impacts associated with storm water run-off, to preserve the water quality.	2
1.9 Available ICT (Information & Communication Technology) Services	Cable and Internet are provided by Xfinity, Centurylink, Direct TV, Dish, AT&T, The Cable Experts, Blue Stake, and All Command- Market Place.	2
1.10 Landfill / waste disposal	The Three Mile Canyon Landfill is a Solid Waste Landfill that collects garbage, and is regulated by the Summit County Solid Waste Division and the Utah State Division of Solid and Hazardous Waste. The Henefer Landfill is a Construction and Demolition Landfill that collect debris generated during construction, renovation, and demolition of buildings. The County carries out single-stream recycling at the Rocky Mountain Recycling facility.	1
Category 2: Logistics		
2.1 Highway Access and Intersection	Summit County has highway access to Interstate 80, Interstate 84, US Route 40, US Route 189, Utah State Route 32, Utah State Route 150, Utah State Route 224, and Utah State Route 248. However, roads must be paved by the industries to connect the two industrial sites to the N Henefer Landfill Rd and W Three Mile Canyon Rd respectively. The driving distance from neighboring cities to the industrial site in W Three Mile Canyon Rd are as follows - 33 miles from Canyon Rim; 36 miles from East Millcreek; 39 miles from Murray; 40 miles from Salt Lake City; 50 miles from Bountiful; 53 miles from Centerville and 55 miles from Farmington.	4
2.2 Ocean / River Access	The distance from the industrial site in W Three Mile Canyon Rd to the nearest port in Salt Lake City is 45 miles. It is a dry port that is served by shipping lines - CMA CGM, Hapag-Lloyd, Maersk, MATSON and OOCL. Others major ports such as Port of Los Angeles is 716 miles; and Port of San Francisco is 776 miles away.	4

2.3 Accessibility to Airport	The distance from the industrial site in W Three Mile Canyon Rd to the closest airports are as follows - 45 miles from Salt Lake City International Airport; 50 miles from Skypark Airport, Bountiful; 53 miles from Evanston-Uinta County Burns Field; 55 miles from Hill Air Force Base, Ogden; 56 miles from Ogden-Hinckley Airport; 58 miles from Provo Municipal Airport and 154 miles from Vernal Regional Airport.	3
2.4 Railway Service	The industrial site in W Three Mile Canyon Rd is strategically located in terms of railway access. It is approximately 40 miles from Salt Lake Central station and 59 miles from Ogden, both of which have commercial access maintained by Union Pacific (with Class 1 through rates access via BNSF), strengthening the connectivity for commerce. The site is also 53 miles from Provo, 54 miles from the Orem station, 57 miles from American Fork, and a further 121 miles from Helper. This proximity to multiple railway stations offers diverse options for transport and logistics needs.	4
2.5 Logistics – Construction	Summit County has 6.9% of its population working in the Construction sector accounting for up to 1450 people. The average between 2010 and 2021 was 1.5% growth. However, with the cost of building has increased due to the rising price of materials, labor and interest rates which have contributed to recent slowing. (USA Facts)	2
Category 3: Social Infrastructure		
3.1 Quality of Life	Summit County has a Livability score of 72/100, which is considered excellent. It ranks #5 in best counties to live in Utah. The Cost of Living in Summit County is 4.6% lower than the National average. However, the prices of food, housing and transportation are up by 2.5% in 2022 from the previous year.	2
3.2 Education	The educational attainment at high school level is 95.2% in Summit County, similar to Utah with 93%, and higher than the US with 88.5%. Also, 56.1% of the residents have a Bachelors or a higher degree, compared to 34.7% in Utah and 32.9% in the US. There are 23 public schools in Summit County covering three school districts - North Summit School District, Park City School District and South Summit School District. Universities and Colleges near Summit County are as follows- The Utah Valley University, Wasatch is 74 miles; University of Utah is 82 miles; Weber State University is 85 miles; Westminster College is 115 miles; Mountainland Technical College is 106 miles; Rocky Mountain University is 107 miles; Brigham Young University is 104 miles; and Southern Utah University is 312 miles from Summit County.	2
3.3 Local Retail	Summit County has multiple big box stores, retail outlets, food chains, convenience stores, restaurants, local groceries etc.	2
3.4 Culture and Recreation	The community offers many facilities - Cultural venues, Community Parks, Swimming Pools, Playgrounds, Golf courses, Outdoor youth activities, Sportsplex, Winter sports, Ski resorts etc.	2
3.5 Hospital and Doctors	Summit County ranks #1 of 24 as the healthiest counties in Utah. There are multiple hospitals and health centers with good number of doctors serving the region. The patient to primary care physician ratio in Summit County is 777 to 1.	1
3.6 Housing Availability	According to the United States Census Bureau, there are 26,073 housing units as of 2022, out of which 51% are occupied and 19% are vacant; compared to the vacancy rate of 10% in Utah and 12% in the US. The median value of a housing unit is $ 734,900, and the median gross rent is $ 1,634. The homeownership rate in Summit County is 78.1%, which is higher than the national average of 64.4%.	1
3.7 Crime Rate	Summit County's violent crime is 10.9/100, and property crime is 27.4/100; lesser than the US average of 22.7 and 35.4 respectively.	2
Category 4: Workforce		
4.1 Labor Rates	The federal minimum wage for 2022 is $7.25 per hour in Utah. According to the United States Census Bureau 2021, the median household income is $ 116,351 and the per capita income is $ 60,768. The hourly rates vary but are majorly between $15.43 to $34.82 based on the profession.	2

4.2 Employment Rates	The current employment rate as indicated by the Summit County Economic Development Office is 2.2 %, indicating a tight labor market.	4
4.3 Available Skilled Labor	There are no specific unskilled and skilled labor statistics for the forest products sector. According to the Summit County Economic Development Office, much of the area workforce is more educated than the jobs on offer – skilled labor specifically is a challenge, although targeted workforce recruitment and partnering with local Colleges and technical institutions would help mitigate. As per the Summit Company Economic Development Department Legacy Industry Snapshot, Q1 July 2023, as of 2023, the wood product manufacturing sector within Summit County, covering all wood primary and secondary manufacturing, employed 66 individuals overall, growing from 28 in 2001, although this is below the national average. A majority of those would be skilled labor. The Forestry and Logging subsector specifically experienced a significant decline of 64.3%, as these primary industry activities reduced. Parties that have relocated would be interested in returning to the area if there was market demand. Looking ahead to 2033, the forest manufacturing sector as a whole is projected to show modest growth of 28%, although less than the overall manufacturing average.	4
4.4 Available Unskilled Labor	There are no specific forest sector unskilled labor stats. Given that there are likely similar changes with unskilled labor as described above, there is some risk to attracting a workforce. However, as with above, targeted employment recruitment programs and partnerships with local colleges and technical institutes could satisfactorily mitigate the challenge.	4
4.5 Workforce Size	According to the United States Census Bureau 2020, Summit County has a total employment of 28,492. The median age in the region is 40, and almost 61.9% of the population is between the age of 18 to 64. Young people typically exhibit interest in environmentally related employment. Summit County's wood product manufacturing jobs currently employs 66 individuals. The industry growth rate is forecasted to rise by 28% from 2023 to 2033, which is lower than the projected 33% growth for Summit County's total manufacturing jobs.	3
	Total	**2.33**



Summit County, UT BDO Zone Independent Review Committee (IRC)

Jess Kirby – Summit County
Bergen Eskilden – Utah Department of Natural Resources
Julie Kies – US Forest Service
Dano Jauregui – US Forest Service
Jeff Jones – Summit County
Cannice Harte – Summit County
Peter Howard – North Zone Silviculture Forest Service
Weston Mcphie – USFS Representative – Timber Sale Administration

APPENDIX A: BIOMASS AVAILABILITY AND PRICING

Here, we establish the parameters for the BDO Zone, which includes the available feedstock quantity and pricing for a potential new bio-project. The feedstock quantity is evaluated based on the Biomass Availability Multiple (BAM), which takes into account the redundancy required for a low-risk supply chain. The pricing reflects the anticipated price for a new bio-project, assuming additional demand equal to the rated feedstock quantity. It is important to note that the pricing does not necessarily reflect the current market price, but rather the expected price available for a new bio-project. However, there is typically a small difference between the current market pricing for feedstock and the anticipated pricing.

Note on units: all quantity units are standardized to bone dry short tons per year (bdt/yr). All price units are standardized to 2023 US dollar per bone dry ton ($/bdt) and can be expressed either as a *delivered or FOB[1] point of production value*.

SAWMILL RESIDUALS

Based on our analysis, we have determined that Sawmill Residuals in the BDO Zone are a high-risk source of feedstock for potential projects. The limited availability of sawmill residuals, as evidenced by the identification of only five relatively small sawmills in the area (Map D-2), along with the high cost of procurement, with sawdust and shavings priced at approximately $130/bdt delivered and wood chips priced at approximately $122/bdt delivered, presents a significant challenge for any new project looking to source this feedstock.

Moreover, over 90% of the available sawmill residual is generated by one sawmill, which currently has all material contracted out. Relying on one supplier for over 90% of feedstock greatly increases the supply risk. Given these factors, we consider sawmill residuals to be a high-risk source of feedstock and, as such, do not include it in our assessment of potential feedstock sources for projects in the BDO Zone.

PULPWOOD

The net growth of pulpwood, which refers to trees with a diameter at breast height (DBH) between 5 and 10.9 inches, is 84,617 bdt/yr (as shown in Figure D-1 in Appendix D). Out of this total, 40,235 bdt/yr is on public lands, while 44,382 bdt/yr is on private lands. On average, 14,475 bdt/yr of pulpwood is removed each year, with 13,601 bdt/yr coming from public lands and 873 bdt/yr from private lands. As a result, there is a surplus of 70,142 bdt/yr of pulpwood after subtracting removals from growth. To account for potential disturbances and sustainability concerns, we assume that 20% of the annual surplus should remain in the forest, resulting in a growth-to-drain ratio of 1.2[2]. Therefore, there are potentially 56,114 bdt/yr of Pulpwood available for a new bio-project. Dominant pulpwood tree types are Aspen (hardwood), Spruce and Lodgepole Pine (softwoods).

There is little demand for pulpwood in the BDO Zone and therefore, a pricing index is not available. Local experts indicated that pulpwood can usually be purchased for $50 - $75/bdt delivered. Therefore, **the pulpwood parameter is 55,000 bdt/yr at $50 - $75/bdt delivered.**

[1] Freight On Board. Indicates pricing at the point of production, including the cost to load feedstock on a truck.
[2] Note that this is a conservative assumption. In fact, forests in the BDO Zone are overgrown and, at least over the next 10-year period, the growth-to-drain ratio can be negative and still provide for sustainability of the forestland.

Forest Residue

We estimate that harvesting operations generate approximately 34,202 bdt/yr of forest residue[3]. The Bioenergy KDF model already considers various constraints and capture rate assumptions, indicating that all 34,202 bdt/yr should be available for use. However, to add an extra layer of risk mitigation, we have applied an additional redundancy factor of 50%[4] (1.5x Biomass Availability Multiple), resulting in 25,651 bdt/yr of forest residue from harvesting operations that is potentially available at low risk. Furthermore, we have estimated that Utah's Wildland-Urban Interface (WUI)[5] fuel reduction program generates around 27,625 bdt/yr of forest residue. Although theoretically all of this material is ready for use in new markets, we have applied an additional risk-mitigating factor of 20% redundancy (1.2x BAM) to account for any unforeseen risk. Consequently, the potential low-risk availability of forest residue from fuel reduction programs is 22,100 bdt/yr. Taking both sources of forest residue into account, we estimate that there is a total of 47,751 bdt/yr potentially available at low risk.

Forest residue has to be skidded to a roadside, where it can be processed through chipping or grinding, loaded, and delivered. Taking all these factors into account, we estimate that the cost of forest residue is around $50-$55/bdt including delivery. Thus, we set **the parameter for forest residue at 45,000 bdt per year at a cost of $50-$55/bdt delivered.**

[3] Source: https://bioenergykdf.net/2016-billion-ton-report. We assume moisture content of 50

[4] This additional redundancy factor accounts for potential challenges in moving chip vans on current forest roads (chip vans require double the turn radius of log trucks).

[5] The Wildland-Urban Interface (WUI) is commonly described as the zone where structures and other human development meet and intermingle with undeveloped wildland or vegetative fuels. Source: https://ffsl.utah.gov/fire/wildfire-community-preparedness/

APPENDIX B: 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: Within the framework of this report, loggers are feedstock suppliers. Since the sawmilling industry is relatively small, there is a limited logging capacity in the region. In fact, forest fuel treatment programs contract out logging to out of state companies. Additionally, we could not find historical data on logging capacity in the region. Raw RI Score is 9 out of 10.	**Score 9**
Notched Salience: No adjustment.	**Score 9.0**
Impact Level: In the context or relatively low forest biomass quantities this BDO Zone is rated for, the longevity and history of supplier performance has low impact on the overall risk profile of the supply chain. RI Impact level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 29.97 out of 100.	**Score 29.97**

1.2. Production Capacity

Rationale: Supplier production capacity can be a strong indicator of long-term credit worthiness and future solvency. Higher production capacities denote strength of operational elements, including cash flows, which are important to future solvency.	
Raw RI Score: Although the current logging capacity adequately supports the supply of roundwood to sawmills, the local logging capacity for conducting forest fuel treatments is insufficient. Consequently, external crews from states such as Oregon and Washington need to be brought in. As a result, the existing logging capacity is unable to meet an additional demand of 55,000 bdt/yr of pulpwood. Compounding this issue is the aging logging workforce, which makes it challenging for local logging businesses to attract new workers. Hence, any attempt to scale up the logging workforce presents a significant risk to the overall supply chain. The extraction of forest residue entails a redesign of the current harvesting operations system, which can likely be achieved with the existing logging workforce. Consequently, the expected modifications in logging operations are projected to necessitate only minimal additional logging capacity. Nevertheless, it is important to acknowledge that risks persist regarding logger production capacity, considering the current practice of bringing in crews from other states. Raw RI Score is 8 out of 10.	**Score 8**

Notched Salience: In the long-term, a bio-project can mitigate risks related to the logging workforce through vertical integration: it can provide for a steady employment and run its own crews in the forest. If such mitigation measure is implemented, the Raw RI Score would be notched down by 50%. Notched Salience is 4.0 out of 10.	**Score 4.0**
Impact Level: A shortage of logger production capacity could significantly impact the proponent's ability to acquire feedstock. 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**

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

Rationale: Suppliers 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. Consequently, 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: Current competition for biomass feedstock is limited or lacking all together. Insignificant amounts of forest residues are offered to local residents for personal firewood supply. We identified no current businesses that source forest residues on an industrial scale. Risk posed by competing markets or suppliers' dependence is deemed low. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
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**

1.4. 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: Suppliers do not act as potential competitors for forest residues and pulpwood. A market outlet to utilize these viable feedstocks is highly desired. Risks related to suppliers acting as competitors is low. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
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**

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: Although sawmills and fiber producers/harvesters typically do not own the land they harvest, we do not view this as posing a risk to the availability of forest residues. Harvesting records indicate that timber in this area is available for harvest on a continual basis year-to-year. There is currently a significant effort underway to reduce the fuel loads caused by beetle-killed trees in the BDO Zone. The extraction of wood from these areas is limited primarily by cost and the availability of crews to perform the work. Since the vast majority of the wood is under Forest Service management, we anticipate that its availability will continue for the foreseeable future. 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.	**Score 1.0**
Impact Level: RI Impact level is *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 contractor cannot schedule harvest times that are convenient and quantity shortages can result.	
Raw RI Score: 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. Forest residues have not been a traditional commodity in the BDO Zone and therefore may require some equipment purchases and modifications. Chippers/grinders and transportation equipment (live bottom trailers, chip vans) would likely be the two pieces of equipment most sought after. The costs of any new equipment can be expected to be passed onto those sourcing the feedstocks. Raw RI Score is 4 out of 10.	**Score 4**
Notched Salience: Although the potential lack of equipment is not considered a significant risk, it can be further mitigated by purchasing of equipment by a bio-project. Raw RI Score is notched down by 25%. Notched Salience is 3.0.	**Score 3.0**
Impact Level: The impact of equipment's ownership structure is low. Risks around the general availability of equipment are discussed in RI 3.11. 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**

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: Loggers typically own or lease the transport equipment they use. Risk associated with transportation/logistics are deemed low. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: The impact of transport equipment's ownership structure is low. 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**

1.8. Supplier as an Aggregator

Rationale: Aggregators may effectively provide supply chain redundancy, eliminating 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 having access to multiple suppliers. Further, when a single supplier breaches, the aggregator can source from another.	
Raw RI Score: We are not aware of any aggregators or fiber brokers operating in the BDO Zone. Instead, loggers and other fiber producers directly deal with markets. Nevertheless, we consider direct supply to be inherently dependable, thanks to a robust group of producers who can provide adequate redundancy in case of any individual supplier failure. Raw RI score is 3 out of 10.	**Score 3**
Notched Salience: No adjustment.	**Score 3.0**
Impact Level: We believe that the impact of the absence of aggregators in the market is limited, mainly because a project only requires a limited number of suppliers to collect the 100,000 bdt per year of fiber that this BDO Zone is rated for. 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**

1.9. Distance from Proponent

Rationale: The greater the distance from a supplier to a plant, the more exposure to weather and fuel cost risks and the greater the competitive pressure (to breach) that a closer competitor can exert.	
Raw RI Score: The BDO Zone is rated for a distance of up to 45 miles, with an average trucking distance of around 30 miles. This is shorter than the average trucking distance in other regions of the country, which is closer to 50 miles. Therefore, we do not consider the distance to feedstock sources to be a significant risk. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: Distance is a moderately important factor in biomass supply chains. 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**

1.10. 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, the Proponent should show that steps have been taken to ensure proper training, knowledge dissemination, and monitoring.	
Raw RI Score: Currently, the practice in the BDO Zone is to either pile and burn or scatter forest residues, while pulpwood is typically converted to firewood or occasionally incorporated into sawmill feedstock. Forest residues are a by-product of roundwood timber production and fuel management programs. Local loggers have experience piling slash, but there may be a learning curve associated with processing these piles. A change of practice would be required to load and transport forest residues instead of piling and burning them, introducing some risk. Additionally, workers may need additional training on chipping equipment if this is the desired form of delivered feedstock. However, given the BDO Zone's relatively low requirement of 55,000 bdt per year of forest residue, the experience necessary to produce this quantity is limited to a small number of loggers who would need to adjust their operations. Raw RI Score is 6 out of 10.	**Score 6**
Notched Salience: The risk related to feedstock production is considered short-term. In the long-term, training for workers could be enacted to reduce this risk. Raw RI is notched down by 50%. Notched Score is 3 out of 10.	**Score 3.0**
Impact Level: Historically, forest residues have not been utilized in the BDO Zone, and the demand for pulpwood has been low. The impact of these factors can be significant. 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 29.97**

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: The current lack of biomass collection and market demand, along with the absence of a traditional business channel in the BDO Zone, are significant challenges. However, if a proponent facility were to impose demand, the current practice of piling and burning forest residues would shift to aggregating and loading. The capacity to load and transport pulpwood already exists, although it may need to expand. In terms of forest residue, if delivered prices are deemed worthwhile to loggers, we anticipate that this group will adopt the necessary operating procedures. Also, given the BDO Zone's relatively low requirement of 55,000 bdt per year of forest residue, the experience necessary to produce this quantity is limited to a small number of loggers who would need to adjust their operations to scale up. Raw RI Score is 5 out of 10.	**Score 5**
Notched Salience: The risk related to feedstock production is considered short-term. In the long-term, we believe the supply chain would scale up, either through growth of existing logging businesses, or through a new project's vertical integration. Raw RI is notched down by 50%. Notched Score is 2.5 out of 10.	**Score 2.5**
Impact Level: Historically, forest residues have not been utilized in the BDO Zone, and the demand for pulpwood has been low. The impact of these factors can be significant. 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**

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 for consistent production. Risk of breach increases when production and/or delivery of feedstock compromises a supplier's ability to make a primary product.	
Raw RI Score: Currently, most of available roundwood, including pulpwood, is in the form of standing dead trees, which are ready for removal. Thus, there is no risk associated with giving pulpwood production priority. However, whether or not to prioritize forest residue production is a separate matter. After harvesting, forest residue is typically scattered or piled up on the forest floor and can be a nuisance for loggers to change their operations to collect it at the roadside. Overall, we believe that there is some risk associated with prioritizing forest residue production. It is worth noting that the price parameter for this BDO Zone reflects the pricing needed to motivate loggers to collect and process forest residue. Raw RI Score is 4 out of 10.	**Score 4**
Notched Salience: No adjustment.	**Score 4.0**
Impact Level: When it comes to forest residue, the potential lack of motivation to collect and process the material can have a significant impact. Furthermore, there is some uncertainty in our assessment of the pricing needed to motivate loggers to collect and process forest residue. 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**

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: No major competitors were found for forest residues or pulpwood in the Summit County BDO Zone. There is one pellet mill co-located with a sawmill. It produces 13,000 tons of pellets annually, consuming approximately 14,000 bdt/yr of sawmill residual. Most, and perhaps all, of the feedstock comes from the sawmill's internal operations. The remainder of sawmill residual generated in the BDO Zone is utilized by the mulch and animal bedding markets.[6] We find low risk associated with feedstock competition. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: Although we are certain of our competitive assessment, in case there is a large competitor that we did not identify, the impact to the BDO Zone would be significant. 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**

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 insights into events impacting 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: There are no major competitors for forest residues and pulpwood feedstocks in the BDO Zone. To our knowledge, no large markets for forest residue or pulpwood existed in the past. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**

[6] Hayes, Steven W.; Bingaman, Cory A.; Morgan, Todd A.; Simmons, Eric A.; Marcille, Kate C.; Shaw, John D. 2021. The Four Corners timber harvest and forest products industry, 2016. Resource Bulletin RMRS-RB-34. Fort Collins, CO.

Impact Level: There is some uncertainty related to this RI, as historical data for pulpwood use were not available. 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**

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 insights 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: No large competitors exist in the BDO zone. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
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**

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: We did not identify any proposed facilities planning to consume pulpwood or forest residue. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: We are certain in our assessment of the lack of proposed competition in the region. 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**

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: No current competitors for forest residuals or pulpwood have been identified. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
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**

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: The local firewood market is the only alternative, non-traditional market identified in the BDO Zone. The firewood market can have a limited seasonal impact on the supply of pulpwood. According to one account[7], between 700 – 800 loads per year (11,200 – 12,800 bdt/yr [8]) are designated for firewood from the Uinta-Wasatch-Cache National Forest. However, all this material comes from the dead stands and is therefore already accounted for in our estimates. Moreover, due to safety concerns, residents and businesses are not allowed to take material from the residue piles, and therefore the firewood market does not have an impact on the availability of forest residues. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
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**

2.7. Demand for Competitors' Products

Rationale: Increased demand for competitors' products 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: No current competitors (therefore product output) for forest residues or pulpwood were identified in the Summit County BDO Zone. We do not see a material short- or long-term threat from traditional producers with a rise in demand for competitors' products.	**Score 1**

[7] Forester, US Forest Service, personal communications.
[8] Assumes 16 bdt per load.

Raw RI Score is 1 out of 10.

Notched Salience: No adjustment.	**Score 1.0**
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**

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 requirement. BAM is a strong indicator of supply chain resilience when stressed by a supply shortage and/or supplier breach.	
Raw RI Score: The net growth of pulpwood, which refers to trees with a diameter at breast height (DBH) between 5 and 10.9 inches, is 84,617 bdt/yr (as shown in Figure D-1 in Appendix D). Out of this total, 40,235 bdt/yr is on public lands, while 44,382 bdt/yr is on private lands. On average, 14,475 bdt/yr of pulpwood is removed each year, with 13,601 bdt/yr coming from public lands and 873 bdt/yr from private lands. As a result, there is a surplus of 70,142 bdt/yr of pulpwood after subtracting removals from growth. To account for potential disturbances and sustainability concerns, we assume that 20% of the annual surplus should remain in the forest, resulting in a growth-to-drain ratio of 1.2. Therefore, there are potentially 56,114 bdt/yr of pulpwood available for a new bio-project at a Biomass Availability Multiple (BAM) of 1.2x. We estimate that harvesting operations generate approximately 34,202 bone dry tons per year (bdt/yr) of forest residue[9]. The Bioenergy KDF model already considers various constraints and capture rate assumptions, indicating that all 34,202 bdt/yr should be available for use. However, to add an extra layer of risk mitigation, we have applied an additional redundancy factor of 50% (1.5x Biomass Availability Multiple), resulting in 25,651 bdt/yr of forest residue from harvesting operations that is potentially available at low risk. Furthermore, we have estimated that Utah's WUI fuel reduction program generates around 27,625 bdt/yr of forest residue. Although theoretically all of this material is ready for use in new markets, we have applied an additional risk-mitigating factor of 20% redundancy (1.2x BAM) to account for any unforeseen risk. Consequently, the potential low-risk availability of forest residue from fuel reduction programs is 22,100 bdt/yr. Taking both sources of forest residue into account, we estimate that there is a total of 47,751 bdt/yr potentially available at BAMs of 1.5x and 1.2 for harvest residue and fuel reduction residue, respectively. These BAMs have been already accounted for in the quantity parameters. In other words, by definition BAMs minimize the risk of insufficient redundancy.	**Score 1**

[9] Source: https://bioenergykdf.net/2016-billion-ton-report. We assume moisture content of 50%.

Raw RI Score is 1 out of 10.

Notched Salience: No adjustment.	**Score 1.0**
Impact Level: While we have taken steps to mitigate uncertainties in our feedstock availability estimates by applying reasonable redundancy assumptions, it is important to note that a significant error on our part could have a considerable impact on this assessment. 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**

3.2. Impact of Increased Utilization of Feedstock

Rationale: Feedstock utilization can change over time owing to expansion of existing facilities. Increased utilization can lead to higher prices, feedstock disruptions, shortages, or supplier breach.	
Raw RI Score: No large consumers of pulpwood or forest residue exist in the market. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
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**

3.3. 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: A supply curve for pulpwood is provided in Figure D-1 in Appendix D. The supply curve is based on the US Forest Service's net growth statistic, which represents the amount of biomass within a certain age class that is added to forest land each year. Net growth can be considered potential annual availability. According to the supply curve, very little pulpwood is available within the first 15 miles of Wanship. However, availability increases significantly at the 20-mile distance threshold, to around 29,000 bdt per year. Within 25 miles, there is approximately 46,000 bdt per year potentially available, and within 30 miles, almost 58,000 bdt per year. Finally, within the 40-mile threshold, the net growth increases to 79,000 bdt per year, and within the 45-mile distance, there is 84,600 bdt per year potentially available. It is worth noting that beyond the 45-mile distance, the supply curve begins to decline. This means that pulpwood net growth is negative outside the 45-mile radius of Wanship. This negative growth is due to the fact that most of the standing trees outside the 45-mile drive distance are dead and therefore growth does not occur.	**Score 2**

We were unable to create a supply curve for forest residue, as around half of the forest residue (and the more accessible half) comes from the fuels reduction program, and we did not have access to precise location data indicating fuel treatments. However, based on Figure D-2 in Appendix D, which shows the distances of standing pulpwood to Wanship, we anticipate that fuel reduction occurs in a similar pattern to roundwood distribution. This is because fuel reduction activities take place in forests surrounding the urban areas in Summit County. Raw RI Score is 2 out of 10.	
Notched Salience: No adjustment.	**Score 2.0**
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**

3.4. Seasonal Feedstock Supply Variation

Rationale: Biomass supply can present significant seasonal supply variations; combined with limitations associated with longer-distance transportation and storage, can lead to regional biomass supply imbalances and manifest in shortages and higher costs for Proponents.	
Raw RI Score: Utah's climate can cause temporary delays in timber delivery to sawmills during periods of heavy rainfall or significant snow events, which can make it difficult for fiber producers to remove trees from timberland and clear roads. These delays can lead to variations in pulpwood and forest residue production. However, these delays (and resulting feedstock generation variations) typically last no more than a few weeks. Raw RI Score is 3 out of 10.	**Score 3**
Notched Salience: To mitigate the risk of feedstock shortages during periods of inclement weather, potential facilities could maintain moderate inventories (two to three weeks) of feedstock reserves on-site. With sufficient inventory, much of the risk associated with delays in feedstock production caused by weather could be mitigated. Raw RI Score is notched by down 50%. Notched Salience is 1.5.	**Score 1.5**
Impact Level: RI Impact level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 9.99 out of 100.	**Score 9.99**

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: Currently, pulpwood and forest residue feedstocks are considered stable. There is a growing focus on high-priority fuels reduction treatments on both public and private land ownerships in the BDO Zone. This suggests that additional volumes of these feedstocks will become available over the next 10-20 years.	**Score 2**

Raw RI Score is 2 out of 10.	
Notched Salience: No adjustment.	**Score 2.0**
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**

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: Our analysis of pulpwood and forest residue availability is based on data from two sources: the US Forest Service's Forest Inventory and Analysis (FIA) EVALIDATOR Tool and direct input from local experts, including the US Forest Service foresters. The FIA dataset is a widely used forest inventory dataset in the industry. However, the results from a simple FIA analysis do not incorporate various constraints that may be relevant to the supply chain. For example, some feedstock may be inaccessible due to topography or road access. We attempt to take these constraints into account through the redundancy (BAM) factor; however, this rough approach introduces a potentially significant degree of error. The availability of forest residue is estimated through the FIA as well as direct input from industry experts. In the case of forest residue resulting from fuel treatment programs, the data are not captured by the FIA tool, so we rely on industry expertise and qualitative information. Nonetheless, we believe that industry expertise is as valid as FIA models, and we have no reason to distrust the information provided. However, it is worth noting that the approach used in this assessment does not incorporate sophisticated pulpwood and forest residue modelling that may be available in other regions. Raw RI Score is 7 out of 10.	**Score 7**
Notched Salience: No adjustment.	**Score 7.0**
Impact Level: Given the BAMs (redundancy factors) incorporated into this analysis, the 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**

3.7. Low Historical Demand for Feedstock in the BDO Zone

Rationale: If the Proponent does not have a history of developing large-scale feedstock procurement, suppliers may not have sufficient expertise in feedstock production to ensure reliable supply, especially early on.	

Raw RI Score: Apart from the relatively small markets for firewood and mulch, the use of biomass is not currently practiced in the Summit County BDO Zone. Furthermore, feedstock collection practices are not currently in place. However, this risk is only relevant to forest residues. Pulpwood is harvested and transported in the same way as sawtimber; therefore, we do not anticipate pulpwood supply risks related to lack of prior demand. Raw RI Score is 6 out of 10.	**Score 6**
Notched Salience: The lack of prior demand for forest residue, and therefore the lack of expertise in its production, should be easily mitigated through proper training. Moreover, part of the supply chain for forest residue is already developed through the fuels treatment program, as the forest residue is piled up at a roadside and ready for processing. Raw RI is notched down by 50%. Notched Salience is 3.0.	**Score 3.0**
Impact Level: Due to the relatively low quantities of biomass this BDO Zone is rated for, 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**

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

Rationale: If the feedstock is a new/secondary crop or a by-product, suppliers may either lack sufficient experience to mitigate risk or be unable to react to such risk, and producers may be less likely to prioritize production. If the feedstock is a secondary crop, then production can be subject to variables beyond suppliers' control.	
Raw RI Score: Forest residues and pulpwood are by-products of sawtimber harvest and production as well as fuel treatment programs. We do not see risks for pulpwood production related to the history of production or feedstock being a secondary product. However, forest residue that is not part of the fuels reduction program (approximately 50% of all forest residue) is subject to this risk. Currently, post-harvest residues are left in the forest, and due to the historical lack of markets for this material, the supply chains are not organized around extracting it. In the short term, it is unlikely that loggers would change their operations to collect and process forest residue. Raw RI Score is 5 out of 10.	**Score 5**
Notched Salience: A proponent can mitigate this risk by building up an inventory with readily available forest residue and pulpwood. Additionally, a proponent can leverage its buying power of pulpwood to demand that loggers collect and supply forest residue. Raw RI Score is notched down by 50%. Notched salience is 2.5.	**Score 2.5**
Impact Level: This risk indicator only applies to post-harvest residue. In the long term, we believe that some loggers would process and supply post-harvest forest residue as well. RI Impact level is deemed *moderate*.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 16.65 out of 100.	**Score 16.65**

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: The cost of diesel is a significant component of the delivered cost of pulpwood and forest residue. Regional data from the US Energy Information Administration's Diesel database show that diesel prices are volatile, hard to predict, and have shown significant increases from 2020 prices. While we expect diesel prices to normalize, as the period of 2020-2022 was exceptionally volatile due to the COVID-19 pandemic, the historical volatility of diesel prices and their impact on the delivered cost of biomass poses a significant risk to the supply chain. Raw RI Score is 6 out of 10.	**Score 6**
Notched Salience: No adjustment.	**Score 6.0**
Impact Level: The BDO Zone is limited to a 45-mile distance, effectively limited the impact diesel prices have on transport costs. RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 19.98 out of 100.	**Score 19.98**

3.10. Harvest & Collection Practices & Schedules

Rationale: Differences in harvest timing and practices can create risks for both the quantity and quality of the 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: Harvesting, collection, and scheduling practices are firmly established in the supply chain. Foresters and fiber producers have developed procedures for forest management practices and timber harvests. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
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**

3.11. 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: Within the BDO Zone, biomass feedstocks are generated from the forest through a combination of hand-crews and professional loggers. As far as we know, the loggers in the region tend to use similar harvesting equipment. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: The impact on pulpwood or forest residue quality resulting from potential differences in harvesting equipment would be insignificant. 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**

3.12. 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 forest residues or pulpwood feedstocks were identified. Raw RI score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
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**

3.13. Variation in Densification Methods Among Different Suppliers

Rationale: The shape and density of the unit in which feedstock is supplied can impact feedstock cost and quality.	
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. Current practices for forest residues in the BDO Zone are piles measuring 8'X8'X8' or 10'X10'X10'. Additional chipping is likely needed before transporting. Pulpwood is stacked in traditional logging decks. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
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**

3.14. 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 Proponents for whom large feedstock requirements, or development of new (or expanded) supply chains, demand significant additions to the local labor force.	
Raw RI Score: Labor availability for feedstock acquisition (logging capacity) in Utah has been historically low with logging crews being imported from other states. Therefore, in the short-term, there is a real risk of a shortage of local logging labor. Raw RI Score is 9 out of 10.	**Score 9**
Notched Salience: In the long-term, a bio-project can mitigate risks related to the logging workforce through vertical integration: it can provide for a steady employment and run its own crews in the forest. If such mitigation measure is implemented, the Raw RI Score would be notched down by 50%. Notched Salience is 4.5 out of 10.	**Score 4.5**
Impact Level: A shortage of logger production capacity could significantly impact the proponent's ability to acquire feedstock. RI Impact Level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 44.95 out of 100.	**Score 44.95**

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 determined by fuel costs, distance, and labor costs. As shown in Figure D-3 in Appendix D, fuel costs have surged between 2020 and 2022 due to the COVID-19 pandemic and geopolitical factors. While fuel costs may remain higher than pre-pandemic levels, we anticipate that they will eventually stabilize. Nevertheless, we have factored in the increased fuel costs in our transportation cost assumptions. On average, we expect transportation costs to be $22.60 per bone-dry ton (bdt). This cost is already factored into the expected feedstock pricing for the BDO Zone. Raw RI Score is 3 out of 10.	**Score 3**
Notched Salience: No adjustment.	**Score 3.0**
Impact Level: Given that the BDO Zone is 45 miles in size, the average transport distance for feedstock should be around 30 miles. This relatively short distance means that fuel and labor costs will have a limited impact on the total feedstock cost. 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**

3.16. 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: With a size of 45 miles, the BDO Zone has an average transport distance of approximately 30 miles, which is relatively short compared to other biomass supply chains. Our analysis indicates that the Zone's biomass production can be sustainably supported by the resources produced within the area. Raw RI score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: Depending on the location of fuel reduction activities, some feedstocks may be located at distances greater than the average transport distance mentioned earlier. However, we do not anticipate this to significantly impact feedstock costs. 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**

3.17. 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: Transporting woody biomass within the BDO Zone does not necessarily require specialized equipment, as most of the feedstock is currently moved by professional loggers who own their own equipment. The BDO Zone already has established capacity for harvesting and transporting pulpwood. However, handling and transporting forest residues is not currently common practice and may require additional equipment, such as chippers and live bottom trailers. Raw RI score is 6 out of 10.	**Score 6**
Notched Salience: The proponent can mitigate the risk of equipment shortages by building up inventory to allow for gradual equipment scale-up. Additionally, longer-term contracts given to loggers would provide them with greater certainty and enable them to acquire the necessary equipment more easily. Raw RI is notched down by 50%. Notched Salience is 3.0.	**Score 3.0**
Impact Level: The impact of equipment shortages is limited by the fact that relatively little additional equipment will be required to process and deliver the rated 45,000 bdt/yr of forest residue from the BDO Zone. 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**

3.18. Delivery Routes through Local Communities

Rationale: Biomass transportation can become a nuisance to local communities, especially if large numbers of trucks pass 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: To feed a plant requiring 100,000 bdt/yr of woody biomass, approximately 22 deliveries per day are needed, or about 2 deliveries per hour[10]. Based on relatively little additional traffic, as well as anecdotal feedback from local experts, we do not anticipate any significant backlash from the local communities due to increased traffic. Raw RI score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: Although we do not anticipate any significant backlash from local communities due to increased traffic, if such backlash occurred, it could temporarily disturb the supply chain. 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**

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 Summit County 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.	**Score 1.0**
Impact Level: Even if there are changes to road weight limits, we do not expect it to have a significant impact on feedstock costs. 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**

3.20. 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.

[10] Assuming an average of 13 bdt per load and 350 operational days/year.

Raw RI Score: The road infrastructure in the BDO Zone is generally good, although some roads may be aged and in need of regular maintenance. The roads have a proven track record of supporting the needs of the vibrant forest products and forest management network of activities in the area. However, there is some risk associated with the expansive and variable nature of forest service roads, as some may be difficult for large trucks to navigate and may be more susceptible to adverse weather conditions. For example, many logging roads may be impassable for chip vans.[11] Raw RI Score is 4 out of 10.	**Score 4**
Notched Salience: No adjustment.	**Score 4.0**
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**

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 Summit County BDO Zone, professional loggers operate and maintain their own transportation equipment. However, there is some uncertainty regarding the limited number of operators in the area. Raw RI Score is 8 out of 10.	**Score 8**
Notched Salience: In the long-term, a bio-project can mitigate risks related to the availability of transport equipment through vertical integration: it can own several trailers in case of transport equipment shortages. If such mitigation measure is implemented, the Raw RI Score would be notched down by 50%. Notched Salience is 4.0 out of 10.	**Score 4.0**
Impact Level: The impact of transportation redundancy risks is limited by the relatively small quantity of forest residue that the BDO Zone is rated to produce. For instance, to transport 45,000 bone-dry tons per year of forest residue, around 3,600 trips are required. Assuming that one truck can make two trips per day, only five trucks and trailers would be needed. 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**

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

[11] Source: Verbal communications with US Forest Service forester.

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: By administering the Uinta-Wasatch-Cache National Forest, the US Forest Service is the primary supplier of pulpwood and forest residues in the Summit County BDO Supply Zone, with significantly less feedstocks provided by state and private sources. Moreover, anecdotal evidence provided by stakeholders responsible for managing public lands in the BDO Zone indicates their eagerness to establish long-term contracts that would ensure a consistent supply to a proponent. In terms of the number of logging companies operating in the region, we were not able to find sufficient data to develop certainty around this risk indicator. It is likely, however, that the existing logging companies are relatively small due to the relatively low demand for timber products. Raw RI Score is 7 out of 10.	**Score 7**
Notched Salience: In the long-term, a bio-project can mitigate risks related to the logging capacity through vertical integration: it can provide for a steady employment and run its own crews in the forest. If such mitigation measure is implemented, the Raw RI Score would be notched down by 50%. Notched Salience is 3.5 out of 10.	**Score 3.5**
Impact Level: Due to the relatively low quantity this BDO Zone is rated for, the impact of risks related to the number, size, mix and locations of suppliers is limited. RI Impact Level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 23.31 out of 100.	**Score 23.31**

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 (loggers) in the Summit County BDO Zone are exposed to many of the same external risk factors, such as macroeconomic factors that affect the housing market. Downturns in the market can threaten sawmill viability and, as a result, impact the harvest of sawtimber, pulpwood, and forest residues. That being said, the sawmilling industry in the region is relatively small and diversified in terms of products manufactured. Therefore, any shifts in the housing market will have low-to-medium effect on the local sawmills. Moreover, we anticipate that the stability of the fuel reduction programs will provide a consistent supply of forest residues. Additionally, the establishment of a new market for biomass would change the economics of removing pulpwood and forest residue, effectively mitigating the risk associated with suppliers being exposed to the same external risk factors. Raw RI Score is 4 out of 10.	**Score 4**
Notched Salience: No adjustment.	**Score 4.0**

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 26.64**

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 may occur during periods of heavy rainfall or snow in the Summit County BDO Zone. When fiber producers are unable to clear trees from the timberland, or when dirt roads become impassable, these delays may cause variations in all sources of feedstock production. However, such delays and variations in feedstock generation typically do not last more than a few weeks. Additionally, there may be seasonal delays in forest residue and pulpwood generation, particularly during the spring when road conditions are more susceptible to adverse weather and thawing. Raw RI score is 4 out of 10.	**Score 4**
Notched Salience: The risk related to seasonal weather can be effectively mitigated through inventory build-up. Raw RI is notched down by 50%. Notched Salience is 1.0.	**Score 2.0**
Impact Level: Seasonal weather may have a negative impact on feedstock production, but typically only for a few weeks. 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**

3.25. 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: The increased frequency of warm weather and drought associated with climate change poses a risk to the biomass supply chain, particularly due to potential increases in wildfires. Although evidence suggests that climate change is happening, the extent to which it will affect the macroclimate in Summit County is a matter of debate. Nevertheless, future impacts due to climate change are inherently unpredictable and pose a degree of risk. Raw RI Score is 4 out of 10.	**Score 4**
Notched Salience: Establishing a market for biomass through a new bio-project would somewhat mitigate the risks related to wildfires caused by climate change by removing the fuel load from the forest. Raw RI is notched down by 25%. Notched Salience is 3.0.	**Score 3.0**
Impact Level: The impact of climate change on the BDO Zone is uncertain. However, any risks related to climate change are likely to occur over extended periods of time. 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**

3.26. Government Subsidies for Feedstock Production or Utilization

Rationale: Feedstock that is directly subsidized through government programs can pose greater long-term risks 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: Significant government subsidies, estimated at $14 million over the next ten years, are available for fuel reduction treatments on federal and state lands. Fuel treatment biomass is expected to comprise around 50% of the estimated forest residue. While we anticipate that the fuel treatment program will continue for at least the next five to ten years, if it is discontinued, forest residue resulting from the fuel treatment program may no longer be available. Notably, the average cost of biomass would increase as the fuel treatment wood is the least costly biomass available. Raw RI Score is 7 out of 10.	**Score 7**
Notched Salience: The case for preserving and potentially expanding the fuels reduction program beyond its existing 10-year timeframe will gain stronger support when a buyer for the material emerges in the market. There are two key factors that contribute to this argument. Firstly, the program has the potential to generate income through the sale of materials, thereby subsidizing its costs. This financial aspect enhances the feasibility and sustainability of the program. Secondly, showcasing the advantageous utilization of hazardous wood fuels is expected to garner political favorability among decision makers. This demonstrated beneficial use of such materials aligns with the current political climate, further supporting the rationale for maintaining and extending the program. Raw RI is notched down by 50%. Notched Salience is 3.5.	**Score 3.5**
Impact Level: As forest residue resulting from fuel reduction programs comprises approximately 50% of the estimated forest residue and is the least costly material, the impact of discontinuing the fuel reduction treatment program is considered moderate. Raw RI Impact level is deemed *moderate*.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 23.31 out of 100.	**Score 23.31**

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

Rationale: Feedstock production 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, a 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 Summit County BDO Zone forests.	**Score 1**

Raw RI Score is 1 out of 10.	
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: We identified no local or state laws or regulations that would prevent or restrict biomass removal from Summit County BDO Zone forests. 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**

3.28. 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 Summit County BDO Zone. Further, the wood products industry is viewed as key component of the Summit County community and provides jobs. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
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**

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

Rationale: Public concerns about the sustainability of feedstock production can jeopardize biomass feedstock operations. Sustainability certification schemes should be utilized where applicable to ensure that feedstock comes from sustainable sources. Soil sustainability can be defined as the 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 the 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 a social and regulatory backlash. Water intake issues can also increase risk.	
Raw RI Score: Biomass harvest in the Summit County BDO Zone is conducted in compliance with local regulations, which have robust sustainability protocols. In highly vulnerable watersheds, special care is taken to curb erosion and prevent excessive nutrient runoff. In fact, wildfires present the most pressing	**Score 1**

risk to soil and water quality. Therefore, as long as wildfires remain a significant risk, we anticipate that incentives for forest residue removal will continue to be significant.

Raw RI Score is 1 out of 10.

Notched Salience: No adjustment.	**Score 1.0**
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**

3.30. 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[12]; 2) all feedstocks must be transported 75 miles; 3) trucks can carry 22 tons per delivery; 4) facility intake requirement is 200,000 tons per year; and 5) 19.64 pounds of CO2 are emitted per gallon of fuel used[13], approximately 1,545 tons of CO2 would be emitted per year in feedstock transport. However, average CO2 carbon sequestration for pine trees is approximately 11 tons per acre of new tree growth[14], 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 Summit County 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. Moreover, wildfires generate significant amount of greenhouse gases. From this perspective, we anticipate incentives for forest fuel removal to remain in place. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**

[12] Arrow Truck: https://www.arrowtruck.com/blog/2016/06/21/manage-your-semi-trucks-fuel-use-with-these-tips/
[13] 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.
[14] GoTree Quotes: https://www.gotreequotes.com/how-much-co2-do-trees-absorb/.

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

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 Summit County BDO Zone does not impact feedstock variability. While there is topographic variation throughout the forests in the BDO 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.	**Score 1.0**
Impact Level: We do not anticipate any feedstock variation due to geographic variability. 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**

3.32. 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 potential suppliers to make significant capital investments. However, we note that 72% of forest management in the region is federal, and therefore capital resources should be adequate. Nonetheless, there is some risk introduced by the unknown willingness of current loggers to scale up equipment if necessary. Furthermore, the quantity of forest residue that the BDO Zone is rated to produce does not necessitate significant scale-up. Raw RI Score is 4 out of 10.	**Score 4**
Notched Salience: Long-term contracts and a stable market for biomass would incentivize loggers to scale-up. Raw RI is notched down by 50%. Notched Salience is 2.0.	**Score 2.0**
Impact Level: Since there is a lack of markets for forest residue and pulpwood, scaling up the supply chain is necessary. An inability of the supply chain to scale up would have a significant impact on the proponent's ability to source feedstock. RI Impact Level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 19.98 out of 100.	**Score 19.98**

3.33. Risk of Wildfire

Rationale: Forest fires, especially when occurring at large-scale, destroy feedstock and create shortages.	
Raw RI Score: A substantial portion of the Uinta-Wasatch-Cache National Forest has suffered from infestation, leading to extensive areas of standing dead trees. These deceased trees possess higher	**Score 8**

dryness levels compared to live trees, making them highly susceptible to ignition and posing a substantial risk of wildfires. Although efforts have been made to harvest these trees and implement a fuels reduction program, the scope of these measures only addresses a fraction of the dead trees present on the land. Consequently, the probability of a significant wildfire outbreak is expected to remain elevated for a minimum of ten years. Raw RI Score is 8 out of 10.	
Notched Salience: No adjustment.	**Score 8.0**
Impact Level: While the probability of a substantial wildfire remains high, the potential impact on a bio-project is assessed as moderate. It is important to note that the evaluation discounts the effects on dead stock, specifically the areas with deceased trees that are susceptible to wildfire consumption. These particular zones are not taken into account in this assessment, thus limiting the overall impact on the bio-project. RI Impact Level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 53.28 out of 100.	**Score 53.28**

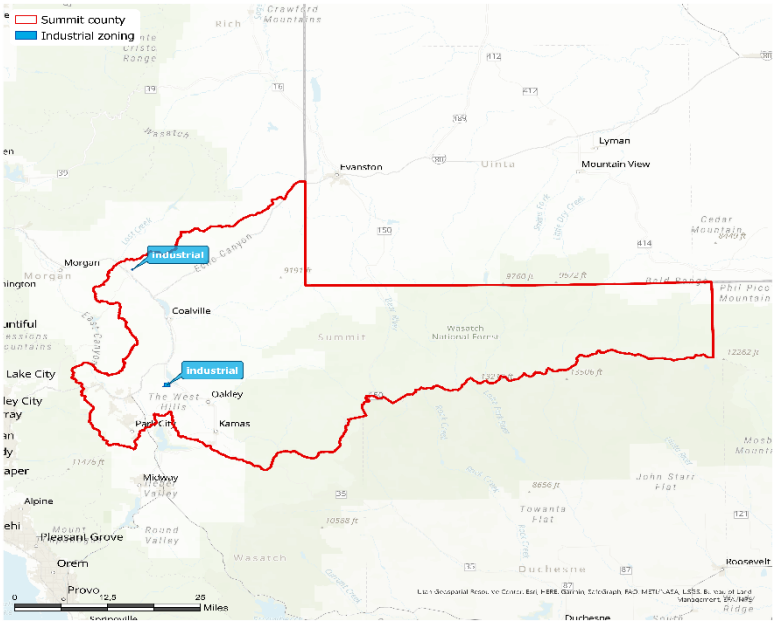
APPENDIX C: INFRASTRUCTURE

Site selection of Summit County, Utah

LOCATION

Summit County lies on the upper east side of Utah. Its northeast borders adjoin the south and west borders on the state of Wyoming. Its central and eastern portion consists largely of the east-west oriented Uinta Mountains, while its western portion runs to the east slopes of the north-south oriented Wasatch Mountains. The county has a total area of 1,882 square miles (4,870 km^2), of which 1,872 square miles (4,850 km^2) is land and 10 square miles (26 km^2) (0.5%) is water.

Map C-1: Summit County, UT



POPULATION

According to the United States Census Bureau, Summit County had a population of 42,357 in 2020 with a density of 23/sq mi (8.7/km^2); and an annual growth rate of 1.4%.

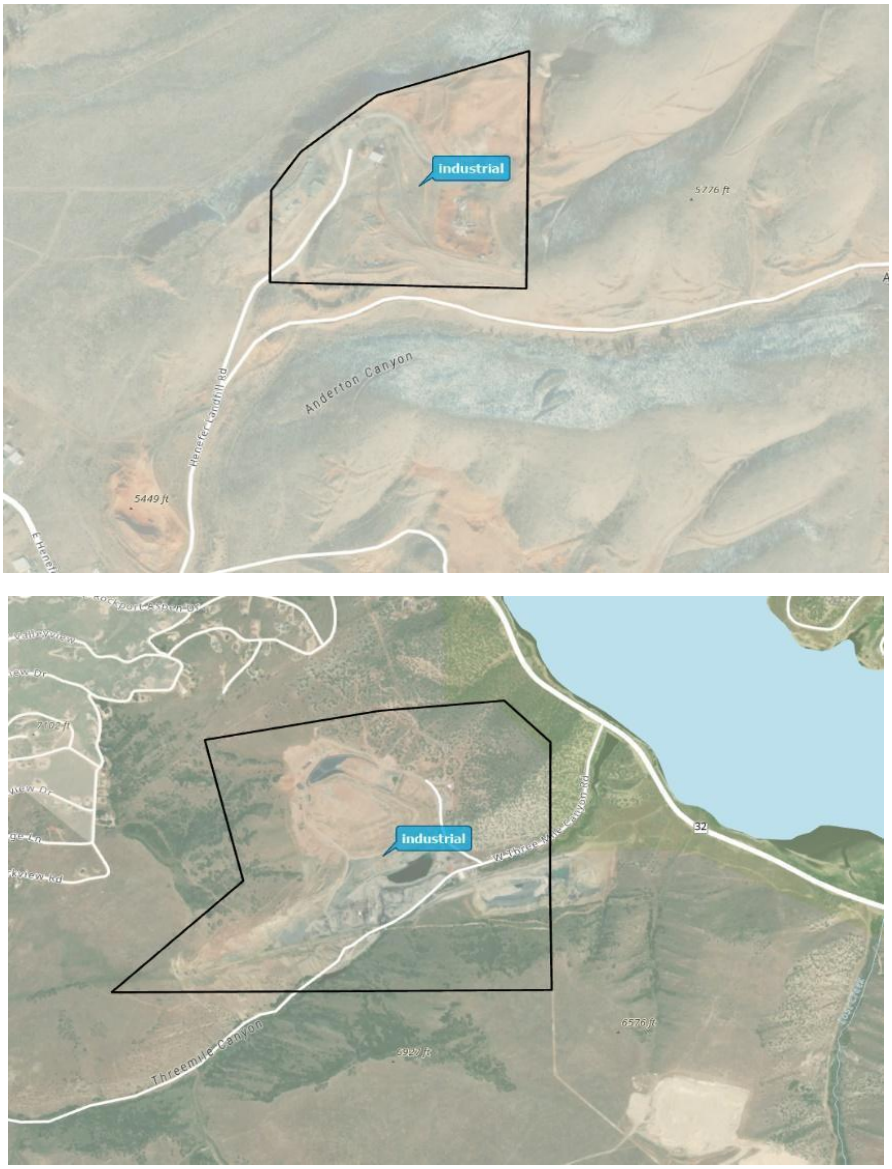
EMPLOYMENT

Summit County employs approximately 30,578 people. The most common occupations in the county are Management (4,115 people); Sales & Related Occupations (2,729 people); Educational Services (2,506 people); Accommodation & Food Services (2,155 people); Scientific & Technical Services (2,152 people); and Administrative Support (2,009 people). The industries with the best median earnings in 2020 are Real Estate, Finance & Insurance, ($ 120,057), Scientific & Technical Services ($ 80,060); Wholesale Trade ($ 79,875); Agriculture, Forestry & Mining ($ 79,211); Wholesale Trade ($ 77,500); Finance & Insurance ($ 76,875).

SITE SELECTION

There are two industrial sites in Summit County - (1) Site adjacent to N Henefer Landfill Rd is 614 acres (0.96 sq miles); (2) Site adjacent to W Three Mile Canyon Rd is 2080 acres (3.25 sq mi).

Figure C-1: Satellite Image of Two Industrial Sites in Summit County, UT



On-site Infrastructure:

The industrial sites will have access to water, sewer/septic, electricity, and natural gas. However, roads must be paved by the industries to connect the two industrial sites to the N Henefer Landfill Rd and W Three Mile Canyon Rd respectively.

TRANSPORTATION INFRASTRUCTURE

Roads:

- ✓ 33 miles from Canyon Rim
- ✓ 36 miles from East Millcreek
- ✓ 39 miles from Murray
- ✓ 40 miles from Salt Lake City
- ✓ 50 miles from Bountiful
- ✓ 53 miles from Centerville
- ✓ 55 miles from Farmington

Rail:

- ✓ 40 miles from Salt Lake Central station
- ✓ 53 miles from Provo
- ✓ 54 miles from Orem station
- ✓ 57 miles from American Fork
- ✓ 59 miles from Ogden
- ✓ 121 miles from Helper

Ports:

- ✓ 45 miles from Port of Salt Lake City
- ✓ 716 miles from Port of Los Angeles
- ✓ 776 miles from Port of San Francisco

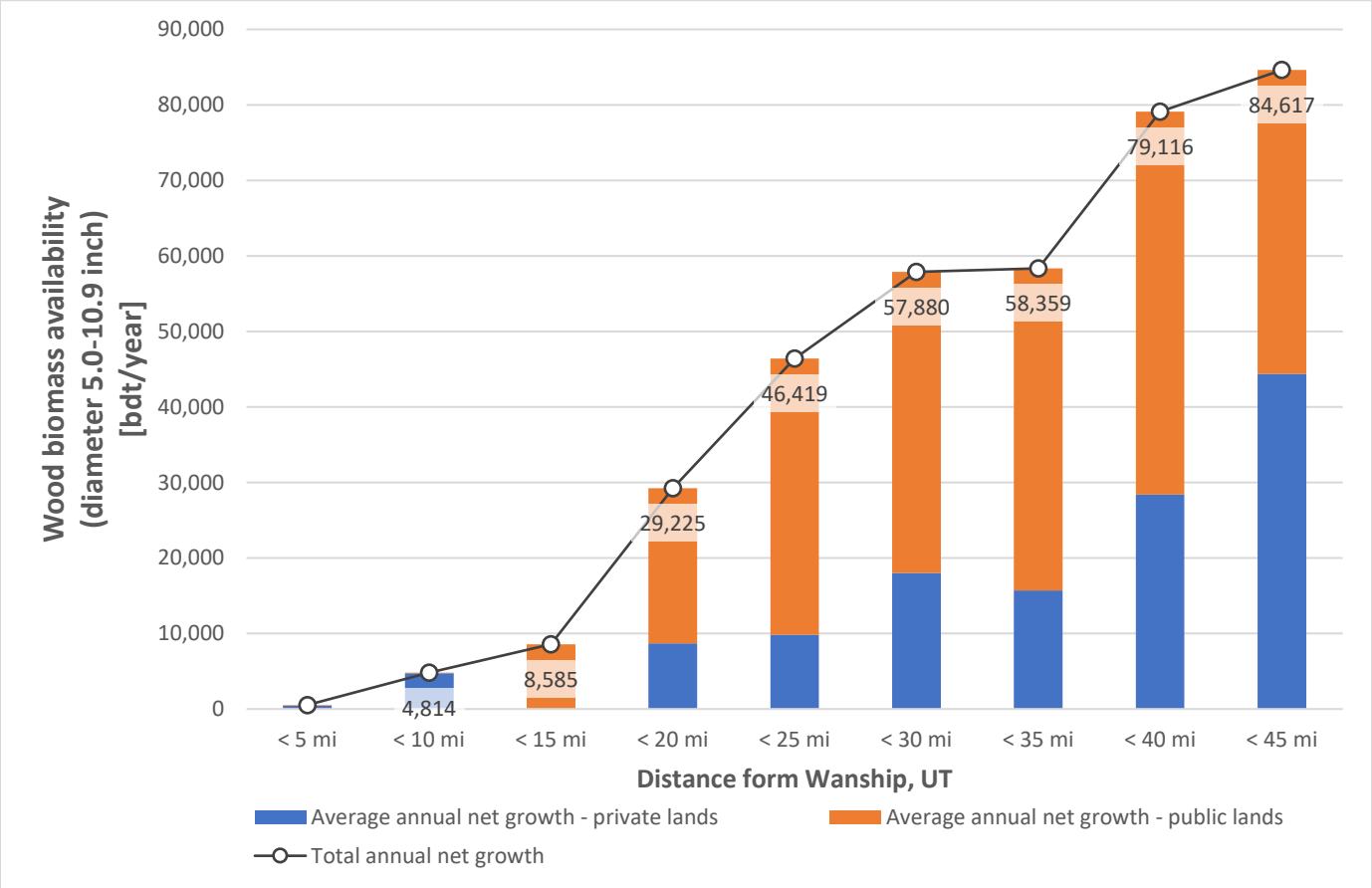
Air:

- ✓ 45 miles from Salt Lake City International Airport
- ✓ 50 miles from Skypark Airport, Bountiful
- ✓ 53 miles from Evanston-Uinta County Burns Field
- ✓ 55 miles from Hill Air Force Base, Ogden
- ✓ 56 miles from Ogden-Hinckley Airport
- ✓ 58 miles from Provo Municipal Airport
- ✓ 154 miles from Vernal Regional Airport

APPENDIX D: FIGURES, TABLES, AND MAPS

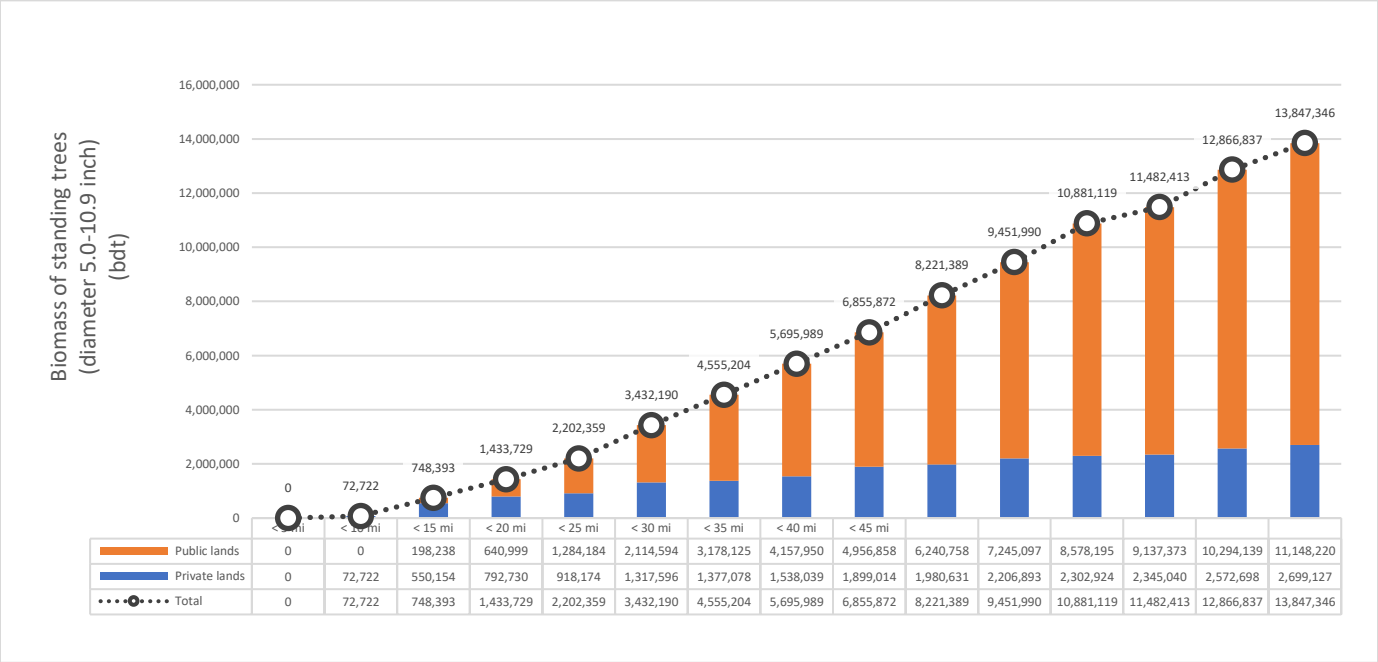
FIGURES

Figure D-1. Pulpwood (5.0 – 10.9-inch DBH) Net Growth Supply Curve, by Ownership Type



Source: US Forest Service, Forest Inventory and Analysis, EVALIDATOR Tool

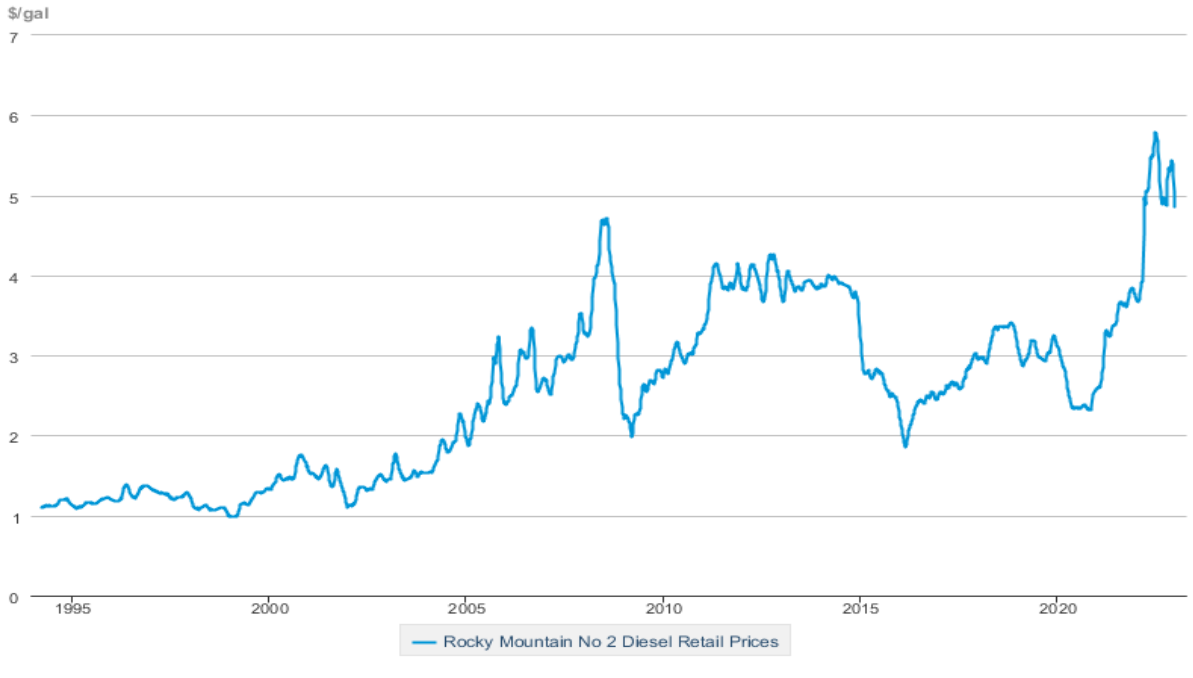
Figure D-2. Standing Pulpwood (5.0 – 10.9-inch DBH) within 45 and 75-mile Distances, by Ownership Type



	< 5 mi	< 10 mi	< 15 mi	< 20 mi	< 25 mi	< 30 mi	< 35 mi	< 40 mi	< 45 mi						
Public lands	0	0	198,238	640,999	1,284,184	2,114,594	3,178,125	4,157,950	4,956,858	6,240,758	7,245,097	8,578,195	9,137,373	10,294,139	11,148,220
Private lands	0	72,722	550,154	792,730	918,174	1,317,596	1,377,078	1,538,039	1,899,014	1,980,631	2,206,893	2,302,924	2,345,040	2,572,698	2,699,127
Total	0	72,722	748,393	1,433,729	2,202,359	3,432,190	4,555,204	5,695,989	6,855,872	8,221,389	9,451,990	10,881,119	11,482,413	12,866,837	13,847,346

Source: US Forest Service, Forest Inventory and Analysis, EVALIDATOR Tool

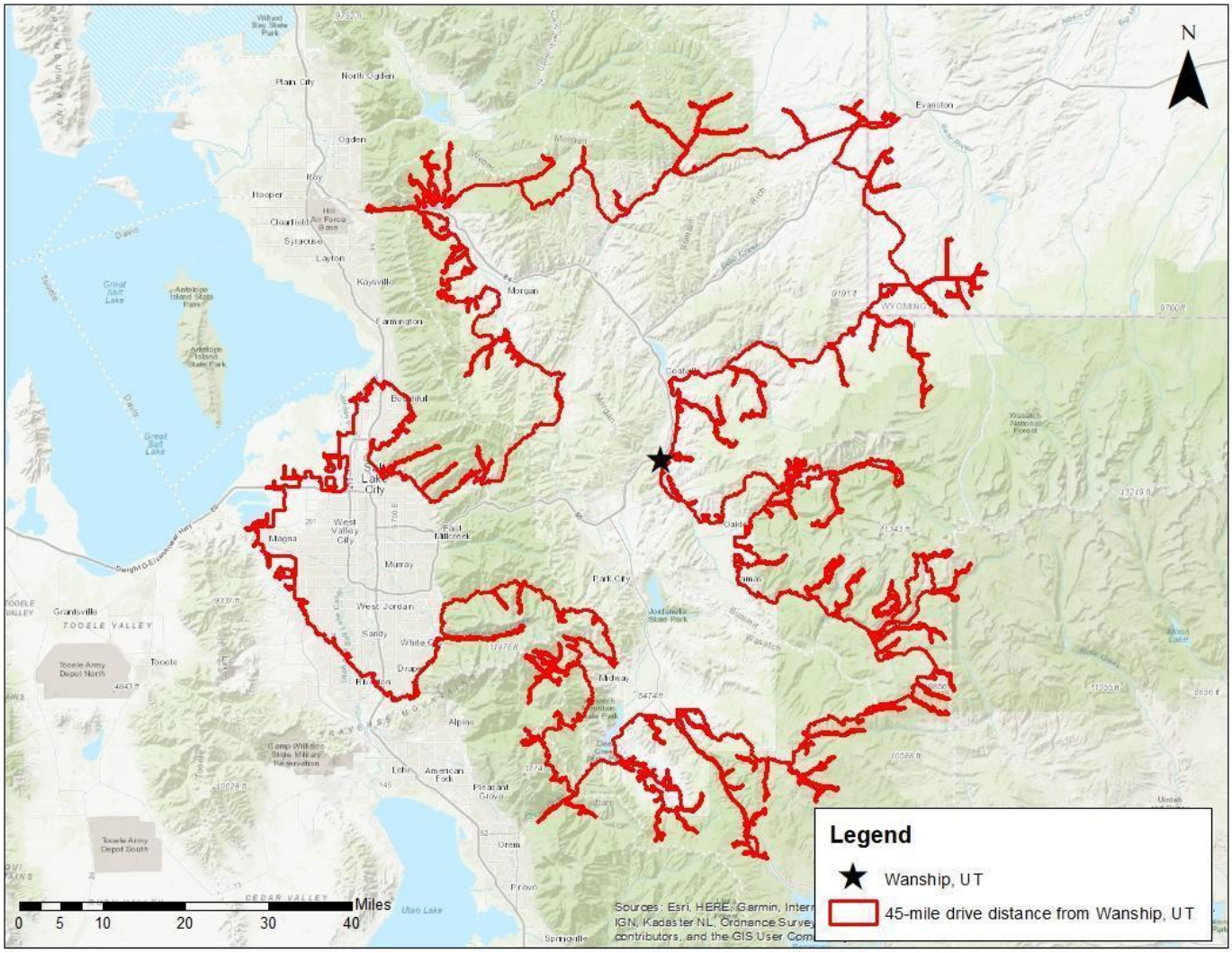
Figure D-3. Annual Regional Diesel Prices, 1995–2022



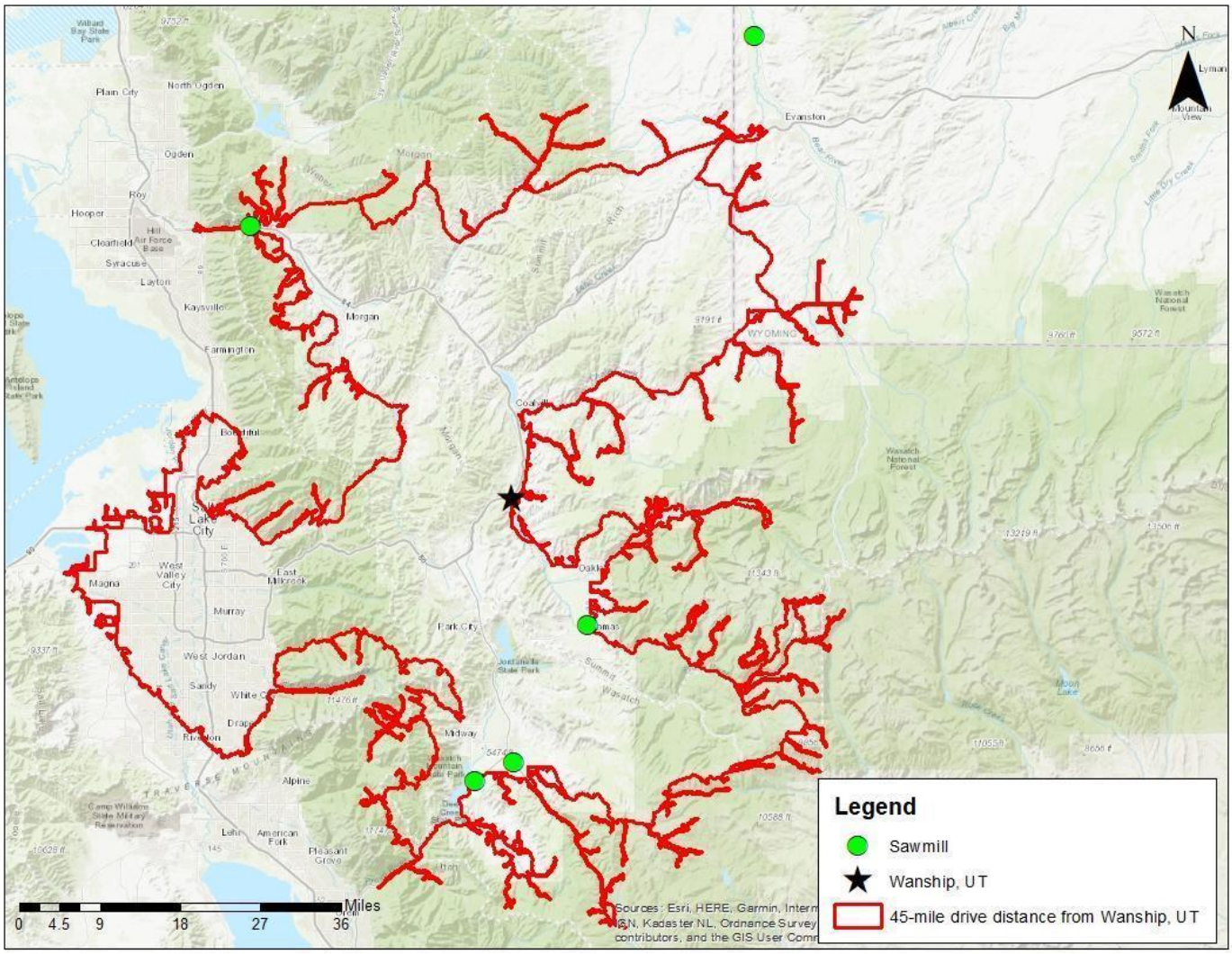
Source: https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_r40_w.htm

MAPS

Map D-1. Summit County BDO Zone Defined by a 45-mile Drive Distance from Wanship, UT



Map D-2. Sawmills within the BDO Zone



TABLES

Table D-1. Transportation Cost Assumptions

Average Transport Cost ($/hour) based on direct feedback from the market	$117.50
Average Truck Speed (mph)	50
Average Round Trip (miles)	60
Truck Payload (bdt)	13
Payload Cost ($/bdt)	$10.85
Loading & Unloading (hr.)	1.3
Loading & Unloading Cost ($/load)	$152.75
Loading & Unloading Cost ($/bdt)	$11.75
Total estimated trucking cost ($/bdt)	**$22.60**

APPENDIX E: WORKFORCE OVERVIEW

OVERVIEW

While there is some skilled and unskilled labor for the wood industry overall, a declining primary industry has made for a tight labor market. Summit County has an overall low unemployment rate, unemployment (May 2023) rate in at 2.2% and imports labor from other states.[15] Interest has been expressed by entities previously active in the area to return should new markets emerge or treatment activities increase.

FOREST AND WOOD INDUSTRY CONTEXT & INDUSTRY DYNAMICS

As of 2023, the wood product manufacturing jobs category within Summit County (which covers all wood related primary and second manufacturing), employed 66 individuals overall, growing from 28 in 2001[16]. This figure was significantly below the national average (50%)[17]. The industry growth rate is forecasted to increase by a modest 28% from 2023 to 2033, less than Summit County's total manufacturing jobs that are projected to grow by 33% for that same period of time[18]. However, further breakdowns within specific subsectors indicates significant challenges in the forestry and logging areas with jobs declining 64.3% from 2001-2023[19], leaving only a handful of companies and extended proprietors active in Summit County. That said, a number of specialists in adjacent areas indicated interest in returning to the area should there be new markets and/or increases in treatment activity.

The average earnings per job in 2022 were $64,070, which is more than the average earnings of $61,431 for all jobs in Summit County. The industry has seven payrolled business locations, suggesting a strong local presence.[20]

The projections align with the county's workforce age demographics, predominantly falling within the 25-34 (34.0%) and 35-44 (26.6%) age ranges.[21] These age groups represent a workforce in their prime productive years, thereby amplifying the potential of economic stability. These workers bring a diverse set of skills, including cabinetmaking, saw machine operation, and fabrication, among others.[22]

WORKFORCE DIVERSITY & INCLUSION

The workforce within the wood industry in Summit County exhibits diversity in terms of gender and ethnicity. Though it is predominantly male (80.2%), females make up a significant 19.8% of the workforce.[23] The presence of different genders enhances workforce diversity, a factor often linked to increased innovation and productivity.

[15] Legacy Industry Snapshot, Lightcast Q2 2023 Data Set (Summit County Economic Development Department, July 2023), 3
[16] Ibid., 3
[17] Ibid., 3
[18] Ibid., 3
[19] Ibid., 3., NAIS Code 113
[20] Ibid., 3.
[21] Bureau of Labor Statistics, "Quarterly Census of Employment and Wages (2023)," accessed June 30 , 2023, https://www.bls.gov/cew/
[22] Ibid., 4.
[23] Ibid., 5.

Racially, the industry is majorly composed of White individuals (89.0%), with a smaller portion of Hispanic or Latino employees (9.3%) and a minor percentage identifying as Two or More Races (1.7%).[24]

Colleges in the area have supported workforce training and enhanced workforce inclusion, including Davis Technical College and Ogden-Weber Technical College in adjacent counties, Utah Valley University with an extension in Coalville, and Western Governors University with a number of online programs.

Economic Impact & Industry Requirements

The wood industry's economic impact is tangible, evidenced by its Gross Regional Product (GRP) in 2022. With earnings of $4.0M property income of $2.4M, and total GRP of $6.5M, the industry represents 16% of the County's $4B GRP.[25]

[24] Ibid., 5.
[25] Ibid., 6.

APPENDIX F: LEGAL DISCLAIMER

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