



**Verified Carbon
Standard**

BETHLEHEM IMPROVED FOREST MANAGEMENT PROJECT NON- PERMANENCE RISK REPORT



Document Prepared by Anew Climate LLC

Project Title	<i>Bethlehem Authority Improved Forest Management Project</i>
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Prepared By	<i>Anew Climate LLC</i>
Contact	<i>2825 E. Cottonwood Parkway, Ste 400, Cottonwood Heights, UT 84121</i>

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1 INTERNAL RISK

Project Management		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a) Planted Species	Planting within the project area will not be extensive and all species planted will be native or proven to be adapted to the same or similar agro-ecological zone(s) in which the project is located. Additionally, the Pennsylvania Department of Conservation and Natural Resources (DCNR) will approve all planted trees species.	0
b) Ongoing Enforcement	No history of illegal activities exists in the region. No supplemental enforcement is required to protect forests within the project area.	0
c) Management Team	The management team has significant experience conducting forest carbon projects and possesses the skills necessary to successfully undertake all project activities. Anew has been involved in carbon project development since 2002 and has staff with expertise in all areas of forest project development. Staff capabilities include: project evaluation, project description document drafting, geospatial analysis, carbon modeling, forest mensuration, project financial analysis, and ghg offset marketing. TNC is an internationally respected NGO that has been active in environmental management for over 60 years. TNC's Pennsylvania chapter has a staff of qualified natural resource managers and is responsible for Pennsylvania's Working Woodlands forest conservation program designed to protect the states forests while improving private forest management, providing revenue for forest landowners, and fighting climate change. Woodland Management Services (WMS) specializes in forest management, timberland investment, and land conservation services. WMS staff holds professional degrees in Forestry, Environmental Management, Biology,	0

	and Environmental Studies, and collectively bring 45 years of forest management experience to the organization.	
d) Management Team Location	All three organizations comprising the management team have offices in the US and both TNC and WMS have offices in the vicinity of the project area. WMS - 308 Egypt Road, Tafton, PA 18464 TNC - Hauser Nature Center, Long Pond Road, Long Pond, PA 18334	0
e) Mitigation: AFOLU/Carbon expertise	Anew has deep experience in forest carbon project development and has more publicly registered third-party verified GHG offsets than any other company in North America. TNC has a long history working with forest based carbon projects and has been the Project Proponent for five of the eight VCS AFOLU projects to be completed in the US to date.	-2
f) Mitigation: Adaptive Management Plan	The project's Adaptive Management Plan outlines the various processes associated with addressing issues to forest health on Bethlehem Authority lands. Processes include: 1) risk assessment and prioritization; 2) identification and implementation of risk mitigation actions; 3) risk monitoring; and 4) feeding monitoring information back into planning and implementation. Forest health-based management activities are carried out year-round and are predicated on changing circumstances within the project area. [The Adaptive Management Plan is provided separately for validation and verification purposes (see Management folder)]	-2
Total Project Management (PM) [as applicable, (a + b + c + d + e + f)] Total may be less than zero.		-4

Financial Viability

Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	Project cash flow breakeven point is greater than 10 years from the current risk assessment	Not applicable
b)	Project cash flow breakeven point is between 7 and up to less than 10 years from the current risk assessment	Not applicable
c)	Project cash flow breakeven point between 4 and up to less than 7 years from the current risk assessment	Not applicable
d)	Project cash flow breakeven point is less than 4 years from the current risk assessment. Based on the cash flow analysis provided for validation and verification purposes (See the RiskTool_Financials worksheet, Breakeven tab), the Bethlehem IFM project achieved breakeven in year one. Forest carbon offset prices were based on Anew's pre-existing sales agreements and the Forest Trends' State of the Forest Carbon Market 2018. Data on stumpage prices for pulp and timber was retrieved through the Penn State Extension covering the Southeastern region of Pennsylvania since 1992. Stumpage price trends were adjusted for inflation using data from the consumer price index. An average stumpage price for hardwoods as well as softwood was calculated and weighted based on the unique harvest mix by volume of timber species from the property analysed including both timber tracks, Wild Creek and Tunkhannock. The property's hardwood timber species mix consisted of 54% oak species, 2% cherry, 0% ash, 31% maple, and 13% other hardwoods. Hardwoods made up 67% of the timber while softwoods contributed another 36% of the timber. For this unique timber mix, the real stumpage prices adjusted for inflation increased by an average of 0.9% per year from 1999-2021. This increase in real stumpage prices from a 22-year dataset was projected into the future for the next 100 years. The average 2021 stumpage price for the property's hardwood and softwood mix was \$524.93 per thousand board feet (mbf) and \$69.50 per mbf, respectively. As the local estimates consider around 75% of the current timber in the pallet/tie log class at an estimated stumpage price of \$100 per mbf, the adjusted average stumpage value for all qualities and hardwood species equalled \$177 per mbf. Hardwood pulpwood was converted from cubic feet to green short tons at a rate of	0

	51 pounds/cubic foot based on the average density of hardwoods in the Southeast (USDA 2008). An average pulp stumpage price of \$0 per green short ton in 2020 was utilized, based on Pennsylvania-specific data from Penn State Extension. Management costs, estimated at \$50 per mbf, were obtained from property management staff. The property has a good internal road network which would not create any extraordinary costs of access or infrastructure beyond what would be included in the management costs. The real discount rate was set at 2.47% based on the average 10-year US Treasury reported in 2020.	
e)	Project has secured less than 15% of funding needed to cover the total cash out before the project reaches breakeven	Not applicable
f)	Project has secured 15% to less than 40% of funding needed to cover the total cash out required before the project reaches breakeven	Not applicable
g)	Project secured 61% (\$75,932) of funding needed to cover the total cash out required before the project achieved breakeven. (See – “Invoices for Project Expenses” within the Risk Report folder, provided separately for validation and verification purposes.) At this point breakeven has already been reached.	1
h)	Project has secured 80% or more of funding needed to cover the total cash out before the project reaches breakeven	Not applicable
i)	Mitigation: Project has available as callable financial resources at least 50% of total cash out before project reaches breakeven	Not applicable
Total Financial Viability (FV) [as applicable, ((a, b, c or d) + (e, f, g or h) + i)] Total may not be less than zero.		1

Opportunity Cost		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	NPV from the most profitable alternative land use activity is expected to be at least 100% more than that associated with project activities; or where baseline activities are subsistence-driven, net positive community impacts are not demonstrated	Not applicable

b)	NPV from the most profitable alternative land use activity is expected to be between 50% and up to 100% more than from project activities	Not applicable
c)	NPV from the most profitable alternative land use activity is expected to be between 20% and up to 50% more than from project activities	Not applicable
d)	NPV from the most profitable alternative land use activity is expected to be between 20% more than and up to 20% less than from project activities; or where baseline activities are subsistence-driven, net positive community impacts are demonstrated At a start date NPV of \$6,307,476 (2.47% discount rate) the Legal Common Practice Baseline is projected to be 6.7% less than the NPV from Project Activities (\$6,759,482) (See RiskTool_Financials worksheet, Opportunity_Cost tab in the Risk Tools Docs folder provided for validation and verification purposes).	0
e)	NPV from project activities is expected to be between 20% and up to 50% more profitable than the most profitable alternative land use activity	Not applicable
f)	NPV from project activities is expected to be at least 50% more profitable than the most profitable alternative land use activity	Not applicable
g)	Mitigation: Project proponent is a non-profit organization	Not applicable
h)	Mitigation: The project is protected by a legally binding easement, committing the land owner to continue management practices that protect the credited carbon stocks over the length of the project crediting period	Not applicable
i)	Mitigation: Project is protected by legally binding commitment to continue management practices that protect the credited carbon stocks over at least 100 years (see project longevity)	Not applicable
Total Opportunity Cost (OC) [as applicable, (a, b, c, d, e or f) + (g + h or i)] Total may be less than 0.		0

Project Longevity		
a)	Without legal agreement or requirement to continue the management practice	$24 - (100/5) = 4$

b)	With legal agreement or requirement to continue the management practice	Not applicable
Total Project Longevity (PL) May not be less than zero		4

Internal Risk	
Total Internal Risk (PM + FV + OC + PL) Total may not be less than zero.	(-4+1+0+4) = 1

2 EXTERNAL RISKS

Document and substantiate the risk and/or mitigation for each risk factor applicable to the project. Include any relevant documentary evidence. Where a risk or mitigation is not relevant to the project, please write "Not applicable".

Land Tenure and Resource Access/Impacts		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	The Bethlehem Authority holds both ownership rights and resource access/use rights.	0
b)	Ownership and resource access/use rights are held by different entity(s) (e.g., land is government owned and the project proponent holds a lease or concession)	Not applicable
c)	No disputes over land tenure or ownership exist on the project area.	0
d)	No disputes over access/use rights exist on the project area.	0
e)	WRC projects unable to demonstrate that potential upstream and sea impacts that could undermine issued credits in the next 10 years are irrelevant or expected to be insignificant, or that there is a plan in place for effectively mitigating such impacts Bethlehem Authority IFM Project is not a WRC Project.	Not applicable
f)	Mitigation: Project area is protected by legally binding commitment (eg, a conservation easement or protected area) to continue	Not applicable

	management practices that protect carbon stocks over the length of the project crediting period	
g)	Mitigation: Where disputes over land tenure, ownership or access/use rights exist, documented evidence is provided that projects have implemented activities to resolve the disputes or clarify overlapping claims	Not applicable
Total Land Tenure (LT) [as applicable, ((a or b) + c + d + e + f + g)]		0
Total may not be less than zero.		

Community Engagement		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	Less than 50 percent of households living within the project area who are reliant on the project area, have been consulted No households are located within the project area	Not applicable
b)	Less than 20 percent of households living within 20 km of the project boundary outside the project area, and who are reliant on the project area, have been consulted	Not applicable
c)	Mitigation: The project generates net positive impacts on the social and economic well-being of the local communities who derive livelihoods from the project area	0
Total Community Engagement (CE) [where applicable, (a + b + c)]		0
Total may be less than zero.		

Political Risk		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	Governance score of less than -0.79	Not applicable

b)	Governance score of -0.79 to less than -0.32	Not applicable																												
c)	Governance score of -0.32 to less than 0.19	Not applicable																												
d)	Governance score of 0.19 to less than 0.82	Not applicable																												
e)	The average World Governance Indicators (WGI) score for the United States, based on the WGI's six governance categories, for 2016-2020 (i.e. the most recent 5 years for which data exists) = 1.17 <table><tr><th colspan="4">Average Combined Ranking for all 6 WGI Categories</th></tr><tr><th>Year</th><th>Percentile Rank</th><th>Governance Score</th><th>5-year Average Governance Score</th></tr><tr><td>2020</td><td>77.47</td><td>0.97</td><td>1.17</td></tr><tr><td>2019</td><td>81.87</td><td>1.13</td><td></td></tr><tr><td>2018</td><td>84.28</td><td>1.24</td><td></td></tr><tr><td>2017</td><td>84.77</td><td>1.27</td><td></td></tr><tr><td>2016</td><td>83.70</td><td>1.25</td><td></td></tr></table>	Average Combined Ranking for all 6 WGI Categories				Year	Percentile Rank	Governance Score	5-year Average Governance Score	2020	77.47	0.97	1.17	2019	81.87	1.13		2018	84.28	1.24		2017	84.77	1.27		2016	83.70	1.25		0
Average Combined Ranking for all 6 WGI Categories																														
Year	Percentile Rank	Governance Score	5-year Average Governance Score																											
2020	77.47	0.97	1.17																											
2019	81.87	1.13																												
2018	84.28	1.24																												
2017	84.77	1.27																												
2016	83.70	1.25																												
f)	Mitigation: The U.S. has an established FSC standard body. This qualifies the project for a mitigation deduction based on 2.3.3. d)	-2																												
Total Political (PC) [as applicable ((a, b, c, d or e) + f)]		0																												
Total may not be less than zero.																														

External Risk	
Total External Risk (LT + CE + PC) Total may not be less than zero.	0+0+0 = 0

3 NATURAL RISKS

Explain the significance and likelihood of the natural risk and any mitigation activities implemented, (copy table for each natural risk).

Natural Risk: Fire	
Significance	Minor – Over the last century, no more 4% of Pennsylvania’s forests have been exposed to fire damage in a single year and over the last 50 years human fire prevention efforts have kept fire outbreaks far below historic levels (no more than 1% of PA’s forests have been exposed to fire in a single year since 1952)³. Fire records provided by the Pennsylvania Bureau of Forestry for Carbon and Monroe Counties⁴ (the counties in which the BA property is located) further support this risk significance determination. The Bureau’s wildfire data, dating back to 1979, reveals that no fire has impacted an area larger than 1,169 acres (an area equal to 6.5% of the BA project) in the last three decades. The average total acreage burned in any single year during the same period was only 436 acres (an area equal to ~2.4% of the BA project). ³http://www.dcnr.state.pa.us/ucmprd1/groups/public/documents/document/dcnr_004230.pdf ⁴Wildfire dataset provided by Richard Dreppen, Assistant Manager of the William Penn Forest District for the Pennsylvania Bureau of Forestry
Likelihood	Every 25 to 50 years (This is conservatively chosen, in lieu of every 50 to 100 years, as the reduced number of fires in recent decades have led to higher than average fuel load within PA forest understories. Though large-scale fires are not likely to occur, this fuel load increases the potential of a fire event in the future.)
Score (LS)	1
Mitigation	0.5 – The Pennsylvania Bureau of Forestry has an active professional fire crew responsible for suppressing forest fires throughout the region. There have been extensive fire breaks and road networks installed on all lands in and around the BA properties and the Bureau of Forestry, Game Commission and TNC are integrated for suppression. Working with the PA Game Commission, TNC has been managing the barrens surrounding the project area with prescribed fire to deplete fuel load and greatly reduces wildfire risk. Additionally, a detailed wildfire response plan is currently under development by TNC for the entire project area.
Natural Risk: Pest and Disease outbreaks	
Significance	Major – Beech bark disease, gypsy moth, and hemlock wooly adelgid have been sporadically present within the project region since the early 1980s. Beech bark disease has had an impact in many of the northern hardwood species, resulting in crown dieback, and some mortality. Gypsy moth caterpillars have periodically exhibited population explosions, which stress the oak forests of the region. Though hemlock wooly adelgid has caused significant damage in the northeastern US in recent decades, it is not currently established on the

	Bethlehem property and poses only modest threat to the carbon project as hemlocks represent only 3% of the Bethlehem's forest population. Emerald ash borer has decimated ash communities in other areas of the northeast, however its presence in Pennsylvania is largely confined to the western portion of the state and it has never been encountered on the Bethlehem Property. In the circumstance that the ash borer did reach Bethlehem it would pose little threat to the carbon project as ash species represent less than one third of a percent of Bethlehem's forest population. Asian longhorn beetle has been of major concern to northeastern forest owners since its introduction in 1996, but it is not found in the state of Pennsylvania. If the beetle does manage to enter the state, the Department of Agriculture has plans to partner with the U.S. Department of Agriculture Animal and Plant Health Inspection Service's Plant Protection and Quarantine division and the U.S. Forest Service to implement a full-scale eradication program.
Likelihood	Every 10 to 25 years
Score (LS)	5
Mitigation	0.25 – Both TNC and Woodland Management Services (WMS) have a proven history dealing with forest pests and disease mitigation. Throughout the project inventory, notes were taken at high conservation value plots defining plot condition in relation to forest stressors. Sites of concern will be regularly monitored to promote improved health and ensure conditions do not worsen. As is stated in the project Forest Management Plan, an adaptive approach involving the use of FSC approved pesticides will be implemented to prevent pest/disease outbreak. [The Forest Management Plan is provided separately for validation and verification purposes]

Natural Risk: Extreme Weather

Significance	Minor – Hurricanes rarely hit Pennsylvania with enough force to cause significant tree mortality. According to the National Oceanic and Atmospheric Administration (NOAA) only one "level rated" hurricane has directly hit PA since 1851⁵. Tornadoes do strike PA with some regularity, but academic research has shown that the highest-powered tornadoes in the region do not typically cause tree mortality above 32% to forests directly within a tornado's path⁶. Studies of ice storm impacts in the northeastern United States reveal that ice storms occur in the region ~twice a century. Unlike hurricanes and tornadoes, ice storms do not cause significant tree blow-down, instead they tend to damage tree crowns, an injury that doesn't typically lead to mortality unless total crown damage is >50%⁷.
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	⁵http://www.aoml.noaa.gov/hrd/tcfaq/E19.html ⁶Peterson, Chris J. Damage and recovery of tree species after two different tornadoes in the same old growth forest: a comparison of infrequent wind disturbances. Forest Ecology and Management. Volume 135, Issues 1–3, 15 September 2000, Pages 237–252 ⁷http://www.nrs.fs.fed.us/pubs/gtr/gtr_nrs60.pdf ⁸Personal communication with Helen Delano, Sr. Geologic Scientist, PA Department of Conservation and Natural Resources
Likelihood	Every 25 to 50 years
Score (LS)	1
Mitigation	1
Natural Risk: Geological Risk	
Significance	Insignificant - No major volcanic activity has occurred in Pennsylvania in >200 million years, and earthquakes powerful enough to cause significant forest mortality are absent in the region⁸. ⁸Personal communication with Helen Delano, Sr. Geologic Scientist, PA Department of Conservation and Natural Resources
Likelihood	Once every 100 years or more
Score (LS)	0
Mitigation	1
Natural Risk: Other Risk	
Significance	No Loss – No other natural risks are of serious concern to the project area.
Likelihood	N/A
Score (LS)	0
Mitigation	1

Score for each natural risk applicable to the project (Determined by (LS × M))	
Fire (F)	$1 \times 0.5 = 0.5$
Pest and Disease Outbreaks (PD)	$5 \times 0.25 = 1.25$
Extreme Weather (W)	$1 \times 1 = 1$
Geological Risk (G)	$0 \times 1 = 0$
Other natural risk (ON)	$0 \times 1 = 0$
Total Natural Risk (as applicable, F + PD + W + G + ON)	2.75

4 OVERALL NON-PERMANENCE RISK RATING AND BUFFER DETERMINATION

4.1 Overall Risk Rating

Risk Category	Rating
Internal Risk	1
External Risk	0
Natural Risk	2.75
Overall Risk Rating (a + b + c)	3.75

4.2 Calculation of Total VCUs

Please see the project Monitoring Report for the calculated buffer pool and VCUs for the 1/1/2021 – 12/31/2021 reporting period.