Hancock Timber Resource Group (HTRG)

2020 GHG Inventory Verification Report

Hancock Natural Resource Group

197 Clarendon St.

Boston, MA 02116

Final report

June 25, 2021

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Lead Verifier 	Kim Mattson June 25, 2021
Independent Reviewer Matthew Lutes	Matthew Lutes June 25, 2021
This verification report is approved when signed and dated by an NSF independent reviewer.	

NSF International
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EXECUTIVE SUMMARY

Hancock Natural Resource Group (HNRG) manages farmland and timberland portfolios through several investment structures for institutional investors, including public and private pension funds, foundations and endowments, high net-worth individuals, and Taft-Hartley plans. Assets are managed through the Hancock Agricultural Investment Group (HAIG) and the Hancock Timber Resource Group (HTRG). HTRG manages timber properties in USA, Canada, Chile, New Zealand, and Australia. Forest types include mixed hardwood and conifers in the US and Canada, and mostly plantations of Radiata Pine in Australia, New Zealand, and Chile.

HNRG contracted with the Delphi Group, consultants in climate change and corporate sustainability and with Finite Carbon, a developer of forest carbon offsets, to prepare the GHG inventory. These consultants assisted in the development of the methodology document and researched the various guidelines, compiled activities reports and timber volume data to convert to GHG estimates of emission or removals.

NSF was contracted to perform a limited level of assurance of HTRG's emissions reporting of carbon dioxide, methane, and nitrous oxide (CO_2, CH_4, and N_2O, respectively) for Scope 1, 2, and 3 emissions and for removals of CO_2 from its forestry operations. NSF applied as criteria for the verification the WRI/WBCSD GHG Protocol Corporate Accounting and Reporting Standard (revised edition). NSF performed its verification in accordance with ISO 14064-3 (2006), *Greenhouse gases—Specification with guidance for the validation and verification of greenhouse gas assertions*. NSF reviewed calculation sheets prepared by Delphi and Finite, LiDAR methods used to estimate forest volumes, and the methodology documentation that described the HNRG organization and the calculations and methods used to arrive at the GHG inventory. There were no site visits; NSF conducted interviews via video-conference calls, regular phone calls, and emails.

HTRG assembled its GHG inventory by gathering reports from its various operations. To estimate its GHG emissions, HTRG used reports of activities such as fuel usage, acres burned, fertilizer used. These were then summarized onto spreadsheets and converted to CO_2-equivalent emissions using emission factors from cited literature sources or from guidance in the criteria. To estimate the forest CO_2 removals from the atmosphere via tree growth and stored harvested timber products, HTRG gathered the timberland inventories for 2019 and 2020 to estimate net change in forest volumes. They added in the harvested wood products that were considered to be stored for 100 years. The inventory tree volume data were expanded using recommended factors from cited literature or the criteria guidance documents to include branches, needles, forest floor, and dead wood. These volumes were converted to CO2-e metric tons (MT) and were summed as positive emissions (loss of forest carbon) or negative emissions (increase in forest carbon).

Reported emissions were considered to be free of material misstatement if found to vary from true values by less than 10% on a CO_2-e basis. NSF checked the activity sheets and reporting procedures used by HTRG, the equations, the emissions factors, the sources for the emission factors, the forest volumes for 2019 and 2020, the harvested wood products volumes, and calculations used for estimating wood product storage factors. NSF did not verify forest volumes but did perform a review of the LiDAR methods used in some of the timberlands. NSF did evaluate forest volumes and growth as reported to see if they were reasonable. NSF checked reported acreages against that reported on HTRG websites and annual reports for consistency. NSF checked spreadsheet summaries of data for accuracy, consistency, and omissions.

Based on the above procedures, NSF has concluded that there is no evidence that HTRG's reported emissions of CO_2, CH_4, N_2O and removals of CO_2 for the year ending 31 December 2020 are not, in all material respects, fairly stated in accordance with the criteria referenced above.

The HTRG GHG inventory as reported was -6.4 million MT CO_2-e due mostly to forest removals (Table 1).

	CO_2	CH_4	N_2O	CO_2e	% of Scope Category	% of Total Scope 1,2,3,Optional
Scope 1						
S1 – Fuel combustion emissions (owned equipment and vehicles)	3,110	0	0	3,142	4%	0.0%
S2 – Nitrous oxide emissions (both direct and in-direct emissions) related to fertilizer application			75	22,411	29%	-0.4%
S3 – Methane and nitrous oxide emissions from prescribed burning		1,234	68	51,200	67%	-0.8%
Scope 2						
Not Applicable						
Scope 3						
S6 – Fuel combustion emissions (contractor equipment and vehicles)	157,452	5	7	159,617	100%	-2%
Optional Information*						
P1 – Live tree biomass pool	-4,670,885			-4,670,885	71%	73.2%
P2 – Standing dead biomass pool	156,409			156,409	-2%	-2.4%
P3 – Understory biomass pool	3,180			3,180	0%	0.0%
P4 – Debris and below ground dead biomass pool	807,670			807,670	-12%	-12.6%
P6 – Harvested wood products pool	-2,917,609			-2,917,609	44%	46%
Subtotal Scope 1 + 2				**76,753**		-1%
Subtotal Scope 3				**159,617**		-2%
Subtotal Optional Information	**-6,621,235**			**-6,621,235**		104%
Total Scope 1, 2, 3, + Optional Information				**-6,384,865**		100%

*CO_2 emissions from prescribed burning of forest biomass are not explicitly calculated, but are implicitly included in the net emissions or removals calculated for the debris and below ground dead biomass pool

VERIFICATION OBJECTIVES, SCOPE AND CRITERIA

Objective

Hancock Natural Resource Group (HNRG) engaged NSF to verify HNRG's greenhouse gas (GHG) inventory for the 2020 emissions year (January 1, 2020 to December 31, 2020) according to the scope and criteria listed below, and if verified, to provide limited assurance to HNRG stakeholders that the reporting of HTRG emissions is fairly stated.

Scope

This verification report is limited to the forestry side of HNRG (e.g., Hancock Timber Resource Groups or HTRG). HTRG's reporting included emissions of carbon dioxide, methane, and nitrous oxide plus carbon dioxide removals from forest growth from their forestry operations (herein referred to as emissions/ removals of CO_2, CH_4, and NO_2; emissions are reported as positive values and removals are negative values).

Criteria

HTRG established its inventory in accordance with criteria provided by CDP and the World Resources Institute/ World Business Council for Sustainable Development (WRI/WBCSD) GHG Protocol. NSF performed its verification of the emissions/removals of CO_2, CH_4, and NO_2 in accordance with ISO 14064-3 (2006), Greenhouse gases — Specification with guidance for the validation and verification of greenhouse gas assertions.

FACILITY DESCRIPTION; SOURCES, SINKS AND RESERVOIRS; PRODUCT DATA; AND BOUNDARIES

Facility Description

Hancock Natural Resource Group (HNRG) manages farmland and timberland portfolios through several investment structures for institutional investors, including public and private pension funds, foundations and endowments, high net-worth individuals, and Taft-Hartley plans. Assets are managed through the Hancock Agricultural Investment Group (HAIG) and the Hancock Timber Resource Group (HTRG). HNRG's website describes HTRG as the world's largest global timberland investment manager for institutional investors. Their services are described as specializing in developing and managing diverse timberland portfolios on behalf of clients, offering capital preservation, portfolio diversification and attractive risk and return characteristics. Assets under management total approximately $10.6 billion. Over the past 35 years 374 million m^3 of timber has been harvested.

HNRG is a wholly owned subsidiary of Manulife Financial, an international financial services group headquartered in Toronto, Canada, that operates as John Hancock in the US. Manulife provides financial advice, insurance, and wealth and asset management for individuals, groups and institutions. Its 2020 annual report lists a book value of $1,297 billion of assets under management (Canadian $).

HTRG manages timber properties in USA, Canada, Chile, New Zealand, and Australia. The portfolio includes a mix of both direct-operated and fee-simple or owned properties. Forest types include mixed hardwood and conifers in the US and Canada, and mostly plantations of Radiata Pine in Australia, New Zealand, and Chile.

Sources, Sinks and Reservoirs included in the GHG Inventory

Scope 1 (direct emissions)

CO_2, CH_4, and N_2O emissions from fuel used in equipment and vehicles (land-based and aircraft) that are owned or directly controlled by HTRG

N_2O emissions from fertilizer application

CH_4 and N_2O from prescribed burning (including slash burning)

CH_4 and N_2O emissions from wildfires were excluded (though loss of CO_2 associated with wildfire was automatically included in the stock-change approach to accounting for biological emissions and removals associated with the forest as reported separately from the scopes). These emissions were considered as largely outside the control of HTRG.

Scope 2 (Energy Indirect)

Given the remote nature of timberlands, there were no relevant scope 2 emission sources.

Scope 3 ("Other Indirect")

Emissions from fuel used in equipment and vehicles (land-based and aircraft) that are owned by third-party contractors and used for forest management and related activities at HTRG-managed sites.

HTRG elected to include a portion of the optional scope 3 sources. The included sources were those that related to management activities physically conducted at timberland properties. HTRG excluded off-site scope 3 emission sources such as production of materials consumed at the properties (e.g., fertilizer, fuels) and transport of fertilizers, workers, machinery to properties, haulage of harvested wood from properties to mills, customers, etc.

CO_2 removals as changes in the amount of sequestered atmospheric carbon (reported separately from the scopes)

HTRG estimated the changes in the amount of carbon stored by various components of the forest ecosystem. These included live trees, tops and root systems, standing dead trees, understory vegetation, woody debris and below ground dead biomass (broken out in different ways depending on the region) .

Changes in the amount of carbon stored in the harvested wood product pool, including wood products in-use.

Wood products sequestered in landfills were excluded in the GHG inventory. HTRG reasoned that the emission factors for CO_2, and in particular, the potential for CH_4 were not reliable yet. Changes in soils were also excluded under the assumption that soil carbon is relatively stable in managed forests.

Boundaries

Given HTRG's role as a developer and manager (not owner) of timberland investments on behalf of clients who are the owners of these lands, an operational control approach as opposed to an equity share or financial control approach to boundary setting was chosen. The organizational boundary was restricted to activities directly related to the operational management of timberland investments performed by HTRG and its affiliates where operational control is exerted by HTRG. HTRG has been granted this operational control through investment

management agreements that it enters into with timberland investment property owners. Emissions associated with corporate and administrative offices were excluded from the boundary as they are tracked and reported separately by HNRG. In applying the operational control boundary approach, both actively managed and potentially managed areas would be considered within the organizational boundary of the GHG inventory. Non-managed areas would be excluded.

DESCRIPTION OF DATA ACQUISITION, TRACKING, EMISSIONS CALCULATION

HTRG assembled their total GHG inventory by first gathering various reports from their operations. To estimate their GHG emissions, they used reports of activities (such as fuel usage, acres burned, fertilizer used). These were then summarized onto spreadsheets and converted to CO_2-equivalent emissions using emission factors from cited sources (literature or the criteria guidance). To estimate the forest CO_2 removals from the atmosphere via tree growth and stored harvested timber products, HTRG gathered the timberland inventories for 2019 and 2020 to estimate net change in forest volumes. They added in the harvested wood products that were considered to be stored for 100 years. The inventory tree volume data were expanded using recommended factors (per cited literature or the criteria guidance documents) so as to estimate total forest volume that is not normally part of a commercial inventory (e.g., branches, needles, forest floor, and dead wood). These volumes were converted to CO_2-e metric tons (MT) and were summed as positive emissions (loss of forest volume including wood products) or negative emissions (increase in forest volume including wood products).

Data were tracked for project activities by region and forest data by individual forest tracts. The forest tract data including items such as stand age, species, volumes, areas, and harvest types by individual forest tracts varying in size from a few to hundreds of hectares. This resulted in data spreadsheets consisting of several thousand records for each of the 10 regions in the four countries. These sheets were summarized and converted to CO_2e values.

DATA CHECKS FOR EMISSIONS

NSF conducted the verification in accordance with the requirements of ISO 14064:2006, Part 3, *Greenhouse gases – Specification with guidance for the validation and verification of greenhouse gas assertions*. NSF used the requirements and guidance of the CDP and WRI/WBCSD documents as criteria for the verification.

- Verification of the organizational boundaries of the HTRG GHG inventory;
- Assessment of the capability of HTRG's management system and procedures to produce accurate, reliable and reproducible data and information;
- Determination of HTRG's conformity in all material respects with the requirements of *WBCSD/WRI GHG Protocol Corporate Standard (Revised Edition, 2004)*;
- Reviewing the basis for and results achieved from the calculated emissions/removals of CO_2, CH_4, and N_2O through performing tracing calculations from selected records (either specific plots, properties or by regions);
- Reviewing the supplemental documentation regarding the LiDAR collection and modeling methods used to derive stand volumes for the Australian and New Zealand ownerships.
- Reviews of their estimates of data forest removals of CO_2 by constructing per-hectare calculations of their data to compare with literature values (e.g., standing live tree carbon, root expansion factors, forest floor and woody debris);

- Interviewing personnel from HNRG and their third-party GHG management consultants and reviewing relevant documents and records.

VERIFICATION FINDINGS

No material misstatements were identified by NSF in this verification engagement.

The calculations of direct emissions appeared to be appropriately quantified based on detailed activity records from fuel purchase receipts, hours of vehicle use, fertilizer purchases, and hectares of prescribed burning. These activities appeared to be properly scaled to emissions using emission factors from cited sources.

The lack of Scope 2 emissions appeared to be reasonable given the nature of the forestry sites where infrastructure is not typically located.

The Scope 3 emissions appear to only include a portion of all possible indirect emissions. However, exclusions were disclosed specifically in Table 3 of the methods document. These cited exclusions were mainly emissions from contractor vehicles transporting fertilizer, workers/machinery, aggregate and logs to and from forest sites. The rational given was that these were outside of the established Scope 3 boundary, and that reporting of Scope 3 emissions is entirely voluntary under the GHG Protocol Corporate Accounting standard.

Sources, sinks and pools for forest regions were well described. Dead wood and understory biomass were excluded from non-North American lands as those forests were mostly plantations that did not carry very much dead standing and understory. Their exclusion was conservative in that it underestimated forest carbon in those excluded pools.

Harvested wood products that stored carbon long-term and were counted as a storage pool appeared to be properly calculated using mill efficiencies and decay factors from well-documented sources. Excluded were estimates of waste from wood products that go to landfills and could be counted as a long-term carbon storage pool. The rational given was that the emission factors for CO_2 and, specifically, CH_4 are not yet well established.

Forest areas were presented as both total area and forest area. Upon interviews, it was explained that total area included all lands owned or managed, and this includes non-managed forest lands. Non-managed lands may be roads, riparian corridors, or set-aside forests that are preserved from harvests. Carbon calculations were based on the managed forest areas. Forest areas presented in Table 14 of the methods document matched those reported on the HTRG.com/about/website.

Forest standing volume was presented, and this is also a very important input variable in calculations of forest carbon. Supplemental documentation was provided per NSF's request summarizing the LiDAR collection and modeling methodology, field data collection, and volume calculation methodology. While no data subsets were provided, and hence NSF cannot quantitatively verify volume estimates, the methodologies appear consistent with methodologies of other similar projects. The LiDAR modeling methodology and summary statistics in particular show reasonable levels of root mean square error, R2 estimates, and a thorough assessment of predictors. Field inventories produced a volume within 10% of the actual volume at a 95% confidence interval. Volumes were calculated using a variety of commonly used region-specific equations.

Steps taken to check data and calculations were described. Activity data were collected at sites on standardized forms. The data checks and calculations appeared to be mostly conducted by HTRG and Delphi and Finite Carbon during the summarization and calculation at the central offices. The data appeared to be well organized and only a few errors were observed. There did not appear to be a procedure in place to check on accuracy and completeness of the activity forms from field sites, however.

During the course of the verification engagement, several clarification questions were forwarded to Delphi and Finite Carbon. This resulted in planned updates and edits to their methods document and carbon calculation sheets.

NSF's recommendations include:

The equation used to convert growing stock volume to stand carbon (Equation 21 of the Methods document) is perhaps the most important part of the estimation of forest carbon from volume. It is recommended to explain the derivation of the coefficients A and B for readers and perhaps comment on its accuracy.

The Dashboard summary file provides forest carbon storage by properties and by year. It also contains estimates of wood products stored and non-biological emissions (Scopes 1 and 3). The sum of these is the net GHG emissions. It is recommended that these be given greater emphasis as the source of the final GHG reports.

Volume data on forest properties were provided and these are very important input values for estimating forest carbon stocks. There was no information about how volume data were collected and their accuracy or precision. It is recommended that background on this data set be provided so as to give greater confidence to the forest carbon estimates.

Preparation of a more detailed description of quality assurance/quality control procedures applied to the HTRG GHG inventory is recommended, particularly relating to the collection of data from the field sites.

CONCLUSION

Based upon the above, NSF has concluded that there is no evidence that HTRG's reported emissions/ removals of CO_2, CH_4, and NO_2 for the year ending 31 December 2020 are not, in all material aspects, fairly stated in accordance with the criteria referenced above.

APPENDIX A: NSF GHG VERIFICATION PLAN

Hancock Timber Resource Group (HTRG)	**FRS #:**	C0588203
Kim Mattson	**Task #:**	T6736451
Kyle Arvisais	**Date (current rev):**	7-Jun-2021
	Initials indicating Lead Verifier approval of plan:	kgm

Greenhouse Gas Emissions Verification of 2020 Scope 1, 2, and 3 emissions reported to CDP

verify the 2020 emissions year (January 1, 2020 to December 31, 2020) of Hancock Natural Resource Group's GHG inventory

Entries are required for all scope elements a-e.

Organizational boundaries or the GHG project and its baseline scenarios

HNRG directly operates forest lands in five countries: Australia, 828,042 ac.; Canada, 49,352 ac.;

Chile, 183,130 ac.; New Zealand, 429,880; and the United States, 3,341,211 ac.

Physical infrastructure, activities, technologies and processes of the organization or the GHG project

HTRG is an operating division of, and thus wholly owned by, Hancock Natural Resource Group (HNRG), which in turn is a wholly-owned subsidiary of Manulife Financial Corporation.

HTRG activities include work undertaken in corporate office buildings and at various timberland investment properties in different regions across the globe.

The organizational / legal structure for HTRG varies depending on the country. The diagram on right illustrates this organizational structure.

GHG sources, sinks and reservoirs

Scope 1, 2 and 3 and optional forest removals. Scope 2 is not applicable as there is no electricity at forest field sites, Corp use is reported elsewhere.

Optional sink (removals) is reported as forest accumulation plus harvested wood products in use. Landfills are not reported.

Types of GHGs

CO_2, CH_4, N_2O as CO_2 e

Time periods

2019- 2020 (2020 base year).

ISO 16064-3, guidance of the WRI GHG Protocol rev ed.

10%

	Reasonable
x	Limited

Engagement: Greenhouse Gas Emissions Verification of 2020 Scope 1, 2, and 3 emissions reported to CDP

Day, DD-MM-YYYY

3/5/2021	Earlier submissions of partial docs by Delphi Group
4/10/2021	Availability of docs for dow nload
4/12/2021	Phone discussion w ith John S about the project and WRI guidance docs for review
4/15/2021	Dow nload of docs and start of review
4/19/212	Phone call w ith Steve Boles re strategies for review and reporting
4/20-4/22	review of docs and pertinent w ebsites
4/23/2021	Conference call w ith Stephan Wehr of Delphi, Tim McAbbe and Sonny of Finite and Devon of Hancock re tour of documentation
4/24/2021	Plans w ith John S and Kyle A re allocation of time and reviews for raw forestry data
4/24/2021	Start of completion of NSF w orksheet for verification steps and details
4/30/2021	Completion of document review
5/1-5/7/2021	Exchange of Issues Log and phone conferences over data and questions
5/7/2021	First draft of statement and report
5/7/201	Request for more information about forest volume how derived and errors/accuracy
5/9-5/25/2021	Break for field w ork on other projects
5/20/2021	Review of LiDAR methods by KV biometrician
5/26/2021	Corrections to forest removals received as downward estimate from -9.8 -6.4 million MTCO2
6/7/2021	Draft of report and statement

APPENDIX B: ISSUES LOG

#	Type	Finding/Clarification	Audit Evidence	Responsible Party Action	LV Conclusion
1	R	Additional country information is seemingly inadvertently included in ***Carbon Pools/Raw date/2019/ HVP/Adjusted HTRG_Carbon…*** has extra tabs (e.g. NZ Chile…)	Tabs for NZ and Chile do not appear to belong in this file.	All regions received the same input template file during the data collection phase hence the inclusion of other regions. NZ and Chile tabs have now been removed, and saved as an updated version of the file under the same SharePoint folder originally shared with NSF.	Closed
2	R	Methodology document has been reviewed and a set of comments and edits have been forwarded to Stephan Wehr.	Comments were largely for readability. The reference to whether or not landfill wood is included per page 27 or excluded per page 9 should be addressed.	Thank you for the comment - we will be addressing, but at a later date.	Closed
3	R	Methodology document eqn 21 appears to be the most important equation for estimating forest standing C stocks. However, the document is not entirely clear regarding the source of the coefficients A and B. A statement of their use and their source in this document would be helpful.	I was able to link to the EPA document and after some searching found the basis for the coefficients on table A191. However, that table did not explain the source of these coefficients. However, the text associated with the table led me to the Smith and Heath publications which were quite good at explanations.	Thank you for the comment - we will be addressing, but at a later date.	Closed
4	R	It would be helpful to have a summary of forest C by country showing hectares C in pools, and wood products. It would also be useful to display these C values per ha as a way to get a feeling of their comparability and to see if the values look reasonable.	The Dashboard summary by client is close to this. However, client is not defined and properties are too detailed.	A country summary Excel file has been uploaded to the "Carbon Pools" subfolder within the SharePoint folder previously shared with the NSF with information requested.	Closed
5	CR	Please explain the percent of ownership for the client tabs on the Dashboard and why that is used in the carbon calculations.	This explanation should be attached to the Dashboard files/tabs.	The %s are only used for client-specific reporting on the dashboards where a client will want to see results based on their ownership share. Not used for the formal HTRG GHG inventory reporting based on the operational control boundary approach.	Closed

6	CR	Please provide a LiDAR Dataset: A point cloud, which is a dataset of points located on a XYZ axis.	Our forest biometrician would like to know the density of the point cloud (#points/area).	HNRG is not able to share the point cloud data given the enormity of the datasets and reliance on imputation and plot data to derive value. Australasian managers target a minimum density of 8-12 pulses/m2 and average 2-3 returns per pulse. As scanning technology improves it is anticipated future collections will increase to ~ 20 pulses/m2 with even greater returns.	Closed. Methods were evaluated by NSF biometric and found to be satisfactory.
7	CR	Regarding your model, please provide information about how information gathered by the LiDAR data is translated into tree volume.	LiDAR can detect things like light reflectance, height, crown width, tree density, and/or other natural indicators. Our biometrician would like to see how these are used to estimate volume	Australasian managers employ an area based approach to determine inventory, but are likely to follow the North American strategy (In development, not yet deployed) of individual tree models given improved point cloud density (above point). LiDAR Yield Tables are built upon an Area-based approach (ABA): Aerially captured LiDAR data is interpreted for each grid (usually around 20-25 meter cell size) across a survey area, plus on-ground measurement of trees within a sample of grids, are used to model inventory plot estimates in every grid across the survey area. The grids represent the population, and the reference plots are the sample. The relationship between the LiDAR metrics for a grid cell and the inventory plot measurement data is used to interpolate the relationship across the landscape. Hyper-precise plots are installed in the field using field measurements or SLAM (Hovermap). LiDAR based yield imputation employs Machine Learning (ML) and nearest neighbor algorithms to build up yield estimates. Results have greatly surpassed prior estimates with harvest reconciliation in the range of 98%+ to actual.	Closed. Methods used to derived and evaluate LiDAR data were evaluated by Kyle Arvisais NSF biometrician and were satisfactory.

8	CR	Please provide information about how the model is trained.	Regarding the training Data: While LiDAR can collect quite a bit of information, the model used to estimate volume must be trained so it knows how to translate the data the LiDAR collected. Usually this is done by collecting LiDAR data from an area that also has inventory data collected from a ground crew. Then you can compare volume estimates from the ground data to the LiDAR and make adjustments to the model.	See above.	More information provided. Closed.
9	R	Please consider adding more guidance for the data trail. I see the readme file is a good example of this. Perhaps they can be built right into the various spreadsheets at the tops and into the individual tabs. The main thing a reviewer wants to do is to start at the final estimates and work backwards through the supporting data and calculations to see how the final data were arrived at.	The carbon calculators are very complex with many columns of data. The data dictionary you provide is very useful as is the Read me file. However, a set of statements at the top of each data set (e.g., tabs) in the files that guide the reader/reviewer as to how best to navigate the spreadsheet. For example, a statement of what the spreadsheet was create for (what it serves) and where to start looking at the sheet. This may typically be the right-most columns where data are often summarized in the desired units. Many of the files and tabs are less important to read initially and guidance at the top would allow readers to ignore these at first. Also clear definitions of the organization of the records would be helpful. That is, description of the left most labels and record names. Pivot tables are very useful but should be clearly labeled.	Thank you for the comment - we will be addressing, but at a later date.	Closed

10	CR	Please provide a shapefile/kml/geojson of land holdings used to estimate carbon stocks.	These data will be used to visually inspect random stands/parcels and qualitatively assess whether the carbon estimate for that stand/parcel seems reasonable according to recent aerial imagery.	While Inventory is maintained at the stand or strata level across our operations, this inventory is aggregated for carbon reporting - this is done into buckets of similar species/forest types, age classes, etc. As a result, the link betw een the stand level inventory and the carbon inventory is broken. As such spot checking at the stand level w ill not be possible. I have included shapefiles for some select properties in the case you w ould like to scan the landscape regardless (see the new subfolder "ShapeFiles" within the SharePoint folder previously shared), and can provide additional sets upon request. Unfortunately, an aggregated shapefile for all managed areas w ould take some days to assemble fully.	Closed
11	CR	The Dashboard file is much appreciated. However the totals using the HTRG total (all assets under management) holdings do not match the sums of the individual regions (Australia, NZ, US regions etc.). Is there something extra included in the HTRG all assets?	The sums of the values in the Dashboard by region (hand sum) are slightly less than those of the Total or All Assests under holdings. I have attached a separate excel file as a tab here to show my checks.	The dashboard w as incorrectly counting only one of the tw o Australian properties. This did not affect the final "inventory results summary - corrected signs", only the dashboard w as affected. There is a new version of the dashboard uploaded to the sharepoint portal for review ("HTRG Calculator Dashboard - Updated May 5 2021.xlsx"). The regional dashboard now contains options for Australia Queensland and Australia Victoria separately. With respect to the spreasheet you shared ("Check of C measures by region") - this update w ould replace the Australian values, and brings the total discrepancy down to 0%.	Closed

12	CR	The Dashboard total C storage indicates change from 2019 to 2020 as both a biological change and resource change. Please explain what these mean.	This is part of my quandary as to how removals were calculated. See next issue.	On the dashboard, the "resource change" value represents the sum of what is referred to as "Area Based Resource Changes" (farea in equation 1 in the methodology document) and Direct Measurement Resource Changes" (fmethod in equation 1 in the methodology document) on the "Carbon Summary 2019-2020 Change" tab. Both of those are correction factors to the prior year (2019 in this case) year end carbon stocks in the different pools, which are applied to make sure there is an apples to apples comparison possible between the end 2020 and end 2019 carbon stocks in order to calculate an accurate carbon stock change = net emission or removal. See equation 1 in the methodology document and the associated explanation of the parameters for more details. Note that the dashboard is set up to present values / tell a story in a way that HTRG expects will be most useful for its clients, and is not meant to present the official HTRG-wide WRI-compliant inventory results. In reality, the 2020 value is not calculated as the sum of the three values to the left of it on the dashboard, rather the 3rd value from left to right ("change in on-site forest carbon") is calculated (on the "Carbon Summary 2019-2020 Change" tab) as [2020 values minus (2019 values + the resource change values)]. -9.8 million MT (i.e. 9.8 million MT of removals) is the sum of all values in column AH on the "Carbon Summary 2019-2020 Change" tab in "HTRG Calculator Dashboard.xlsx" (now updated to "HTRG Calculator Dashboard - Updated May 5 2021.xlsx") plus the removals assigned to the HWP pool which is the sum of values from column AL from the same tab. Each of the property-specific values in column AH is the sum of the results for each of the individual in-forest carbon pools for that property in columns AD to AG. Note that in the calculator dashboard file, net removals for in-forest carbon pools and HWPs are being expressed as positive numbers and net emissions as negative, but the non-biological emissions are being reported as positive numbers, so this is something we would ideally adjust in future so that there is a consistent + - sign usage throughout all files.	Closed
13	CR	Please explain from where the calculated -9.8 million MT CO2e removals for the forests as shown on the 2020 HTRG GHG Inventory results summary come.	The Dashboard summary by region or by total HTRG holdings show forest inventories for 2019 and 2020, but these are all decreasing. Harvested wood products do not appear to make up the difference. (note that the -9.8 million removals for forests was revised downward to -6.4 million on May 26, 2021 as a result of re-evaluation of how harvest volumes were included in the Australian data set and how stand age calculations were done on some of the South US tracts--see email from Stephan Wehr May 26, 2021).		Closed new Dashboard resolved this. And new estimates of -6.4 million were provided on May 20, 2021.

APPENDIX C: VERIFICATION STATEMENT

Greenhouse Gas Validation/Verification Program

Verification Statement (GHG Inventory)

Independent Assurance Statement for Hancock Natural Resource Group on its emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from operation activities and removals of CO_2 by forest holdings for the year ending 31 December 2020.

To the Management of:

Hancock Natural Resource Group

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Boston, MA, 02116-5010

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Brandon Lewis

Manager of Sustainability

Hancock Natural Resource Group

Boston, MA

Introduction

Hancock Natural Resource Group (HNRG) engaged NSF to verify its emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from operational activities and removals of CO_2 by forest holdings. Reporting of emissions was in accordance with the requirements of the WBCSD/WRI GHG Protocol, Chapter 9, for the year ending 31 December 2020.

HNRG is a registered investment advisor and wholly owned subsidiary of Manulife Financial Corporation. HNRG is comprised of two core businesses: Hancock Timber Resource Group (HTRG) which manages timberland investments and Hancock Agricultural Investment Group (HAIG) which develops and manages farmland investments. This statement covers the emissions report for the forestry sector of HNRG (HTRG).

HTRG reported direct emissions (Scope 1) as CO_2 from owned equipment and vehicles, as N_2O from fertilizer use, and as CH4 and N_2O from prescribed burning in Table 1 as 76,753 metric tons of CO_2 equivalent (Mt CO_2e). No Scope 2 energy related emissions were reported as no electricity is used on remote forest sites and corporate office use was reported elsewhere. Indirect emissions (Scope 3) of CO_2, CH_4 and N_2O were reported from contractor-owned equipment and vehicles as 159,617 Mt CO_2e. Table 1 shows that removals of CO_2 by the forest were substantially larger than all GHG emissions (calculated as CO_2equivalents: 236,370 emissions versus -6,621,235; removals are shown as negative emissions). This resulted in a negative emission or removal of 6,384,865 Mt CO_2e.

Table 1: 2020 HTRG GHG inventory results.

	CO_2	CH_4	N_2O	CO2e	% of Scope Category	% of Total Scope 1,2,3,Optional
Scope 1						
S1 – Fuel combustion emissions (owned equipment and vehicles)	3,110	0	0	3,142	4%	0.0%
S2 – Nitrous oxide emissions (both direct and in-direct emissions) related to fertilizer application			75	22,411	29%	-0.4%
S3 – Methane and nitrous oxide emissions from prescribed burning		1,234	68	51,200	67%	-0.8%
Scope 2						
Not Applicable						
Scope 3						
S6 – Fuel combustion emissions (contractor equipment and vehicles)	157,452	5	7	159,617	100%	-2%
Optional Information*						
P1 – Live tree biomass pool	-4,670,885			-4,670,885	71%	73.2%
P2 – Standing dead biomass pool	156,409			156,409	-2%	-2.4%
P3 – Understory biomass pool	3,180			3,180	0%	0.0%

P4 – Debris and below ground dead biomass pool	807,670			807,670	-12%	-12.6%
P6 – Harvested wood products pool	-2,917,609			-2,917,609	44%	46%
Subtotal Scope 1 + 2				**76,753**		-1%
Subtotal Scope 3				**159,617**		-2%
Subtotal Optional Information	**-6,621,235**			**-6,621,235**		104%
Total Scope 1, 2, 3, + Optional Information				**-6,384,865**		100%

*CO2 emissions from prescribed burning of forest biomass are not explicitly calculated, but are implicitly included in the net emissions or removals calculated for the debris and below ground dead biomass pool

It was the responsibility of HTRG/HNRG management to quantify its emissions CO_2, CH_4, N_2O and removals of CO_2 and report them. It was the responsibility of NSF to express our conclusion on the reported emissions and removals based on the work described below.

Basis for Our Work

HTRG reported its emissions CO_2, CH_4, N_2O and removals of CO_2 in accordance with the requirements of WRI/WBCSD, The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, Revised Edition 2004. The scope of HTRG's reporting was worldwide at operations located in Chile, New Zealand, Australia, and North America. The objective of this verification was to determine with limited assurance whether HTRG had fairly stated its CO_2, CH_4, N_2O and removals of CO_2 as described in its methods document **HTRG Operational GHG Inventory Methodology Document - Apr 13, 2021** and results in **2020 HTRG GHG Inventory Results Summary – Updated 05202021.xls** as shown in Table 1.

Quantification Methodologies and Emissions Factors Used by NSF

NSF's verification scope included a review of the reasons for selecting quantification methodologies and emission factors, the appropriateness of their use, and explanations for any changes to quantification methodologies and emission factors from those previously used by HTRG.

Impact of Uncertainty

To the extent that HTRG has included a description of the impact of uncertainties on the accuracy of the GHG emissions and removals data that it reported, NSF has reviewed it.

Base Year and Base Year Adjustments

HTRG's designated base year for GHG inventory reporting is 2020. As this was the first year of inventory emissions reporting to be verified by an independent third party, the scope of this verification engagement included review of the explanations provided by HTRG for its selection of base year.

Criteria Used for Verification

We conducted our work in accordance with the requirements of ISO 14064:2006, Part 3, *Greenhouse gases – Specification with guidance for the validation and verification of greenhouse gas assertions*. NSF obtained HTRG's reported emissions from Delphi's SharePoint site on April 15, 2021 and evaluated the reported assertions for conformity with the requirements WBCSD/WRI GHG Protocol (Chapter 9).

Inventory reports were considered accurate if they varied by no more than 10 % from a complete statement of the organization's emissions CO_2, CH_4, N_2O and removals of CO_2.

Work Conducted

NSF's verification approach is risk-based. It draws upon our understanding of risks to fair statement of reported emissions and the operation of controls to reduce such risks. Based upon a risk-based sampling plan, we have tested HTRG's assertions related to its reported emissions for the year ending 31 December 2020.

We planned and performed our work to obtain all the information and explanations that we considered necessary for us to give limited assurance that there is no evidence that HTRG's emissions CO_2, CH_4, N_2O and removals of CO_2 data for the year ending 31 December 2020 were not fairly stated.

Our work included:

- Verification of the organizational boundaries of HTRG's GHG inventory.
- Assessment of the capability of HTRG's management system and procedures to produce accurate, reliable and reproducible data and information;
- Determination of HTRG's conformity in all material respects with the requirements WBCSD/WRI GHG Protocol Corporate Standard (Revised Edition, 2004);
- Reviewing the basis for and results achieved from the calculated emissions of emissions CO_2, CH_4, N_2O and removals of CO_2.
- Reviewing the basis for and results achieved from the reported HTRG's sequestration of carbon in its forests.
- Interviewing personnel by phone and emails, reviewing descriptions of operations, and reviewing relevant documents and records.

Conclusion

Based upon the above, NSF has concluded that there is no evidence that HTRG's reported emissions of CO_2, CH_4, N_2O and removals of CO_2 for the year ending 31 December 2020 are not, in all material respects, fairly stated in accordance with the criteria referenced above.

NSF

NSF Certification, LLC
Ann Arbor, Michigan
USA

13 June 2021

Greenhouse Gas Validation/Verification Program

ANSI ACCREDITED
ISO 14065
Greenhouse Gas Validation and Verification Body
#1181

APPENDIX D: CONFLICT OF INTEREST

Greenhouse Gas Program Inventory Conflict of Interest Assessment Form

Use this form to record evaluation of COI only where the GHG program does not require submission of a program-specific form (e.g. ISO 14064-1, GHG Protocol).

NSF management shall complete this form with respect to any prior work conducted for the GHG client or responsible party. The lead verifier shall complete this form on his/her behalf and, after consultation, on behalf of the verification team members. Once completed, the lead verifier shall forward a copy to the GHG program manager and retain a copy of this form to be filed with the applicable audit package.

Date	01/11/2021
Lead Verifiers	Kim Mattson for Forestry and Stephen Boles for Agriculture
Telephone	Kim Mattson: 530-925-5943, Stephen Boles: 519-872-6250
Email	Kim Mattson: mattson@ecosystemsnw.com, Stephen Boles: sboles@aol98.com
Mailing address	Kim Mattson: Mount Shasta, California Stephen Boles: North Kitchener, Ontario, Canada
Organization Issuing Inventory	Hancock Natural Resource Group
Issuing Facility Name	Multiple properties in the agricultural and forestry sectors
Issuing Facility Location	Australia, Canada, United States, Chile and New Zealand
Org. or Parent is Publicly Traded	☒ Yes ☐ No *Manulife Financial Corporation is the parent corp.
Inventory Document Title	TBD. The verification scope is the 2020 GHG emissions and removals of Hancock Natural Resource Group properties in the agricultural and forestry sectors under HNRG's operational control (scope 1 and 2) and properties leased to third parties (scope 3).
Inventory Issue Date & Version	TBD. Emissions and removals for the calendar year 2020
Inventory Criteria	☐ ISO 14064-1 ☒ GHG Protocol ☐ Other (Specify):
Organization Contact	Brandon Lewis
Title	Manager of Sustainability
Telephone	617-747-1532
Email	blewis@hnrg.com
Mailing address	197 Clarendon Street, Boston, Massachusetts
Technical Consultant	N/A
Title	N/A
Telephone	N/A
Email	N/A
Mailing address	N/A
Other Parties w/ a Mat'l Interest	N/A
Title	N/A
Telephone	N/A
Email	N/A
Mailing address	N/A

Part A: Schedule and Planning of Verification Activities

1. Total number of facilities in inventory: Agricultural sector has 227 properties in Australia, Canada, and the United States. Additionally, there are 129 leased properties in Australia, Canada, and the United States. HNRG directly operates forest lands in five countries: Australia, 828,042 ac.; Canada, 49,352 ac.; Chile, 183,130 ac.; New Zealand, 429,880; and the United States, 3,341,211 ac.

2. Number of facilities expected to be visited for verification: No site visits
Please list all facilities to be visited. Add boxes as needed to include all facilities.

Name of Facility 1	
Address	
Anticipated Date of Visit	

Name of Facility 2	
Address	
Anticipated Date of Visit	

Name of Facility 3	
Address	
Anticipated Date of Visit	

Name of Facility 4	
Address	
Anticipated Date of Visit	

3. Provide anticipated dates for each planned verification activity.

First Verification Meeting	
Site Visit Date(s)	N/A
Final Verification Meeting	
Completion of verification activities	

4. Will an ANSI witness assessment be conducted in conjunction with the verification activities?

☐ Yes ☒ No

5. Provide a brief description of planned verification activities specific to this inventory. Your response should provide a general overview of the scope and breadth of verification activities. This may include, but should not be limited to, plans to interview which staff, types of records, emissions reductions that will be reviewed, etc.:

Document Review. In this stage, verifiers will review documents provided by HNRG that explain inventory quantification processes and controls, and both 2019 and 2020 emissions inventory results. The Document Review stage includes a strategic analysis and a risk assessment. These outputs inform NSF's verification plan and sampling plan.
On-site Planning Audit. In this stage, verifiers continue to obtain understanding HNRG's control environment, including any necessary interviews with personnel needed to complete our understanding of inventory quantification methods. The interviews will be conducted remotely using information and communication technology (videoconferencing).
Verification Audit. The verification audit stage, also performed remotely, focuses on the elements of the GHG inventory as a whole and is not as detailed as a reasonable level of assurance audit. NSF will design verification activities to address all items included in the scope of verification with a focus on those areas where we believe material misstatements are most likely to arise.

Part B: Evaluation of Potential for Conflict of Interest

1. Has the verification body or any staff member to be assigned to the proposed verification (including while employed with another organization) ever provided any additional GHG verification services for this Organization? (I.e. for another GHG program) If yes, complete the table below.

☐ Yes ☒ No

Emissions Year Verified	Dates of Service (mo/year-mo/year)	Description of Services	Value of Prior Services	% of NSF Total Revenue

2. Excluding the proposed GHG inventory verification services, has NSF International or a member of the verification team provided any of the following non-inventory services for the organization within the last five years?

Yes	No	Activity
☐	☒	Designing, developing, implementing, reviewing, or maintaining a GHG inventory or GHG information or data management system for air emissions;
☐	☒	Developing GHG emission factors or other GHG-related engineering analysis that includes GHG inventory-specific information;
☐	☒	Designing energy efficiency, renewable power, or other projects which explicitly identify GHG reductions or GHG removal enhancements as a benefit;
☐	☒	Designing, developing, implementing, conducting an internal audit, consulting, or providing technical services for a GHG emissions inventory;
☐	☒	Preparing or producing GHG-related manuals, handbooks, or procedures specifically for use with the Organization's GHG inventory or directed actions;
☐	☒	Providing GHG inventory-related training to the Organization, except where the training is confined to the provision of generic information that is freely available in the public domain (i.e. the trainer does not provide organization-specific advice or solutions).
☐	☒	Appraisal services of carbon or GHG liabilities or assets;
☐	☒	Brokering in, advising on, or assisting in any way in carbon or GHG-related markets;
☐	☒	Directly managing any health, environment or safety functions for the Organization;
☐	☒	Bookkeeping or other services related to the accounting records or financial statements of the Organization;
☐	☒	Third-party auditing of information systems unless those systems will not be reviewed as part of the inventory verification process;
☐	☒	Appraisal and valuation services, both tangible and intangible;
☐	☒	Fairness opinions and contribution-in-kind reports in which the verification body has provided its opinion on the adequacy of consideration in a transaction, unless the information reviewed in formulating the Verification Statement will not be reviewed as part of the verification services;
☐	☒	Any actuarially oriented advisory service involving the determination of amounts recorded in financial statements and related accounts;
☐	☒	Any internal audit service that has been outsourced by the Organization that relates to the Organization's internal accounting controls, financial systems, or financial statements, unless the systems and data reviewed during those services, as well as the result of those services will not be part of the verification process;
☐	☒	Acting as a broker-dealer (registered or unregistered), promoter, or underwriter on behalf of the Organization;
☐	☒	Any legal services;
☐	☒	Expert services to the Organization or a legal representative for the purpose of advocating the Organization's interests in litigation or in a regulatory or administrative proceeding or investigation, unless providing factual testimony.

If the answer to any of the above is "Yes", the conflict of interest risk is "High".

3. If services other than those listed in the table above have been provided, describe these non-GHG services in the table below. Past services only include services provided within the last five years. Include work performed by subcontractors on the verification team.

Service	Location of Service	Name of Person(s) Providing Service	Dates of Service (mo/year-mo/year)	Dollar Value of Work	Related to GHG Work?
Fish surveys	Independence, OR	Kim Mattson	3/20-5/20	$12000	No

5. What is, or was, the nature of the relationship between any part of NSF and the organization contracting for the work? No relationship. Work was performed by Mattson under his company, Ecosystems Northwest.

a. Do NSF and the project developer share any formal affiliation or management?

☐ Yes ☒ No

If yes, please describe:

b. Are NSF and the organization currently engaged in any joint ventures or partnerships?

☐ Yes ☒ No

If yes, please describe:

c. Are there any other business relationships not captured by (a) or (b) above?

☐ Yes ☒ No

If yes, please describe

6. List each staff member to be assigned to the proposed verification, identifying any previous work these individuals have conducted for the Organization including while in the employment of other organizations. Please copy the table as many times as necessary to identify all staff who will be assigned to the verification.

Independent Reviewer Name	Matthew Lutes
Telephone number	530-859-1788
Email Address	mlutes@nsf.org
Business location (city, state)	Ann Arbor, Michigan
Previous work for project Developer (description of services)	None
Date of Services (month/year to month/year)	
Employer at time of service:	

Lead Verifier 1 Name	Kim Mattson
Telephone number	530-925-5943
Email Address	mattson@ecosystemsnw.com
Business location (city, state)	Mount Shasta, California
Previous work for project Developer (description of services)	None
Date of Services (month/year to month/year)	
Employer at time of service:	

Lead Verifier 2 Name	Stephen Boles
Telephone number	519-872-6250
Email Address	sboles@aol98.com
Business location (city, state)	North Kitchener, Ontario
Previous work for project Developer (description of services)	None
Date of Services (month/year to month/year)	
Employer at time of service:	

Verification Team Member 1 Name	Kyle Arvisais
Telephone number	201-558-0245
Email Address	Kyle.arvisais@maine.edu
Business location (city, state)	Woodbury, Connecticut
Previous work for project Developer (description of services)	None
Date of Services (month/year to month/year)	
Employer at time of service:	

Verification Team Member 2 Name	
Telephone number	
Email Address	
Business location (city, state)	
Previous work for project Developer (description of services)	
Date of Services (month/year to month/year)	
Employer at time of service:	

Part C: Proposed Mitigation Plan

Do you believe that your risk of COI is medium or high and that mitigation if required?

☐ Yes ☒ No

If yes, please complete and attach the Mitigation Plan form.

Part D: Written Attestation Regarding Conflict of Interest

The undersigned, on behalf of NSF, represents and warrants that information provided herein are true and correct, to the best of my knowledge.

I understand and acknowledge that if any of the above representations require amendment due to a material change or discovery of facts, I will note such changes in an amendment to this document. (Note: material changes do not include adjustments to the dates of verification services or minor changes to planned validation or verification activities).

LEAD VERIFIER 1

Authorized Signature
Title:Lead Verifier
Date:1/16/21

LEAD VERIFIER 2

Authorized Signature
Title:
Date:

Based on the information provided, we have determined that our risk of conflict of interest is:

☐ Low ☐ Medium ☐ High

Part E: Acceptance of Attestation Regarding Conflict of Interest

The undersigned has reviewed and approved the submitted attestation concerning the risk of conflict of interest in this engagement with respect to NSF as a validation/verification body and with respect to the validation team or the verification team

FOR NSF International

Authorized Signature:
Title: NSF Sustainability General Manager or Designee
Date: