State of California
California Environmental Protection Agency
California Air Resources Board
U.S. FOREST OFFSET PROJECT DATA REPORT
INITIAL REPORTING PERIOD - IMPROVED FOREST MANAGEMENT

U.S. FOREST OFFSET PROJECT DATA REPORT INITIAL REPORTING PERIOD - IMPROVED FOREST MANAGEMENT

OPR Staff Use Only	Date Report Received:	OPR Tracking Number:	Date Report Reviewed:	*OPR Staff Use Only*

*Entities submitting the project's first Offset Project Data Report must submit the information requested in both **Initial Reporting Period** and the **Annual Reporting** forms to the appropriate Offset Project Registry. For every reporting year thereafter, submit only the information requested in the Annual Reporting form.*

PART I. ENTITY SUBMITTING REPORT

Is this form being submitted by the Offset Project Operator (OPO) or by the Authorized Project Designee (APD)? *Note: The person completing this form should be an OPO/APD employee.*

☐ OPO ☒ APD

Name of Person Completing Form:		Organization, if applicable:
James D. Clark		NCRM, Inc.
Date Form Completed:	**Phone Number:**	**Email Address:**
09/09/2015	707-485-7211	jimclark@ncrm.com

PART II. OFFSET PROJECT INFORMATION

Offset Project Name:	OPR Project ID#:	ARB Project ID# (if known):
Brushy Mountain	CAR1095	CAFR5096

Offset Project Commencement Date:	First Reporting Period Start Date:	First Reporting Period End Date:
January 17, 2014	January 17, 2014	September 30, 2014

Provide an explanation and justification for the commencement date. Specify the action(s) that identify the offset project commencement date.
The date that field work on the inventory for the Project began is the offset project commencement date.

Optional: Provide the nearest town/city to the Project Area:
Willits is approximately 20 miles south of the Project Area

PART III. OPO/APD INFORMATION

A. OPO

OPO Name:			OPO's CITSS ID#:	
Coastal Forestlands, LTD., a California Limited Partnership			CA 1 7 6 9	
Mailing Address:	**City:**		**State:**	**Zip:**
PO Box 537	Willits		CA	95490
Contact Person:	**Phone Number:**	**Email Address:**		
Lori Withy	(707) 459-3096	loriwithey@sbcglobal.net		

B. APD (if applicable)

☐ No APD/Not Applicable

APD Name:			APD's CITSS ID#:	
James D. Clark			CA 1 5 6 9	
Mailing Address:	**City:**		**State:**	**Zip:**
PO Box 435	Calpella		CA	95418
Contact Person:	**Phone Number:**	**Email Address:**		
James D. Clark	(707) 485-7211	jimclark@ncrm.com		

PART IV. LAND OWNERSHIP

A. Is the Offset Project Operator (OPO) the owner in fee for the Project Area?
Further documentation is required for all projects. Submit as attachment labeled "Attachment A." See Part X of this OPDR document for more information.
If "no," explain how the entity identified as the OPO has the right to undertake and list the project.

☐ Yes ☒ No

The OPO, Coastal Forestlands, Ltd., a California Limited Partnership, is the majority landowner of the Project Area (13,733 acres), with the remaining 2,680 acres being owned by Richard L. Padula. Richard L. Padula by written agreement has authorized Coastal Forestlands, Ltd. To act as the OPO for his 2,680 acre portion of the Project Area.

B. Optional: List all Forest Owners. This includes owners in fee as well as third parties with existing property interests within the Project Area that affect the trees and standing timber located in the Project Area (e.g. mineral rights, timber rights, easements, rights of way, leases, etc.).

The OPO and Richard L. Padula are the only Forest Owners in fee and the only owners of property interests that affect the trees and standing timber located on the Project Area.

C. Does the offset project occur on public or private lands?
If the project occurs on public lands, proceed to questions C1 and C2. Otherwise, skip to question D. Further documentation is required if project occurs on public lands. Submit copies of documentation demonstrating explicit approval of the project's management activities and baseline, as well as the public vetting process used; attachment should be labeled "Attachment B." See Part X of this document for more information.

☒ **Private**
☐ **Public**

1. **Describe the public process that was used to evaluate the forest management activities and policy decisions concerning the offset project.**
   N/A
2. **Describe the explicit approval process used by the public entity to initiate and maintain this offset project, including the offset project's management activities and baseline.**
   N/A

D. Does the project employ a Qualified Conservation Easement (QCE)?
If employing a QCE, proceed to questions D1, D2, and D3. Otherwise, skip to question E. Supporting documentation for a QCE is required. Submit as attachment labeled "Attachment C." See Part X of this document for more information.

☐ **QCE**
☐ **Public Ownership**
☒ **N/A**

1. **Date that the QCE was recorded.**
   N/A
2. **Optional:** Is the project located in a state that requires third-party beneficiaries to sign the easement (i.e., to "accept and record that acceptance"), such as Arizona, Pennsylvania, or West Virginia?

   ☐ **Yes** ☐ **No** ☒ **N/A**
3. **Provide the terms within the easement that affect forest management.**
   N/A

E. Does the offset project occur on any of the following categories of land? (check all that apply)

☐ **Land that is owned by, or subject to, an ownership of possessory interest of a Tribe**
☐ **Land that is "Indian lands" of a Tribe as defined by 25 U.S.C. §81(a)(1)**
☐ **Land that is owned by any person, entity, or Tribe, within the external borders of such Indian lands**
☒ **None of the above**

If "none of the above," skip to Part V. Otherwise, proceed to Optional questions E1 and E2. Further documentation is required for projects occurring on land listed in the first three categories. Submit supporting documents as attachments labeled "Attachment D." See Part X of this document for more information.

1. **Optional:** Does a limited waiver of sovereign immunity between ARB and the governing body of the Tribe exist?

   ☐ **Yes** ☐ **No** ☒ **N/A**
2. **Optional:** Provide a description of land ownership within the Project Area.
   N/A

PART V. OFFSET PROJECT AREA

Maps depicting specific elements of the Project Area are required for all projects.
Submit supporting documentation as attachments labeled "Attachment E." See Part X of this document for more information.

Latitude of Offset Project Location:	Longitude of Offset Project Location:	Project Area Total Acreage:
39.6297	-123.258	16,412.83

A. Identify the assessment area (or assessment areas, if project crosses more than one) that contain Project Area lands and list the acreage of project lands within each assessment area.
See Addendum to OPDR V.A.

B. Identify and describe the governing jurisdiction(s) applicable to the Project Area.
See Addendum to OPDR V.B.

C. Describe how the Project Area was determined.
See Addendum to OPDR V.C.

D. Describe the existing land cover, and land use of the Project Area.
See Addendum to OPDR V.D.

E. Describe the forest vegetation types within the Project Area boundary.
See Addendum to OPDR V.E.

F. Describe the site classes within the Project Area boundary.
See Addendum to OPDR V.F.

G. Describe the land pressures and climate zone/classification applicable to the Project Area.
See Addendum to OPDR V.G.

H. Describe the historical land uses, current zoning, and projected land use within the Project Area and surrounding areas.
See Addendum to OPDR V.H.

I. Describe the forest conditions within the Project Area, including species composition, age class distribution, and management history.
See Addendum to OPDR V.I.

PART VI. OFFSET PROJECT ELIGIBILITY

A. Does the Project Area have a canopy cover that is greater than 10 percent?
Supporting documentation is required. Submit as attachment labeled "Attachment F." See Part X of this document for more information.
See Addendum to OPDR VI.A.

☒ **Yes** ☐ **No**

B. Optional: Are the associated project lands currently in compliance with all local, state, and federal regulatory requirements?

☒ **Yes** ☐ **No**

Optional: If no, provide an explanation of the non-compliance.
N/A

C. Does the entity submitting this report declare that the offset project has not and does not employ broadcast fertilization?

☒ **Yes** ☐ **No**

D. Indicate how the offset project meets the definition of Natural Forest Management per Table 3.2 in the Compliance Offset Protocol US Forest Offset Projects, October 20, 2011:

1. Native species:

a) Does the project consist of at least 95% native species based on the estimated sum of carbon in the standing live carbon pool? Improved Forest Management Projects are assessed using estimates of basal area per acre.
If "no," proceed to question 1b. Otherwise, skip to question D2.
See Addendum to OPDR VI.D.1.

☒ **Yes** ☐ **No**

b) Describe how the project will meet this requirement.
N/A

2. Composition of native species:

a) Does the Project Area naturally consist of a mixed species distribution where no single species' prevalence, measured as the percent of basal area of all live trees in the Project Area, exceeds the percentage value of standing live carbon shown under the heading 'Species Diversity Index' in the Assessment Area Data File?
If "no," proceed to questions 2b and 2c. Otherwise skip to question D3.
See Addendum to OPDR VI.D.2

☒ **Yes** ☐ **No**

b) Explain how the project will demonstrate a trend toward achieving the Species Diversity Index of native species and meet this requirement within 25 years.
N/A

c) If the Project Area does not naturally consist of a mixed species distribution: Will or have you provided a written statement from the government agency in charge of forestry regulation in the state where the project is located stipulating that the Project site is not capable of meeting the requirement of mixed species distribution?

☐ **Yes** ☐ **No** ☒ **N/A**

3. Distribution of age classes/sustainable management:

a) Indicate how the project will meet the requirement for sustainable management if regeneration or commercial harvesting is either planned or initiated within the Project Area demonstrating sustainable long-term harvesting practices. This applies to all forest landholdings of the Forest Owner(s)
(check one of the boxes).

☒ **Not applicable; no commercial harvesting is occurring within the Project Area.**

☐ **Third party certification under the Forest Stewardship Council, Sustainable Forestry Initiative, or Tree Farm System, whose certification standards require adherence to and verification of harvest levels which can be permanently sustained over time.**

☐ **Adherence to a renewable long-term management plan that demonstrates harvest levels which can be permanently sustained over time and that is sanctioned and monitored by a state or federal agency.**

☐ **Employ uneven-aged silvicultural practices and maintain canopy retention averaging at least 40% across the forest, as measured on any 20 acres within the entire forestland owned by the Forest Owner, including land within and outside of the Project Area (areas impacted by Significant Disturbance may be excluded from this test).**

See Addendum to OPDR VI.D.3(a).

b) On a watershed scale up to 10,000 acres (or the Project Area, whichever is smaller), projects must maintain, or make progress toward maintaining, a maximum of 40% of the project's forest lands in ages that are less than 20 years old. (Areas impacted by Significant Disturbance are exempt from this test until 20 years after reforestation of such areas.) Does the acreage within this project meet this requirement?
If "no," proceed to question 3c. Otherwise, skip to question D4.
See Addendum to OPDR VI.D.3(b).

☒ **Yes**
☐ **No**

c) If the project does not meet the age class requirement at this time, explain how the project intends to demonstrate progress to meet this requirement over time; such that forest lands in ages less than 20 years old are reduced and make up no more than 40% of the Project Area.
N/A

4. Structural elements (standing and lying dead wood):
How does the project ensure that structural elements are retained in sufficient quantities throughout the project life?
See Addendum to OPDR VI.D.4.

E. Describe the management activities that will result in increased carbon stocks in the Project Area, compared to the baseline.
See Addendum to OPDR VI.E.

F. Is this project being implemented and conducted as the result of any law, statute, regulation, court order, or other legally binding mandate?
If "yes," explain:

☐ **Yes**
☒ **No**

G. Does the offset project take place on land that was part of a previously listed and registered Forest Offset Project?
This question is applicable to both voluntary and compliance markets. If "yes" proceed to questions G1 and G2. Otherwise, skip to Part VII.

☐ **Yes**
☒ **No**

1. Optional: Was the previous Forest Offset Project terminated due to an Unintentional Reversal?

☐ **Yes**
☐ **No**

2. Optional: Is the project transitioning to the Compliance Offset Protocol U.S. Forest Projects, October 20, 2011, after previously being listed as an early action offset project?

☐ **Yes**
☐ **No**

PART VII. CARBON STOCK INVENTORY

A. Provide a description of the inventory methodology used to quantify carbon stocks for each required carbon pool in the forest project's offset boundary. The inventory methodology must describe the information required in Appendix A.3 of the Compliance Offset Protocol U.S. Forest Projects, October 20, 2011.

IFM-1 Standing Live: See Addendum to OPDR VII.A.

IFM-3 Standing Dead: See Addendum to OPDR VII.A.

IFM-6 Soil (if applicable): See Addendum to OPDR VII.A.

IFM-7 Carbon in in-use forest products: See Addendum to OPDR VII.A.

IFM-8 Forest product carbon in landfills (if applicable): See Addendum to OPDR VII.A.

IFM- 9 Biological emissions from site preparation: See Addendum to OPDR VII.A.

IFM-14 Biological emissions/removals from change in harvesting on forestland outside project area: See Addendum to OPDR VII.A.

IFM-17 Biological emissions from decomposition of forest products: See Addendum to OPDR VII.A.

B. Describe the calculation methodologies used to determine metric tons per acre for each of the carbon pools included in the Offset Project Data Report.

IFM-1 Standing Live: See Addendum to OPDR VII.B.
IFM-3 Standing Dead: See Addendum to OPDR VII.B.
IFM-6 Soil (if applicable): See Addendum to OPDR VII.B.
IFM-7 Carbon in in-use forest products: See Addendum to OPDR VII.B.
IFM-8 Forest product carbon in landfills (if applicable): See Addendum to OPDR VII.B.
IFM- 9 Biological emissions from site preparation: See Addendum to OPDR VII.B.
IFM-14 Biological emissions/removals from change in harvesting on forestland outside project area: See Addendum to OPDR VII.B.
IFM-17 Biological emissions from decomposition of forest products: See Addendum to OPDR VII.B.

C. Provide a summary of the inventory of carbon stocks for each carbon pool (or approach used, if inventory is not applicable).

IFM-1 Standing Live: See Addendum to OPDR VII.C.
IFM-3 Standing Dead: See Addendum to OPDR VII.C.
IFM-6 Soil (if applicable): See Addendum to OPDR VII.C.
IFM-7 Carbon in in-use forest products: See Addendum to OPDR VII.C.
IFM-8 Forest product carbon in landfills (if applicable): See Addendum to OPDR VII.C.
IFM- 9 Biological emissions from site preparation: See Addendum to OPDR VII.C.
IFM-14 Biological emissions/removals from change in harvesting on forestland outside project area: See Addendum to OPDR VII.C.
IFM-17 Biological emissions from decomposition of forest products: See Addendum to OPDR VII.C.

D. Provide a summary of inventory confidence statistics.
See Addendum to OPDR VII.D.

E. Provide the calculation of the offset project's reversal risk rating and contribution to the Forest Buffer Account.
See Addendum to OPDR VII.E.

PART VIII. OFFSET PROJECT BASELINE

A. Required for ALL Improved Forest Management Projects

1. Describe the project's modeling plan, following the requirements and methods in Appendix B, Section B.3 of the Compliance Offset Protocol U.S. Forest Projects, October 20, 2011.
Please see the Modeling Plan included as Attachment K.

2. Describe and estimate the project's baseline onsite carbon stocks. Explain any annual changes in baseline carbon stocks over time.
A graph of the baseline onsite carbon stocks, labeled "Attachment G," must be portrayed depicting time on the x-axis and metric tons CO2-e on the y-axis. Include a written characterization describing any annual change in baseline carbon stocks over time. See Part X of this document for more information. A diagram of the baseline incorporating all required carbon stocks, labeled "Attachment H," is also required.
This information is contained in the Modeling Plan included as Attachment K.

3. Optional: Identify the approved growth model that will be used for the project.
FORSEE

4. Harvest Planning **a. Is harvesting planned in the Project Area?** *If "yes," proceed to question 4b. Otherwise, skip to question A5.*	☒ **Yes** ☐ **No**
b. **Optional:** Does the project use a harvest schedule model? *If "yes," proceed to question 4c. Otherwise, skip to question A5.*	☐ **Yes** ☒ **No**

c. **Optional:** Explain how you are addressing age class and stratification as part of your harvest scheduling?
N/A

5. Provide an estimate of carbon that will be stored long-term in harvested wood products in the baseline.
See Addendum to OPDR VIII.A.5.

6. Provide a projection of baseline and actual harvesting volumes from the Project Area over 100 years.
A projection may be provided in an attachment, labeled "Attachment I". Include a narrative with a clear explanation of how the OPO/APD arrived at the baseline and actual harvest volumes is determined
As the Project is above Common Practice, Attachment I is not included with this OPDR.

B. Required for Improved Forest Management Projects on Private Lands ONLY

1. Provide the initial above ground standing live carbon stock (per acre) for the project.
Estimated to be 149.26 MgCO2e per acre

2. Provide the Common Practice statistic (per acre) associated with the Project Area.
The Common Practice statistic for the Project Area is 86.43 MgCO2e per acre.

3. Summarize how the Project's initial above-ground standing live carbon stock compares to Common Practice.
The Project's initial above-ground standing live carbon stocks are above the common practice statistic listed in VIII.B.2 above.
Are the initial above-ground standing live carbon stocks above or below Common Practice?
Above
If below Common Practice, what is the High Stocking Reference for the Project Area? Describe the Project Area's live tree carbon stocks over the previous 10 years.
Further documentation is required if project is below Common Practice. Submit supporting documents as attachments labeled "Attachment I." See Part X of this document for more information. An affidavit must be submitted testifying that the inventory depicted over the past 10 years is reasonably accurate.
N/A

☒ **Above**
☐ **Below**

4. Optional: Does the Forest Owner(s) and its affiliate(s) own land in fee or hold timber rights on land outside the Project Area?
If "no," skip to question B.5.

☒ **Yes**
☐ **No**

Optional: If "yes" does the Protocol require the use of a weighted average carbon stock on lands in the same Logical Management Unit (LMU, as defined in Section 6.2.1.1)?
If "no," skip to question B.5.
See Addendum to OPDR VIII.B.4.

☐ **Yes**
☒ **No**

Optional: If "yes," is inventory data available for the LMU or will the OPO use a stratified vegetation analysis?
If "no," skip to question B.5.

☐ **Data available for LMU**
☐ **Stratified Vegetation Analysis**

Optional: Identify the Minimum Baseline Level for above-ground standing live carbon stocks for the Project Area:
86.43 MgCO2e

5. Provide a description of any and all legal constraints affecting forest management activities in the Project Area. Include documentation of legal constraints and a description of each constraint (referring to Section 6.2.1.2); for each constraint provide a narrative that constraint has on forest management.
Submit supporting documents as attachment labeled "Attachment J". See Part X of this reporting document for more information.
This information is included in the Modeling Plan included as Attachment K.

6. Provide a description of the modeling techniques used to simulate the effect of any constraints on carbon stocks.
This information is included in the Modeling Plan included as Attachment K.
Optional: Provide a description of the modeling techniques used to simulate forest management activities that may affect carbon stocks.

7. How will the OPO demonstrate financial feasibility of the growth and harvesting regime assumed for the baseline?
(check one of the boxes)
☒ **Conducting a financial analysis of the anticipated growth and harvesting regime that captures all relevant costs and returns, taking into consideration all legal, physical, and biological constraints, using regional norms or documented costs and returns for the project area or other properties in the Forest Project's Assessment Area**
☐ **Providing evidence that activities similar to the proposed baseline growth and harvesting regime have taken place on other properties within the Forest Project's Assessment Area within the past 15 years**
See Addendum to OPDR VIII.B.7.

C. Required for Improved Forest Management Projects on Public Lands ONLY

1. **Provide a projection of future changes to Project Area forest carbon stocks extrapolating from historical trends.**
   N/A

2. **Explain how current public policy affects onsite carbon stocks and how the baseline modeling incorporates constraints imposed by all applicable statutes, regulations, policies, plans, and activity-based funding.**
   N/A

3. **Have carbon stocks in the Project Area been increasing or declining over the preceding ten-year period?**

☐ Increasing
☐ Declining
☒ N/A

PART IX. OTHER OFFSET PROGRAMS

A. Have any GHG reductions or GHG removal enhancements associated with the Project Lands ever been listed or registered with, or otherwise claimed by, another registry or program, or sold to a third party prior to listing?
If "yes," identify the registry or program and provide details on the issued credits below.

☐ Yes
☒ No

B. Have any lands within the Project Area ever been listed or registered with an offset project registry or program in the past?
If "yes," identify the registry or program and provide details on the issued credits below.

☐ Yes
☒ No

C. Have greenhouse gas emission reductions or removal enhancements associated with lands within the Project Area been credited or claimed for the purpose of greenhouse gas mitigation or reduction goals, whether in a voluntary or regulatory context?
If "yes," identify the goal(s) and provide details on the reductions and removal enhancements (under "Number of Credits Issued") below.

☐ Yes
☒ No

Registry / Program / Goal(s):	Reporting Period(s):	Vintage(s):	Number of Credits Issued:
N/A	N/A	N/A	N/A

PART X. ATTACHMENTS

A. If the answer to Part IV.A is "yes," provide documentation (e.g., deed of trust, title report, etc.) showing the OPO's ownership interest in the property and its interest in the trees and standing timber on the property. If the answer to Part IV.A is "no," provide documentation supporting the explanation of the OPO's right to undertake and list the project.

B. If the answer to Part IV.C is "public," provide documentation demonstrating explicit approval of the offset project's management activities and baseline including any public vetting processes necessary to evaluate management and policy decisions concerning the offset project. If the project is a private lands project, mark "N/A" in the box below. The OPO may provide an "Attachment B" page with a "This Page Left Intentionally Blank - Private Lands Project" notation on the page.
☒ N/A

C. If a Qualified Conservation Easement (QCE) has been recorded, provide a copy. The information contained in this form and the documents attached to it will be submitted to ARB so submitting a copy of the QCE as an attachment to this document fulfills the requirement in 9.1.1.1(18)(a) of the Compliance Offset Protocol U.S. Forest Projects, October 20, 2011 to provide ARB with a copy.
☒ N/A

D. If the project is located on one of the categories of Tribal land listed in Part IV.E, provide documentation demonstrating that the land within the Project Area is owned by a tribe or private entity. Also provide documentation that demonstrates the existence of a limited waiver of sovereign immunity between ARB and the governing body of the Tribe entered into pursuant to section 95975(l) of the Cap-and-Trade Regulation.

☒ N/A

E. Attach map(s) of the Project Area including:

1. **Public and private roads**
2. **Towns**
3. **Major watercourses (4th order or greater), water bodies, and watersheds**
4. **Topography**
5. **Townships, ranges, and sections or latitude and longitude**
6. **Existing land cover and land use (optional)**
7. **Forest vegetation types (optional)**
8. **Site classes (optional)**
9. **Land pressures and climate zone / classification (optional)**
10. **Historical land uses, current zoning, and projected land use within the Project Area (optional)**
11. **A georeferenced shape file (or other electronic file that can be read in a geographic information system) that clearly identifies the Project Area and boundaries.** *Note that the georeferenced shape file may constitute the required map if it includes the required map information listed above.*

F. **Provide supporting documentation demonstrating that the offset project takes places on land that has greater than 10 percent tree canopy cover.**

G. **Attach a graph portraying the baseline onsite carbon stocks with time depicted on the x-axis and metric tons CO_2e depicted on the y-axis.**

H. **Attach a diagram of the final baseline incorporating all required carbon stocks.**

I. **For IFM projects on private lands ONLY: If the Project Area's initial above-ground standing live carbon stocks are below Common Practice, submit an affidavit testifying that the inventory depicted over the past 10 years (used to determine the High Stocking Reference for the Project Area) is reasonably accurate. Also include a summary of volume harvested over the past 10 years.** ☒ **N/A**

J. **Attach supporting documentation identifying the legal constraints within the Project Area. A 'constraints' table with the following categories may be provided for simplicity with the following information: narrative of legal constraint, identification of specific governing law guiding the constraint, acreage, silviculture method, retention strategy.**

See Attachment J for a general list of legal constraints. An explanation of how these constraints were modeled is included in the Modeling Plan included as Attachment K.

PART XI. OPO/APD SIGNATURE

Note: The person signing this Initial Reporting Period report should be the same person signing the accompanying U.S. Forest Offset Project Data Report Annual Reporting Period – All Project Types report.

In signing this form, I certify under penalty of perjury of the laws of California that the information contained in this form is true, accurate, and complete. I further certify that I am an Account Representative of the Offset Project Operator (OPO).

SIGNATURE:	**PRINTED NAME:** James D. Clark
TITLE: APD	**DATE:** 09/09/2015

Background for U.S. Forest Offset Project Data Report Initial Reporting Period – Improved Forest Management

Section 95976(d) of the Cap-and-Trade Regulation specifies reporting requirements for offset projects participating in the Compliance Offset Program. Offset Project Operators (OPO) or Authorized Project Designees (APD) are required to submit an Offset Project Data Report (OPDR) within four months of the end of each (annual) Reporting Period. The Compliance Offset Protocol U.S. Forest Projects, October 20, 2011, requires additional information to be included with the initial OPDR. This form is designed to help OPOs and APDs provide the extra information required for an initial OPDR by offset projects using Compliance Offset Protocol U.S. Forest Projects, October 20, 2011. This information is submitted to the approved Offset Project Registry that is listing the offset project and should also be provided to the ARB-accredited verification body that will be verifying the Offset Project Data Report.

The information to be provided in this form closely mirrors information provided in the application for listing an offset project using the Compliance Offset Protocol U.S. Forest Projects, October 20, 2011. OPOs and APDs may wish to copy the information in their project's application for listing to the extent that the information provided at the time of that application has not changed.

Where to Submit Information Contained in This Form

Please complete the information on the form using your computer. Then print, sign, and scan the form. The completed and signed information and all supporting documentation should be submitted to the appropriate Offset Project Registry.

Copies of this form can be downloaded from the ARB website at:
http://www.arb.ca.gov/cc/capandtrade/offsets/forms/forms.htm

Detailed Instructions for U.S. Forest Offset Project Data Report Initial Reporting Period – Improved Forest Management

This form is protected with restricted editing to facilitate completing the form. If the applicant wishes to unprotect the form, the password is "form".

Part I. Entity Submitting Report:

- Indicate whether the Offset Project Operator (OPO) or Authorized Project Designee (APD) is submitting the Offset Project Data Report.
- List the name, organization, phone number, and email address of the person submitting the information. This person should be an employee of the OPO or APD, whichever entity is making the submission. The person submitting the information need not be the same person as the contact person listed for the OPO or APD in Part III and also need not be the person signing the form in Part XI.
- The person submitting the information should indicate the date the form is completed.

Part II. Offset Project Information:

- Provide the name for the offset project. Also provide the project's identification number from the approved Offset Project Registry listing the project. The ARB project identification number may also be provided if known.
- Indicate the offset project commencement date and the start and end dates of the first reporting period. Unlike with the listing form, approximations are no longer acceptable for these dates since precise dates should be known.
- Project commencement for an Improved Forest Management Project must be linked to a discrete, verifiable action that delineates a change in practice that increases sequestration and/or decreases emissions relative to the forest project's baseline. This date could be triggered by the transfer of property ownership, recordation of a conservation easement on the Project Area, or when submitting the offset project listing information.

Part III. OPO/APD Information:

- Enter contact information for the OPO and APD submitting the report. Every offset project will have an OPO. If an offset project does not have an APD, please mark the box indicating the Offset Project does not have an APD and leave the remaining fields blank.

- For both the OPO and, if applicable, the APD, enter the entity's name, its mailing address, and the name, phone number, and email address of a contact person for the entity. Also include its CITSS ID number. The CITSS ID is six characters in length, with two letters followed by four numbers (e.g., "CA1234"). **DO NOT PROVIDE THE CONFIDENTIAL CITSS ACCOUNT NUMBER**, which begins with the CITSS ID number followed by a hyphen and more numbers.

Part IV. Land Ownership:

- This part includes questions regarding land ownership and property interests.
- Further documentation is required based on the responses to some questions. See Part X of this report for more information on the precise requirements.

Part V. Offset Project Area:

- This part asks for qualitative descriptions of the offset Project Area.
- Maps are required to complement the descriptions provided in this part. See Part X of this report for more information on the precise requirements.
- The Project Area should be determined following the requirements of Section 4 of the Compliance Offset Protocol U.S. Forest Projects, October 20, 2011.
- Assessment areas shall be determined by referencing the Assessment Area Data File available at: http://www.arb.ca.gov/cc/capandtrade/protocols/usforestprojects.htm

Part VI. Offset Project Eligibility:

- The questions in this part are designed to facilitate the determination of project eligibility for Improved Forest Management Projects.
- Further documentation is required based on the responses to some questions. See Part X of this report for more information on the precise requirements.
- Details on the eligibility requirements for Improved Forest Management Projects can be found in Sections 2.1.2, 3.1, and 3.8 of the Compliance Offset Protocol U.S. Forest Project, October 20, 2011.
- Details on the Natural Forest Management criteria can be found in Table 3.2 in the Compliance Offset Protocol U.S. Forest Project, October 20, 2011.

Part VII. Carbon Stock Inventory:

- Projects are required to have completed a full carbon stock inventory for the initial Offset Project Data Report. Unlike the inventory provided at the time of listing, a general description of the project's inventory methods with preliminary best estimates is no longer sufficient to meet the regulatory requirements. If the project's inventory methodology changed between the time of listing and submission of the initial OPDR, this change should be reported as a change to the information submitted at project listing when submitting the first OPDR.
- Section 6.2 of the Compliance Offset Protocol U.S. Forest Projects, October 20, 2011 outlines the approved quantification methodologies for Improved Forest Management Projects. Further details on completing a forest project carbon inventory can be found in Appendix A of the Protocol.
- Follow the steps in Appendix D of the Compliance Offset Protocol U.S. Forest Projects, October 20, 2011 to quantify the project's reversal risk rating.
- The project's expected contribution to the Forest Buffer Account is determined annually based upon the project's risk of reversal and is calculated by multiplying the project specific reversal risk rating by the total net GHG reductions/removals achieved by the project. Unlike the listing application, for this OPDR an approximation of the contribution to the Forest Buffer Account is not acceptable.

Part VIII. Offset Project Baseline:

- For this OPDR, unlike the project listing application, projects are required to have a finalized baseline. A modeling plan with preliminary best estimates is no longer sufficient to meet the regulatory requirements. If the project's modeling plan or baseline estimates changed between the time of listing and submission of the initial OPDR, this change should be reported as a change to the information submitted at project listing when submitting the first OPDR.
- Note that IFM projects located on public land must present documentation demonstrating explicit approval of the offset project's management activities and baseline. These projects may report changes to the baseline within the initial OPDR if the changes have gone through a public review process and meet the Protocol requirements regarding explicit approval of the project's baseline.
- This part is divided into three sections: questions required for all Improved Forest Management Projects; questions for Improved Forest Management Projects on private lands; and questions for Improved Forest Management Projects on public lands. Answer the questions applicable to the project.

- A diagram and graph are required to complement the descriptions provided in this part. See Part X of this report for more information on the precise requirements.
- Section 6.2 of the Compliance Offset Protocol U.S. Forest Projects, October 20, 2011 outlines the approved quantification methodologies for Improved Forest Management Projects. Instructions for considering legal and financial constraints can be found in Sections 6.2.1.2 and 6.2.1.3, respectively. Further details on modeling carbon stocks can be found in Appendix B of the Protocol.
- ARB approved growth models can be found in Appendix B, Section B.1 of the Compliance Offset Protocol U.S. Forest Projects, October 20, 2011.

Part IX. Other Offset Programs:

- Answer all questions. If the answer to any question is "yes," identify the registry or program and provide details on the issued credits in the space provided.

Part X. Attachments:

- Provide each attachment on a separate sheet of paper and submit along with the completed Initial Reporting Period-Offset Project Data Reporting Form.
- To aid with tracking each attachment, it is recommended that the attachments are labeled to correspond with the letter in Part X that they refer to (e.g. "Attachment B").
- When an attachment is not applicable to the project being listed, please select the "N/A" (Not Applicable) checkbox next to the requirement so that it is clear that the attachment was not inadvertently left off.

Part XI. OPO/APD Signature:

- The individual signing the document must be registered in CITSS as the OPO's Primary Account Representative or Alternate Account Representative for the entity submitting the information. The individual signing the document may be an APD employee and/or representative; but to sign the document, the individual must be an Account Representative on the OPO's CITSS account.
- Please provide the individual's signature, printed name, corporate title, and date signed.
- There are no attestations for this report. The attestations required for the Offset Project Data Report are included in the form U.S. Forest Offset Project Data Report Annual Reporting Period – All Project Types.

Please contact your Offset Project Registry with any questions regarding the OPDR.

Brushy Mountain

CAR1095

CAFR5096

Addendum to OPDR for the Initial Reporting Period Form

Under

California Air Resources Board

Compliance Offset Protocol – U.S. Forest Projects

Adopted: October 20, 2011

Prepared January 22, 2015

Revised September 9, 2015

Offset Project Operator	Authorized Project Designee
Coastal Forestlands, LTD., a California Limited Partnership **96 North Main St. Willits, CA 95490** **(707) 459-3096**	**James D. Clark** **PO Box 435 Calpella, CA 95418** **(707) 485-7211**

Reporting Period

The reporting period for this Offset Project Data Report is from 01/17/2014 to 09/30/2014.

Protocol Version

Air Resources Board
Compliance Offset Protocol – U.S. forest Projects
Adopted: October 20, 2011

Introduction

Brushy Mountain is an Improved Forest Management (IFM) Project that is seeking registration under the California Air Resources Board Compliance Offset Protocol – U.S. Forest Projects Adopted: October 20, 2011. The Offset Project Operator is Coastal Forestlands, Ltd. The proposed Project is approximately 16,412.83 acres in size.

V.A.

The Project is located entirely within the Southern Cascade Mixed Conifer Assessment Area and is classified as site class IV and V timberland and as such is within the "Low" "Site Class" portion of the Assessment Area.

V.B.

The Project Area is subject to the governing jurisdiction of the County of Mendocino, the State of California, and the United States of America.

V.C.

The Project Area has been determined based on the best available data representing the legal description described in the title report included as Attachment A. The Project Area boundary is described and represented by the maps included as Attachment E, and the GIS data supplied in a geodatabase as a part of this Project submission. For the purpose of calculating GHG stocks, the Project Area acreage is taken from the GIS data provided with the OPDR.

V.D.

Brushy Mountain supports a healthy, diverse forest community comprised, predominantly, of Douglas-fir, as the dominant conifer species, incense cedar, ponderosa pine, sugar pine, white fir, gray pine and hardwoods, consisting of Pacific madrone, bigleaf maple, red alder, tanoak, interior live oak, California bay laurel, black oak, white oak, California buckeye, and is bordered by properties containing the same. Across the Project Area, the ecological community shifts

with aspect, transitioning from Douglas-fir richly shaded areas and riparian areas to open, mature oak groves. Current land uses include timber production, grazing, and recreational use by the landowners and their guests.

V.E.

Habitat types on Brushy Mountain, according to the California Wildlife Habitat Relationship (WHR) system, include Douglas-fir, Montane Chaparral, Ponderosa Pine, Montane Hardwood-Conifer, Montane Hardwood, Montane Riparian, Mixed Chaparral, and Annual Grassland habitats. The Project Areas is a diverse mosaic of topography and forest vegitation types. Plant diversity is relatively high on the Project Area due to convergence of many different habitat types that results from the topographic and geologic heterogeneity.

V.F.

The entire Project Area is classified as site class IV or V timberland. Please see the Modeling Plan included as Attachment K for a more detailed description of the calculation of site index.

V.G.

The Project Area, as well as the general region, is characterized by a rural forest landscape with large public and private timber holdings, as well as individual rural residential lots. Properties in the general vicinity are zoned by Mendocino County as Timber Production Zone (TPZ), and Rangeland.

The market demand for 10-160 acre rural properties in Mendocino County has risen sharply in recent years, and many neighboring and nearby properties to Brushy Mountain have already been divided into small tracts used primarily for rural residential purposes. The Project Area's location is desirable due to its proximity to the town of Willits and good access from Highway 162, and the demand for rural residential properties in the area is high. The gentle slopes, scenic vistas, good access, and proximity to local and bay area cities make this area highly desirable as a source of rural residential properties. Vineyard development is occuring in the

vicinity of the Project Area, with several vineyards having been developed in the near vicinity of the Project Area in the past decade.

Brushy Mountain is in close proximity to thousands of acres of already protected and/or restricted land. The Bureau of Land Management controls a majority of the land between the southern edge of the Project Area and the Eel River as well as several in holdings inside the Project Area boundary. The State Lands Commission also controls land adjacent to the Project Area. Approximately 20 miles to the East lies the 913,306 acre Mendocino National Forest.

The Brushy Mountain Project Area consists primarily of a Mediterranean climate influenced by the proximity to the Pacific Ocean and topography. Summers are warm and winters are mild and wet, with colder weather and snowfall at higher altitudes. Temperatures range from an average low of 32 degrees F in January to an average high of 93 degrees F in July. Average annual rainfall for the Project Area is approximately 60 inches per year.

V.H.

There is a long history of human occupation and use within the Project Area. Homesteading began in the mid-1800's and small ranches in the area raised pigs, sheep, horses, and cows. Clearings on the landscape that were flat to gently sloped were planted to annual grains or pasture for forage and hay. Fruit trees and small gardens were common near homesteads. Since early in its history the region was grazed and its timber harvested. Roads and fences and a few foundations are evidence of this agrarian past. Some of the worn fences have been replaced, and some wagon roads updated to graded gravel roads that meander about the property. Modern timber harvesting operations on the Project Area began in the 1930's and continued intermittently throughout the 1990's. No timber harvesting has taken place since 1998.

The current timberland owners acquired the properties that comprise the Project Area over a number of years. Coastal Forestlands acquired the Brushy Mountain Ranch in 1998, and Richard L. Padula acquired the Summer Camp Ranch in 1989.

The Project Area is zoned Timber Production Zone (TPZ) and rangeland. The TPZ ordinance is an agricultural designation, intended primarily for timber production. The Project Area contains 128 separate legal parcels for which Certificates of Compliance have been issued and recorded by Mendocino County.

Projected land uses include continued timber production, livestock grazing, and those land uses as permitted by zoning.

V.I.

The Brushy Mountain Project Area is characterized by a mix of predominantly Douglas-fir, with some ponderosa pine, sugar pine, incense cedar, gray pine, white fir, and hardwoods consisting of California bay laurel, interior live oak, Oregon white oak, California black oak, madrone, and other native hardwoods. Based on the 2014 inventory, the Project Area is composed of approximately 41% Douglas-fir, 13% ponderosa pine, 2% other conifers, 13% California black oak, 15% live oak, 7% pacific madrone, 8% White Oak, and 1% other hardwoods by basal area. The Brushy Mountain owners intend to manage the timber stands to maintain this diversity of species that supplements the dominant Douglas-fir stands.

Several age classes of timber stands exist across the Project Area as the result of past land management activities with age classes ranging from 80 years to 20 years.

There has been no timber harvesting on the Project Area since 1998. Presently, the Project Area does not have any active timber harvest plans.

VI.A.

The Brushy Mountain Project Area meets condition 1 under section 2.1.2 (page 10) of the Compliance Offset Protocol by maintaining greater than 10% tree canopy cover. Compliance is substantiated by the Orthophoto map of the Project site, that may be found in Attachment F, clearly showing canopy closure for the Project Area greater than 10% and, also, by modeling conducted in FORSEE based on the 2014 inventory, which indicated over 100% overlapping canopy for most stands.

VI.D.1.

The Brushy Mountain Project Area is characterized by a mix of Douglas-fir, native pines and other conifers, oaks, madrone, and other native hardwoods. 100% of the Project's biomass is in native species and thus the Project meets the 95% criteria for carbon in native species.

VI.D.2.

The Brushy Mountain Project Area is characterized by a mix of predominantly Douglas-fir, with some ponderosa pine, sugar pine, incense cedar, gray pine, white fir, and hardwoods consisting of California bay laurel, interior live oak, Oregon white oak, California black oak, madrone, and other native hardwoods. Based on the 2014 inventory, the Project Area is composed of approximately 41% Douglas-fir, 13% ponderosa pine,2% other conifers, 13% California black oak, 15% live oak, 7% pacific madrone, 8% White Oak, and 1% other hardwoods by basal area. The Brushy Mountain owners intend to manage the timber stands to maintain species diversity, ensuring that the Project continues to meet the requirements for composition of native species under Table 3.2 (page 20) of the Compliance Offset Protocol by maintaining species' basal area percentage below 65% , the Species Diversity Index from the Assessment Area Data File.

VI.D.3.

(a) The Brushy Mountain project will employ natural forest management practices as described in items VI.D.1, VI.D.2, VI.D.3(b), and VI.D.4 as well as sustainable

harvesting practices if it elects to conduct commercial harvesting in the future. Commercial harvesting is not currently planned in the Project Area for the near term. If the forest owners elect to conduct commercial harvesting in the future, sustainable long-term harvesting practices will be demonstrated using one or more of the compliant options allowed under section 3.8.1 of the Protocol.

(b) There are currently no immediate plans to harvest on the Brushy Mountain Project Area. In the future, the Brushy Mountain owners will employ management practices which meet the sustainable management requirements under Table 3.2 (page 21) of the Compliance Offset Protocol by maintaining less than 40% of the Project's forested acreage in ages less than 20 years. Present conditions for the Project Area already satisfy these requirements as well over 90% of the Project Area acreage has not been harvested over the last 20-year period. Please see the table below that lists Project acres by Cal Watershed.

Project Area Acres by CAL Watershed are as follows:

CALWATER Watershed	IDNUM	Project Acreage	% of Acreage < 20 Years
Blacksmith Creek	1111.710204	1,841	0.0%
Deep Hole Creek	1111.710202	658	0.0%
Eastman Creek	1111.710404	2,488	0.0%
Fish Creek	1111.620503	709	0.0%
Garcia Creek	1111.620203	611	0.0%
Indian Creek	1111.620502	2,171	0.0%
Low Gap Creek	1111.710203	288	0.0%
Lower Salt Creek	1111.710403	1,829	0.0%
Old Woman Canyon	1111.620202	1,295	0.0%
Rodeo Creek	1111.620602	1,896	0.0%
Upper Salt Creek	1111.710401	2,628	0.0%
Grand Total		**16,413**	

VI.D.4.

The Brushy Mountain Forest Owners do not actively remove lying dead wood as a part of their stand management activities. It is expected that the accumulation of lying dead wood will be commensurate with recruitment from standing dead trees. The Brushy Mountain Forest Owners are committed to maintaining if not increasing, the number of standing dead trees within the Project Area as a component of their forest management objectives. The Brushy Mountain Forest Owners do not currently, nor do they intend in the future to actively pursue salvage operations on their timberlands except in the event of fire, disease or other disturbance. The Brushy Mountain Forest Owners have a policy of allowing standing dead trees to remain and recruiting large specimen trees across their ownerships as components of their overall timber management strategy as evidenced by the specimens of old growth Douglas-fir, ponderosa pine, California black oak, and Pacific madrone found throughout the Project Area.

The Brushy Mountain Project Area has not recently undergone any salvage harvesting. Therefore, all that must be demonstrated is that the greater of one metric ton of carbon per acre or 1% of standing live carbon stocks is present in standing dead wood, or that progress towards these targets is ongoing. The project currently contains an average of 1.27 Mg C per acre and 2.4% of standing live carbon stocks in standing dead wood. Therefore, the project currently meets the aforementioned standing dead wood target.

VI.E.

The Forest Owners intend to allow conifer and hardwood stocking levels to develop on the Project Area in excess of those defined by the baseline analysis which projects carbon stocks levels over time following a harvest scenario which implimens the minimum requirements of the California Forest Practice Rules as well as other financial and legal constraints. When timber harvesting is initiated on the Project Area, the Forest Owners intend to balance harvest with growth such that conifer board foot volume is maintained or increased over time, excepting those portions of the Project Area which may in the future experience a Significant Disturbance.

Changes in Project carbon stocks over time will also be governed by economic decisions such that more or less carbon may be sequestered over any given period. Therefore, a combination of economic decisions by the Forest Owners as to whether or not to commercially harvest the Project Area combined with the constraints imposed by the California Forest Practice Rules, and specific terms of the Forest Project Protocol will guide carbon stock levels over time.

VII.A.

IFM-1 Standing Live:

Standing live carbon has been inventoried based on sample plots installed in 2014. The inventory specifications are included as Attachment L. The cruise design consists of the installation of sample points on a systematic grid 20 chains by 20 chains in size anchored with a random starting location.

The sample design includes the installation of fixed area plots to measure both live and dead conifers and hardwoods. A 1/100th acre fixed area plot was installed at each sample point to sample trees 1" DBH to 3.5" DBH; a 1/50th acre fixed area plot was installed at each sample point to sample trees 3.6" DBH to 10.5" DBH; and, a 1/5th acre fixed area plot was installed at each sample point to sample trees 10.6" DBH and larger.

Attachment L describes the procedures for collecting field measurements, specific criteria pertaining to data collection, stratification rules, and documentation on quality assurance and quality control. Documentation of analytic methods and biomass equations used to translate field measurements into volume or biomass carbon estimates is included in Part B below.

Cruise data from field cards were reviewed for completeness and entered into an Access database. Plot data within the database was extensively sorted and queried to look for data entry errors. This process has resulted in a final data set for cruise processing. The

Access database serves as the repository for inventory data and is accessed by the growth and yield model during growth and yield simulations.

Inventory monitoring and update procedures are described in Attachemnt L.

IFM-3 Standing Dead:

As described above, and in Attachment L, standing dead trees were sampled in conjunction with standing live trees.

IFM-6 Soil (if applicable):

Excluded because the conditions in Table 5.2 of the Protocol that would require inclusion of this pool (site preparation involving deep ripping, furrowing, or plowing where soil disturbance exceeds 25 percent of the Project Area over the Project Life, or mechanical site preparation activities not conducted on contours) are not planned.

IFM-7 Carbon in in-use forest products:

Carbon in in-use forest products has not been generated by the Project as no harvesting has occurred since the Offset Project Commencement Date. Part B below will include documentation of analytic methods and biomass equations used to translate future harvest volumes delivered to the mill into appropriate carbon in in-use forest products values.

IFM-8 Forest product carbon in landfills (if applicable):

Carbon in landfills is a component of carbon related to forest products. No forest products have been generated by the Project as no harvesting has occurred since the Offset Project Commencement Date. Part B below will include documentation of analytic methods and biomass equations used to translate future harvest volumes delivered to the mill into appropriate forest products carbon in landfill values.

IFM-9 Biological emissions from site preparation:

As IFM-6 is an excluded carbon pool, IFM-9 is also an excluded pool.

IFM-14 Biological emissions/removals from change in harvesting on forestland outside Project Area:

Part B below will include documentation of analytic methods and biomass equations used to translate future harvest volumes delivered to the mill into appropriate values for the calculation of this carbon pool.

IFM-17 Biological emissions from decomposition of forest products:

This is quantified as a component of IFM-7 and IFM-8 per Appendix C of the Protocol.

VII.B.

IFM-1 Standing Live:

Above-ground standing live carbon in trees 1" DBH and larger were calculated using the appropriate biomass equation by species taken from the Compliance Offset Protocol U.S. Forest Offset Projects page on ARB's website (http://www.arb.ca.gov/cc/capandtrade/protocols/usforestprojects.htm). The current biomass equation documentation provided by ARB is included as Attachment M . The equations referenced below are not reproduced here for the sake of minimizing redundancy. These equations are used to generate biomass estimates for the above-ground portion of standing live trees, and hard snags. These equations will be referred to as the "FIA equations" herein. Each species can have as many as three FIA equations in order to calculate tree biomass.

The FIA equations used by species are as follows:

Species	Bole Cubic Ft Volume	Bark Biomass	Live Branches Biomass
Douglas-fir	Equation 3	Equation 8	Equation 6
Cypress	Equation 19	Equation 13	Equation 10
Sugar pine	Equation 20	Equation 10	Equation 8
Ponderosa pine	Equation 5	Equation 9	Equation 7
Gray Pine	Equation 5	Equation 9	Equation 7
Incense Cedar	Equation 19	Equation 12	Equation 10
White fir	Equation 23	Equation 1	Equation 1
Other Conifer	Equation 17	Equation 21	Equation 17
Tanoak	Equation 34	None	None
Pacific madrone	Equation 40	None	None
Interior Live oak	Equation 44	None	None
Black oak	Equation 41	None	None
White oak	Equation 41	None	None
California laurel	Equation 33	None	None
California buckeye	Equation 43	None	None
Golden chinkapin	Equation 32	None	None
Bigleaf maple	Equation 37	None	None
Red Alder	Equation 26	Equation 20	Equation 16
Other hardwood	Equation 41	Equation 20	Equation 16

Tonnes of standing live biomass per sample plot are calculated as follows:

For equations that use total tree height in meters, tree height is calculated by multiplying the trees total height in feet by 0.3048. Trees per hectare are calculated by multiplying trees per acre by 2.471. Tree diameter at breast height ("DBH") in centimeters (cm) is calculated by multiplying its DBH by 2.54.

Bole Biomass:

The Cubic foot volume of each tree is calculated as the volume of the total stem from ground to tip (includes the top and stump). FIA refers to this value as CVTS. Bole biomass is calculated by multiplying the cubic volume by the wood density, and then dividing by 2.20462 to calculate weight in kilograms (kg). Above-ground biomass in kilograms (Kg) per acre is calculated by multiplying the FIA calculated kg per tree by each tree's per acre value.

Bark and Live Branches Biomass:

The above referenced FIA equations produce biomass in kg for the various parts of the above-ground portion of each tree. Above-ground biomass in kilograms (Kg) per acre is calculated by multiplying the FIA calculated kg per tree by each trees per acre value.

Missing volume of each tree is recorded as a percentage missing by 1/3rd segment of the tree (top, middle, bottom) as adapted from the Climate Action Reserve's "Quantification Guidance for Use with Forest Carbon Projects" dated November 15, 2012. The total heights of trees with broken tops were calculated from their measured top heights using FORSEE. If 1/3rd of the calculated tree height was less than the measured top height, then the break was assumed to be above the bottom 3rd of the tree. Likewise, if 2/3^{rds} of the calculated tree height was less than the measured tree height, the break was assumed to be in the top 3rd of the tree.

Missing volumes of damaged trees that were recorded in the field were then added to the estimated volume missing if there was a broken top. The total missing percentage of each tree is calculated based on 65% of the trees biomass being in the bottom 1/3rd , 25% in the middle 1/3rd, and 10% in the top 1/3rd. The total percentage of the tree that is missing is then calculated and multiplied by various biomass components of the tree as calculated above to calculate the net biomass of each component.

The net Kg per acre value of each tree on the plot is summed to derive above-ground live biomass Kg per acre for the plot. This value is used to calculate the respective below-ground live biomass component for the plot.

Below-ground live carbon is calculated at the plot level using the model provided by Cairnes et. al. specified on page 86 of Appendix A of the Protocol. The formula has as its input, above-ground live biomass in Mg per hectare, and outputs below-ground biomass in Mg per hectare. Total net above-ground live carbon in Kg per acre for each plot is converted to Mg of biomass per hectare by multiplying by 2.471, and then dividing by 1000. After calculating the below ground component in Mg per hectare using the Cairnes model, the results are converted to Kg per acre by multiplying by 1000 and dividing by 2.471.

Total standing live biomass for each plot is the sum of the above-ground and below-ground live biomass Kg per acre. Mg of carbon (Mg C) per acre per plot is then calculated by multiplying by 0.5 to estimate carbon biomass. Mg C per acre is converted to CO2-equivalent by multiplying by 3.664.

IFM-3 Standing Dead:

Data on standing dead trees will be collected as a part of the Brushy Mountain inventory. In general, the amount of carbon stored in a standing dead tree is based on the proportion

of the tree remaining standing, and the condition of the tree, or its decay class. The standing dead carbon pool includes trees 5” DBH and larger, with a minimum height of 15'.

Standing dead trees from the inventory data are classified into six decay classes based on descriptions contained on page 12 of General Technical Report NRS-29 (Harmon et al, 2008). These decay classes are generally described as follows:

Class 0 Tree has recently died with leaves intact.

Class 1 Leaves mostly still attached, intact bark, fine twigs, and branches.

Class 2 Leaves mostly gone, fine branches mostly gone, bark loose and starting to fall off.

Class 3 A few large branches or stubs remain, bark falling off in large patches, softwood sloughing is evident.

Class 4 Highly decomposed, no branches, little bark, broken off top.

Class 5 Mostly decomposed, no branches, very little bark, broken off close to the ground.

Biomass for standing dead trees includes the bole and bark components calculated using the FIA biomass equations described above and following the same procedures as for live trees other than the manner in which missing volume is calculated.

Missing volume of each tree is recorded as a percentage missing by 1/3rd segment of the tree (top, middle, bottom) as adapted from the Climate Action Reserve's "Quantification Guidance for Use with Forest Carbon Projects" dated November 15, 2012. The total heights of trees with broken tops are calculated from their measured top heights using FORSEE. If 1/3rd of the calculated tree height is less than the measured top height, then the break is assumed to be above the bottom 3rd of the tree. Likewise, if 2/3^{rds} of the calculated tree height is less than the measured tree height, the break is assumed to be in the top 3rd of the tree.

Missing volumes of damaged trees that are recorded in the field are then added to the estimated volume missing if there was a broken top. The total missing percentage of each tree is calculated based on 65% of the trees biomass being in the bottom 1/3rd , 25% in the middle 1/3rd, and 10% in the top 1/3rd. The total percentage of the tree that is missing is then calculated and multiplied by various biomass components of the tree as calculated above to calculate the net biomass of each component.

Once the net biomass of each tree has been calculated, a relative density is applied by species and decay class. The relative density is in relation to the green density of sound wood, or the tree's wood density. The table below lists the relative densities applied by species and decay class taken from General Technical Report NRS-29 (Harmon et al, 2008).

Relative Density by Species and Decay Class:

	Decay Class (DC)					
Species	**DC0**	**DC1**	**DC2**	**DC3**	**DC4**	**DC5**
Douglas-fir Interior	1	0.858	0.723	0.444	0.305	0.329
Ponderosa pine	1	0.889	0.876	0.868	0.339	0.495
Sugar Pine	1	1	0.788	0.553	0.364	0.407
White fir	1	0.958	0.759	0.47	0.381	0.33
Incense cedar	1	1	0.845	0.76	0.42	0.366
California Foothill pine	1	0.916	0.826	0.697	0.421	0.407
Cypress (spp)	1	0.956	0.827	0.678	0.426	0.366
Other Interior Conifers	1	0.916	0.826	0.697	0.421	0.407
California black oak	1	0.981	0.779	0.665	0.416	0.428
California-laurel	1	0.944	0.734	0.583	0.37	0.282
Interior live oak	1	0.981	0.779	0.665	0.416	0.428
Pacific madrone	1	0.944	0.734	0.583	0.37	0.282
Oregon white oak	1	0.981	0.779	0.665	0.416	0.428
Red alder	1	0.99	0.836	0.505	0.277	0.3
Bigleaf maple	1	0.941	0.709	0.533	0.317	0.241
Tanoak	1	0.944	0.734	0.583	0.37	0.282
California Buckeye	1	0.944	0.734	0.583	0.37	0.282
Other Interior Hardwoods	1	0.981	0.779	0.533	0.317	0.241

Below-ground standing dead carbon is calculated at the plot level using the model provided by Cairnes et. al. specified on page 86 of Appendix A of the Protocol. The formula has as its input, above-ground biomass in Mg per hectare, and outputs below-ground biomass in Mg per hectare.

Total standing dead biomass for each plot is the sum of the above-ground and below-ground standing dead biomass Mg per acre. Mg of carbon (Mg C) per acre per plot is then calculated by multiplying by 0.5 to estimate carbon biomass. Mg C per acre is converted to CO2- equivalent by multiplying by 3.664.

IFM-6 Soil (if applicable):

Excluded because the conditions in Table 5.2 of the Protocol that would require inclusion of this pool (site preparation involving deep ripping, furrowing, or plowing where soil disturbance exceeds 25 percent of the Project Area over the Project Life, or mechanical site preparation activities not conducted on contours) are not planned.

IFM-7 Carbon in in-use forest products:

Wood products delivered to the mill in any period is calculated beginning with the cubic volume of harvested conifer trees 10” DBH and larger. Conifers smaller than 10" DBH are not included as they are too small to be delivered to the mill. The dry weight of wood products in pounds is calculated by multiplying the wood density in lbs/cubic foot by the cubic volume for each softwood species harvested based on the CVTS values derived from the FIA equations listed above. Bark and branch biomass are not included in the volume harvested. The wood densities utilized are those for the Mixed Conifer forest type and are included in Table C.1 of Appendix C of the Protocol. The dry weight is multiplied by 0.5 to convert the weight to carbon weight only. The weight of carbon in lbs is divided by 2,204.6 to get the carbon weight in metric tonnes (Mg).

Mg of carbon is then multiplied by 0.675 to account for mill efficiencies, taken from the Compliance Offset Protocol U.S. Forest Offset Projects page on ARB's website (http://www.arb.ca.gov/cc/capandtrade/protocols/usforestprojects.htm).

The resulting Mg carbon value after accounting for milling efficiencies is then passed to the wood products worksheets for calculating long-term in-use wood products storage. The wood products carbon is separated into product classes and multiplied by the respective 100-year average storage factor. The tables below list the assignment of wood products by class per the most current Assessment Area Data File taken from the Compliance Offset Protocol U.S. Forest Offset Projects page on ARB's website (http://www.arb.ca.gov/cc/capandtrade/protocols/usforestprojects.htm), as well as the 100-year average storage factors applied to each wood product class per table C.2 of Appendix C of the Protocol.

Wood Products by Class

% Softwood Lumber	69.501%
% Hardwood lumber	0.656%
% Softwood Plywood	27.695%
% Oriented Strandboard	0.000%
% Non Structural Panels	0.095%
% Miscellaneous Products	0.553%
% Paper	1.500%

100-year Storage Rates Average Values from Appendix C, In-Use Table C.2

Softwood Lumber	0.463
Hardwood lumber	0.250
Softwood Plywood	0.484
Oriented Strandboard	0.582
Non Structural Panels	0.380
Miscellaneous Products	0.176
Paper	0.058
Weighted Average	0.310

Average carbon stored in in-use wood products is calculated using equation C.1. Carbon is converted to CO_2-equivalent by multiplying by 3.67. This value is combined with IFM-8 using equation C.3 to represent $WP_{total, y}$ for the reporting period.

$WP_{total, y}$ for the reporting period represents $AC_{wp,y}$ in equation 6.1. Average in-use wood products produced by the baseline analysis ($BC_{wp, y}$) are deducted from actual wood products produced each reporting period ($AC_{wp,y}$) in equation 6.1 and the resulting calculation is multiplied by 80% to account for the "Market Response".

IFM-8 Forest product carbon in landfills (if applicable):

Wood products delivered to the mill in any period is calculated beginning with the cubic volume of harvested conifer trees 10" DBH and larger. Conifers smaller than 10" DBH are not included as they are too small to be delivered to the mill. The dry weight of wood products in pounds is calculated by multiplying the wood density in lbs/cubic foot by the cubic volume for each softwood species harvested. The wood densities utilized are those for the Douglas-fir forest type and are included in Table C.1 of Appendix C of the Protocol. The dry weight is multiplied by 0.5 to convert the weight to carbon weight only. The weight of carbon in lbs is divided by 2,204.6 to get the carbon weight in metric tonnes (Mg).

Mg of carbon is then multiplied by 0.675 to account for mill efficiencies, taken from the Compliance Offset Protocol U.S. Forest Offset Projects page on ARB's website (http://www.arb.ca.gov/cc/capandtrade/protocols/usforestprojects.htm).

The resulting Mg carbon value after accounting for milling efficiencies is then passed to the wood products worksheets for calculating long-term landfill wood products storage. The wood products carbon is separated into product classes and multiplied by the respective 100-year average storage factor. The tables below list the assignment of wood products by

class per the most current Assessment Area Data File taken from the Compliance Offset Protocol U.S. Forest Offset Projects page on ARB's website, (http://www.arb.ca.gov/cc/capandtrade/protocols/usforestprojects.htm), as well as the 100-year average storage factors applied to each wood product class per table C.3 of Appendix C of the Protocol.

Wood Products by Class	
% Softwood Lumber	69.501%
% Hardwood lumber	0.656%
% Softwood Plywood	27.695%
% Oriented Strandboard	0.000%
% Non Structural Panels	0.095%
% Miscellaneous Products	0.553%
% Paper	1.500%

100-year Storage Rates Average Values from Appendix C, In Landfill Table C.3	
Softwood Lumber	0.298
Hardwood lumber	0.414
Softwood Plywood	0.287
Oriented Strandboard	0.233
Non Structural Panels	0.344
Miscellaneous Products	0.454
Paper	0.178
Weighted Average	0.199

Average wood products carbon stored in landfills is calculated using equation C.2. Carbon is converted to CO_2-equivalent by multiplying by 3.67. This value is combined with IFM-7 using equation C.3 to represent $WP_{total,\ y}$ for the reporting period.

$WP_{total,\ y}$ for the reporting period represents $AC_{wp,y}$ in equation 6.1. Average in-use wood products produced by the baseline analysis ($BC_{wp,\ y}$) are deducted from actual wood products produced each reporting period ($AC_{wp,y}$) in equation 6.1and the resulting calculation is multiplied by 80% to account for the "Market Response".

IFM-9 Biological emissions from site preparation:

As IFM-6 is an excluded carbon pool, IFM-9 is also an excluded pool.

IFM-14 Biological emissions/removals from change in harvesting on forestland outside Project Area:

The Protocol refers to this carbon pool as Secondary Effects which are calculated using equation 6.10 of the Protocol. Secondary Effects of harvesting less than the average wood products produced by the baseline growth and yield analysis are calculated by subtracting the average carbon in harvested trees prior to delivery to a mill (PDM) generated by the baseline analysis from the actual carbon in harvested trees prior to delivery to a mill, and then multiplying the difference by 20%. As Secondary Effects are only calculated in years when actual wood products produced are less than the annual average under the baseline analysis, the resulting calculation is either zero, or a negative number.

The PDM calculation for each annual reporting period will be calculated based on a ratio between the average volume of wood delivered to the mill generated by the baseline analysis, and the average PDM value generated by the baseline analysis. Each reporting period, this ratio will be applied to the actual volume of wood delivered to a mill.

IFM-17 Biological emissions from decomposition of forest products:

This is quantified as a component of IFM-7 and IFM-8 as described above.

VII.C.

IFM-1 Standing Live: This carbon pool will be calculated each year as described in parts A and B above. As of the end of the initial reporting period the carbon stocks for the standing live carbon pool are 3,156,228 $MgCO_2e$.

IFM-3 Standing Dead: This carbon pool will be calculated each year as described in parts A and B above. As of the end of the initial reporting period the carbon stocks for the standing dead carbon pool are 76,481 $MgCO_2e$.

IFM-6 Soil (if applicable): N/A

IFM-7 Carbon in in-use forest products: This carbon pool will be calculated each year as described in parts A and B above. No harvesting is planned during the initial reporting period.

IFM-8 Forest product carbon in landfills (if applicable): This carbon pool will be calculated each year as described in parts A and B above. No harvesting is planned during the initial reporting period.

IFM-9 Biological emissions from site preparation: N/A

IFM-14 Biological emissions/removals from change in harvesting on forestland outside Project Area: -5,444 $MgCO_2e$ for the initial reporting period.

IFM-17 Biological emissions from decomposition of forest products: This is quantified as a component of IFM-7 and IFM-8 as described above.

VII.D.

Stratified random sampling formulas taken from Shiver and Borders (1996) will be used to calculate the sampling error for the Brushy Mountain Project once mean standing live and standing dead pools have been determined. Preliminary estimates of the inventory confidence statistics are as follows:

Mean standing live and standing dead pools	53.76	Mg C per acre
SE of mean	1.20	Mg C per acre
SE of mean as %	2.24 %	1.20 ÷ 53.76
Sampling Error of 90% CI	3.69 %	(2.24 %) * 1.645
Inventory Confidence Deduction	0.0%	3.7*% - 5.0%

*3.69 rounds to 3.7

VII.E.

The risk ratings shown on the next page assume that the Project will not employ a Qualified Conservation Easement.

Project Area Reversal Risk Rating:

Risk Category	Contribution to Reversal Risk Rating
Financial Failure	5.0%
Conversion	2.0%
Over-harvesting	2.0%
Social	2.0%
Wildfire	4.0%
Disease/Insect	3.0%
Other Catastrophic	3.0%
Total Buffer Pool Contribution	19.2%

The Project's reversal risk rating is calculated as follows:

100% - (((1-0.05)*(1-0.02)*(1-0.02)*(1-0.02)*(1-0.04)*(1-0.03)*(1-0.03)*100)) = 19.2%

The contribution to the Forest Buffer Account during the initial reporting period is estimated to be 262,582 ROCs.

VIII.A.5.

Following the calculation methodologies described in section VII B above, the baseline modeling presented in the Modeling Plan (Attachment K) generates an average annual value for each of the above described wood products carbon pools. Actual wood products values for In-use, Landfill, and Prior to Delivery to the Mill ("PDM") are calculated based on a flow of wood products over the 100-year planning period. The table below presents an estimate of the average wood products stored long-term values that will be generated by the baseline analysis.

Woods Products Class	**Mg C/ acre**	**Mg CO2e/ acre**	**Total Mg CO2e**
Average Annual Carbon 100-year In-Use	0.110	0.403	6,626.46
Average Annual Carbon 100-year Landfill	0.071	0.259	4,249.99
Average Annual Carbon in Harvested Trees Prior to Delivery to the Mill	0.644	2.361	38,812.64

VIII.B.4.

Although the Forest Owners own lands outside of the Project Area and within the same Logical Management Unit (LMU), the Project Area's initial above ground standing live carbon stocks are above Common Practice. The minimum baseline level (MBL) for the Project was determined through the use of equation 6.5 which does not require the calculation of the Project's weighted average above-ground standing live carbon stocks (WCS) within the LMU.

VIII.B.7.

In modeling the baseline for standing live carbon stocks, the Forest Owner must incorporate financial constraints that could affect baseline growth and harvesting scenarios. The Compliance Offset Protocol provides two means by which the Forest Owner may demonstrate that the growth and harvesting regime assumed for the baseline is financially feasible. The first approach involves a financial analysis of the growth and harvesting regime, while the second approach provides evidence that activities similar to the assumed baseline growth and harvest scenario have taken place on other properties within the Forest Project's Assessment Area within the past 15 years and that harvesting activities have taken place on sites comparable to the Project Area. The Brushy Mountain Project will demonstrate financial feasibility using the first approach under section 6.2.1.3 (page 52).

A financial analysis of the baseline harvesting regime that captures all relevant costs and returns, taking into account all legal, physical, and biological constraints is included as Attachment N. Cost and revenue variables included in the financial analysis are based on documented costs and returns for the Project Area, and on other properties in the Assessment Area. This financial analysis illustrates that the baseline harvest scenario is financially feasible.

X Attachments

The following attachments are included as a part of this OPDR:

Attachment A - Title Report for the Brushy Mountain Ranch, and Summer Camp Ranch.

Attachment E – Maps of the Project Area, including an ESRI Geodatabase that represents the Project Area.

Attachment F – Orthophoto map of the Project Area.

Attachment G – A graph portraying the baseline.

Attachment H – A diagram of the baseline.

Attachment J – Legal Constraints Affecting Forest Management Activities in the Project Area.

Attachment K –Modeling Plan.

Attachment L – Inventory Specification.

Attachment M – Volume and Biomass Equations.

Attachment N – Financial Analysis of Baseline Scenario

Attachment O – OPO Landowner Agreement

ATTACHMENT A



Redwood Empire Title Company of Mendocino County

405 S. Orchard Avenue, P. O. Box 238
Ukiah, CA 95482
Phone: (707)462-8666 Ÿ Fax: (707)462-5010

Our No.: **20141126DN**
Your No.:
Seller: **Coastal Forestlands Ltd.**
Buyer:

When replying Please Contact:
ESCROW OFFICER: **Debbie Niesen**
dniesen@redwoodtitle.com

PRELIMINARY REPORT

Property Address: **Brushy Mountain, CA**

In response to the above referenced application for a policy of title insurance, **Redwood Empire Title Company of Mendocino County** hereby reports that it is prepared to issue, or cause to be issued, as of the date hereof, a Policy or Policies of Title Insurance describing the land and the estate or interest therein hereinafter set forth, insuring against loss which may be sustained by reason of any defect, lien or encumbrance not shown or referred to as an Exception below or not excluded from coverage pursuant to the printed Schedules, Conditions and Stipulations of said Policy forms.

The printed Exceptions and Exclusions from the coverage and Limitations on Covered Risks of said Policy or Policies are set forth in Exhibit A attached. Copies of the Policy forms should be read. They are available from the office which issued this report.

Please read the exceptions shown or referred to below and the exceptions and exclusions set forth in Exhibit A of this report carefully. The exceptions and exclusions are meant to provide you with notice of matters which are not covered under the terms of the title insurance policy and should be carefully considered.

It is important to note that this preliminary report is not a written representation as to the condition of title and may not list all liens, defects and encumbrances affecting title to the land.

This report (and any supplements or amendments hereto) is issued solely for the purpose of facilitating the issuance of a policy of title insurance and no liability is assumed hereby. If it is desired that liability be assumed prior to the issuance of a policy of title insurance, a Binder or Commitment should be requested.

Dated as of August 21, 2014 at 07:30AM.

John Baron
Chief Title Officer

jbaron@redwoodtitle.com

The form of policy of title insurance contemplated by this report is:
CLTA Standard 1990 Owners Policy

Underwritten by Old Republic National Title Insurance Company

SCHEDULE A

1. The estate or interest in the land hereinafter described or referred to covered by this Report is:

   a Fee

2. Title to said estate or interest at the date hereof is vested in:

   Coastal Forestlands Ltd., a California limited partnership

3. The land referred to in this report is situated in the State of California, County of Mendocino and is described as follows:

   See Exhibit A attached hereto and made a part hereof.

SCHEDULE B

At the date hereof exceptions to coverage in addition to the printed Exceptions and Exclusions in the said policy form would be as follows:

1. Taxes and assessments, general and special, for the fiscal year 2014 - 2015, a lien not yet due or ascertainable.

2. The lien of supplemental taxes, if any, assessed pursuant to the provisions of Section 75, et seq. of the Revenue and Taxation Code of the State of California.

3. (a) Any adverse claim based upon the assertion that some portion of said land has been created by artificial means, or has accreted to such portion so created; some portion of said land has been brought within the boundaries thereof by an avulsive movement of Eel River, or has been formed by accretion to any such portion.

   (b) Rights and easements for navigation and fishery which may exist over that portion of said land lying beneath the waters of Eel River.

4. Any easement for water course over that portion of said land lying within the banks of Eel River.

5. An easement for the purposes stated herein and incidental purposes as provided in the following instrument
   Recorded: October 12, 1893 in Book 59 of Deeds, Page 188
   In Favor of: County of Mendocino
   For: road

6. An easement for the purposes stated herein and incidental purposes as provided in the following instrument
   Recorded: February 14, 1940 in Book 136, Page 282 and June 3, 1940 in Book 142, Page 142, Official Records
   In Favor of: County of Mendocino
   For: road

7. Reservation regarding minerals, rights of way, etc., as contained in deed executed by Maud Lee Flood, Mary Emma Stebbins and James Flood to George A. Newhall, dated March 16, 1942, recorded March 27, 1942 in Book 154, Page 270, Official Records.

8. An easement for the purposes stated herein and incidental purposes as provided in the document:
   Recorded: October 27, 1943 in Book 168, Page 55, Official Records
   For: road and wire tramway

9. An easement for the purposes stated herein and incidental purposes as provided in the following instrument
   Recorded: January 7, 1947 in Book 206, Page 337, Official Records
   In Favor of: Pacific Gas and Electric Company
   For: electric transmission line

10. An easement for the purposes stated herein and incidental purposes as provided in the following instrument
    Recorded: January 7, 1947 in Book 206, Page 343, Official Records
    In Favor of: Pacific Gas and Electric Company
    For: poles and wires

11. Easement(s) for the purposes stated herein and incidental purposes as provided in the document:
Recorded: August 15, 1947 in Book 221, Page 411, Official Records
For: road

12. Easement(s) for the purposes stated herein and incidental purposes as provided in the document:
Recorded: August 14, 1947 in Book 226, Page 224, Official Records
For: road

13. An easement for the purposes stated herein and incidental purposes as provided in the document:
Recorded: September 26, 1952 in Book 327, Page 370, Official Records
For: ingress and egress

14. An easement for the purposes stated herein and incidental purposes as provided in the following instrument
Recorded: September 21, 1954 in Book 380, Page 42, Official Records
In Favor of: Pacific Gas and Electric Company
For: pole lines

15. Reservations and conditions as contained in deed executed by W.J. Hammonds et al to A.M. Baxter recorded April 26, 1955 in Book 397, Page 155, Official Records.

16. Reservations and conditions as contained in deed executed by W.J. Hammonds et al to A.M. Baxter recorded April 4, 1957 in Book 457, Page 219, Official Records.

17. Terms, provisions, covenants, restrictions and conditions contained in a document executed pursuant to the California Land Conservation Act of 1965 (Williamson Act) and recorded February 16, 1972 in Book 876, Page 600, September 30, 1974 in Book 977, Page 497, February 26, 1976 in Book 1030, Page 535 and January 5, 1973 in Book 911, Page 90, Official Records.

    a. Notice of Non-Renewal of a portion recorded February 24, 1978 in Book 1134, Page 406, Official Records.

    b. Notices of Implementation Under Williamson Act recorded December 29, 2010 as 2010-18377 and December 27, 2011 as 2011-17950 and December 27, 2012 as 2012-19731 and December 27, 2013 as 2013-19038, Official Records.

18. Any facts, rights, interests or claims that may exist or arise by reason of matters, if any, disclosed by that certain Record of Survey filed January 12, 1970 in Map Case 2, Drawer 14, Page 59; June 28, 1973 in Map Case 2, Drawer 21, Page 90; March 11, 1977 in Map Case 2, Drawer 29, Page 88; May 16, 1979 in Map Case 2, Drawer 34, Page 54; November 4, 1987 in Map Case 2, Drawer 46, Page 49; October 14, 1988 in Map Case 2, Drawer 47, Page 63; May 15, 1996 in Map Case 2, Drawer 62, Page 55; March 24, 2009 in Maps Drawer 77, Page 74; April 28, 2010 in Maps Drawer 79, Page 70, Mendocino County Records.

19. Rights and easements contained in the Judgment Quieting Title issued out of the Superior Court of California, County of Mendocino, Case No. 31787, entitled "Dos Rios Mutual Water Corp., plaintiff vs A.M. Baxter, defendant", recorded September 3, 1974 in Book 974, Page 733, Official Records.

20. Easement(s) for the purposes stated herein and incidental purposes as provided in the following instrument
Recorded: October 2, 1978 in Book 1173, Page 430, Official Records
In Favor of: United States of America
For: road

21. Easement(s) for the purposes stated herein and incidental purposes as provided in the following instrument
Recorded: October 31, 1979 in Book 1234, Page 104, Official Records
In Favor of: United States of America
For: road

22. Terms and provisions as contained in an instrument,
Entitled : Road Maintenance Agreement
Recorded: December 30, 1986 in Book 1599, Page 70, Official Records

23. An easement for the purposes stated herein and incidental purposes as provided in the following instrument
Recorded: February 9, 1990 in Book 1808, Page 285, Official Records
In Favor of: State of California
For: drainage

24. Matters as contained or referred to in instruments,
Entitled : Notice Pursuant to Mendocino County Code Section 18.23.060 of Issuance of a Building Permit
Recorded: February 5, 1993 in Book 2059, Page 704 and April 26, 1995 in Book 2248, Page 373, Official Records

25. Waiver of any claims for damages to said property by reason of the location, construction, landscaping or maintenance of the highway adjoining said property, as contained in the deed to the State of California, recorded January 16, 1996 in Book 2303, Page 42, Official Records.

26. Easement(s) for the purposes stated herein and incidental purposes as provided in the document:
Recorded: April 15, 1996 in Book 2324, Page 336, Official Records
For: ingress and egress

a. Terms and provisions contained in the document above referred to.

27. Matters as contained or referred to in an instrument,
Entitled : Indemnification Agreement
Recorded: April 15, 1996 in Book 2324, Page 339, Official Records

28. An easement for the purposes stated herein and incidental purposes as provided in the following instrument
Recorded: April 29, 2009 as 2009-06021, Official Records
In Favor of: State of California
For: highway

29. Deed of Trust to secure an indebtedness of the amount stated below and any other amounts payable under the terms thereof,
Amount : $2,040,000.00
Trustor/Borrower : Coastal Forestlands, Ltd., a California limited partnership
Trustee: Richard P. Selzer
Beneficiary/Lender: Ronald W. McGehee & Elizabeth A. McGehee as Trustees of The Amendment & Restatement of Revocable Trust of Ronald W. McGehee & Elizabeth A. McGehee dated May 12, 1994
Dated: May 30, 2012
Recorded: June 8, 2012 as 2012-08689, Official Records

Affects a portion

30. Deed of Trust to secure an indebtedness of the amount stated below and any other amounts payable under the terms thereof,
Amount : $4,200,000.00
Trustor/Borrower : Coastal Forestlands, Ltd., a California limited partnership
Trustee: Richard P. Selzer
Beneficiary/Lender: Ronald W. McGehee & Elizabeth A. McGehee as Trustees of The Amendment & Restatement of Revocable Trust of Ronald W. McGehee & Elizabeth A. McGehee dated May 12, 1994
Dated: November 9, 2012
Recorded: November 14, 2012 as 2012-16938, Official Records

Affects a portion

31. Deed of Trust to secure an indebtedness of the amount stated below and any other amounts payable under the terms thereof,
Amount : $1,000,000.00
Trustor/Borrower : Coastal Forestlands Ltd., a California limited partnership
Trustee: Redwood Empire Title Company of Mendocino County
Beneficiary/Lender: Mark Drury Edwards and Elizabeth Alydia Edwards, Trustees of the Edwards Family 2004 Trust dated May 26, 2004, as to an undivided 45% interest; Kirk L. Edwards, an unmarried man, as to an undivided 20% interest; Sue Deiro-Phelps, an unmarried woman, as to an undivided 20% interest; Andrew L. Atkins and Alydia A. Atkins, husband and wife as community property, as to an undivided 5% interest; and Austin Edwards and Kaycie Edwards, Trustees of the Edwards Family Trust dated 2/14/2013, as to an undivided 10% interest
Dated: July 9, 2014
Recorded: July 14, 2014 as 2014-08182, Official Records

Affects a portion

END OF SCHEDULE B

INFORMATIONAL NOTES:

1. Taxes and assessments, general and special, for the fiscal year 2013 - 2014, 1st and 2nd installments are paid.

2. NOTE: According to the public records, there have been no deeds conveying the property described in this report recorded within a period of 24 months prior to the date hereof except as follows:
NONE

EXHIBIT "A"

All that certain real property situated in the County of Mendocino, State of California, more particularly described as follows:

Parcel 1:

Lot 11, Lot 12, Lot 13 of Section 6, the North one half of Lot 7 of Section 7, Township 21 North, Range 13 West, Mount Diablo Meridian.

The North one half of the Southeast quarter, and the Southwest quarter of the Southeast quarter of Section 6, the Northwest quarter of the Northeast quarter of Section 7, Township 21 North, Range 13 West, Mount Diablo Meridian.

Excepting therefrom the following:

1st: That portion of Lot 12 lying North of the centerline of the Biggar Highway and North of the centerline of Middle Eel River.

2nd: All those portions of Lots 2, 11, and 12 of said Section 6, described as follows:

Beginning at a point in the Easterly line of the Biggar Highway right of way, from which the Southeast corner of Lot 3, Section 6, Township 21 North, Range 13 West, Mount Diablo Base and Meridian, as the same is at present located, bears North 66° 20' East and is distant 217.73 feet, said point bears South 81° 18' East 40 feet from Station 2111.72 of said highway survey; thence from such point of beginning South 67° 50' East 1287.51 feet; South 78° 40' East 174.56 feet; North 77° 50' East 174.56 feet; North 65° 05' East 258.65 feet; thence North 24° 55' West 281.78 feet to the Southerly line of said highway survey; thence following along the Southerly and Easterly line of said highway right of way as follows:

South 65° 05' West 160.05 feet, more or less, to a point from which Engineer's Station 4013.15 of said highway survey bears North 24° 55' West 50 feet distant; thence North 24° 55' West 10.00 feet; South 65° 05' West 98.60 feet; thence on a curve to the right with a radius of 154.81 feet, through an angle of 47° 00', a distance of 126.75 feet; thence North 67° 55' West 18.60 feet; thence on a curve to the right with a radius of 449.30 feet, through an angle of 28° 06', a distance of 220.32 feet; thence North 39° 49' West 11.61 feet; thence on a curve to the left with a radius of 180.50 feet, through an angle of 26° 10', a distance of 82.38 feet; thence North 65° 59' West 428.31 feet; thence on a curve to the right with a radius of 398.17 feet, through an angle of 16° 33', a distance of 114.99 feet; thence North 49° 26' West 95.61 feet; thence on a curve to the left with a radius of 139.18 feet, through an angle of 75°, a distance of 182.04 feet; thence South 55° 34' West 94.24 feet; thence on a curve to the right with a radius of 278.82 feet, through an angle of 22° 41', a distance of 110.34 feet; thence South 78° 15' West 3.62 feet; thence on a curve to the left with a radius of 151.13 feet, through an angle of 69° 33', a distance of 183.31 feet; thence South 8° 42' West 60.06 feet to the point of beginning.

3rd: That portion of Lot 13 of said Section 6 contained in the Deed to the County of Mendocino, recorded September 16, 1965 in Book 698, Page 401 and the Deed to the State of California, recorded may 2, 1983 in Book 1389, Page 323.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17959 (CC 1).

APN: 035-030-59, 035-040-10 and 035-050-34

Parcel 2:

The Southeast quarter of the Southeast quarter of Section 6, the Northeast quarter of the Northeast quarter of Section 7, the West one half of the Northwest quarter of Section 8, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17960 (CC 2).

APN: 035-030-60 and 035-050-43

Parcel 3:

The West one half of the Southwest quarter, the Southeast quarter of the Southwest quarter and the Southwest quarter of Section 5. Those portions of the Southwest quarter of the Northwest quarter and the Northwest quarter of the Southeast quarter of Section 5, lying South of the Northerly low water line of the Middle Eel River. That portion of the Northeast quarter of the Southwest quarter of Section 5, lying South of the center of the channel of the Middle Eel River, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17961 (CC 3).

APN: 035-030-62

Parcel 4:

The Southeast quarter of the Southeast quarter of Section 5, and the Northwest quarter of the Northeast quarter, and the East one half of the Northeast quarter of Section 8, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17962 (CC 4).

APN: 035-030-61 and 035-050-44

Parcel 5:

That portion of the Southwest quarter of the Southwest quarter of Section 4 lying South of the Middle Fork of Eel River, and the Northwest quarter of the Northwest quarter, and the South one half of the Northwest quarter of Section 9, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17963 (CC 5).

APN: 035-030-20 and 035-050-45

Parcel 6:

The Northeast quarter of the Northwest quarter, the West one half of the Northeast quarter, and the Northwest quarter of the Southeast quarter of Section 9, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17964 (CC 6).

APN: 035-050-46

Parcel 7:

The East one half of the East one half of Section 9, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17965 (CC 7).

APN: 035-050-47

Parcel 8:

The Northwest quarter of Section 10, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17966 (CC 8).

APN: 035-070-03 and 035-070-41

Parcel 9:

All of that portion of Section 2, lying South of the Middle Fork of Eel River, and the North one half of the Northeast quarter of Section 10, and the North one half of the Northwest quarter of Section 11, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17967 (CC 9).

APN: 035-060-07 and 035-070-42 and 035-070-53

Parcel 10:

The South one half of the Northeast quarter of Section 10, and the South one half of the Northwest quarter of Section 11, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17968 (CC 10).

APN: 035-070-43 and 035-070-54

Parcel 11:

That portion of the East one half of Section 11, lying South of the Middle Fork of Eel River and West of theW est bank of Salt Creek, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17969 (CC11).

APN: 035-070-29

Parcel 12:

The North one half of the Southeast quarter of Section 10, and the North one half of the Southwest quarter of Section 11, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17970 (CC 12).

APN: 035-070-44

Parcel 13:

The South one half of the Southwest quarter of Section 11, and the Northwest quarter, Lot 3, Lot 4, Lot *5* of Section 14, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17971 (CC 13).

APN: 035-070-45

Parcel 14:

The Southeast quarter of the Southeast quarter of Section 10, and the Northeast quarter of the Northeast quarter, and the South one half of the Northeast quarter of Section 15, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17972 (CC 14).

APN: 035-070-46

Parcel 15:

The Southwest quarter of the Southeast quarter of Section 10, and the Northwest quarter of the Northeast quarter, and the North one half of the Northwest quarter of Section 15, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17973 (CC 15).

APN: 035-070-47

Parcel 16:

The Southwest quarter of Section 10, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17974 (CC 16).

APN: 035-070-48

Parcel 17:

The Northeast quarter of the Southwest quarter, the South one half of the Southwest quarter, and the Southwest quarter of the Southeast quarter of Section 9, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17975 (CC 17).

APN: 035-050-48

Parcel 18:

The Southwest quarter of the Northeast quarter, the Northwest quarter of the Southeast quarter, and the East one half of the Southeast quarter of Section 8, and the Northwest quarter of the Southwest quarter of Section 9, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17976 (CC 18).

APN: 035-050-49 and 035-050-50

Parcel 19:

The East one half of the Northwest quarter, the Northeast quarter of the Southwest quarter, the West one half of the Southwest quarter of Section 8, the Northwest quarter of the Northwest quarter of Section 17, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17977 (CC 19).

APN: 035-050-51

Parcel 20:

The South half of the Northeast quarter, the South one half of Lot 7, and the North one half of Lot 8 of Section 7, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17978 (CC 20).

APN: 035-050-42

Parcel 21:

The Southeast quarter, and the South one half of Lot 8 of Section 7, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17979 (CC 21).

APN: 035-050-52

Parcel 22:

The Southeast quarter of the Southwest quarter, and the Southwest quarter of the Southeast quarter of Section 8, and the Northeast quarter of the Northwest quarter, the Northwest quarter of the Northeast quarter of Section 17, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17980 (CC 22).

APN: 035-050-53

Parcel 23:

The Southwest quarter of the Northwest quarter of Section 17; Lot 7 and the Northeast quarter of Section 18, Township 21 North, Range 13 West, Mount Diablo Meridian.

Excepting from Section 18 those portions contained in the deeds to the State of California recorded March 24, 1982 in Book 1345, Page 241, and January 16, 1996 in Book 2303 Official Records, Page 42, Mendocino County Records.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17981 (CC 23).

APN: 035-050-54

Parcel 24:

The West one half of the Northwest quarter of Section 16, and the Northeast quarter of the Northeast quarter, and the South one half of the Northeast quarter of Section 17, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17982 (CC 24).

APN: 035-050-55

Parcel 25:

The West one half of the Northeast quarter, the East one half of the Northwest quarter, and the Northwest quarter of the Southeast quarter of Section 16, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17983 (CC 25).

APN: 035-050-56

Parcel 26:

The East one half of the East one half, and the Southwest quarter of the Southeast quarter of Section 16, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-17984 (CC 26).

APN: 035-050-57

Parcel 27:

The South one half of the Northwest quarter, the North one half of the Southwest quarter, and the Southeast quarter of the Southwest quarter of Section 15, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-17985 (CC 27).

APN: 035-070-49

Parcel 28:

Lot Number Two (2) and Lot Number Three (3) of Section 15; and Lot Number Two (2) and the Northeast quarter of the Northwest quarter of Section 22, in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-17986 (CC 28).

APN: 035-070-12 and 035-210-04

Parcel 29:

The Southwest quarter of the Southwest quarter of Section 15; the Northeast quarter of the Northeast quarter of Section 21, and the west one half of the Northwest quarter of Section 22, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-17987 (CC 29).

APN: 035-070-50, 035-200-58 and 035-210-01

Parcel 30:

The Southwest quarter of Section 16; and the Southeast quarter of the Southeast quarter of Section 17, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17988 (CC 30).

APN: 035-050-58 and 035-050-59

Parcel 31:

The Southeast quarter of the Northwest quarter, the Northeast quarter of the Southwest quarter and the North one half of the Southeast quarter of Section 17, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17989 (CC 31).

APN: 035-050-60

Parcel 32:

The West one half of the Southwest quarter of Section 17, Township 21 North, Range 13 West, Mount Diablo Meridian.
The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17990 (CC 32).

APN: 035-050-61

Parcel 33:

The Southeast quarter of Section 18, Township 21 North, Range 13 West, Mount Diablo Meridian.

Excepting therefrom those portions contained in the deeds to the State of California recorded March 24, 1982 in Book 1345 Official Records, Page 241 and January 16, 1996 in Book 2303 Official Records, Page 42, Mendocino County Records.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17991 (CC 33).

APN: 035-050-19 and 035-050-41

Parcel 34:

The Southeast quarter of the Northeast quarter of Section 19; the Northwest quarter of the Northwest quarter, the South one half of the Northwest quarter and the Southwest quarter of the Northeast quarter of Section 20, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

Excepting from Section 19, 25% of all gas and other minerals as contained in the deed executed by w. J. Hammonds et al to A. M. Baxter, dated February 15, 1955, recorded April 4, 1957 in Volume 457 of Official Records, Page 219, Mendocino County Records.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17992 (CC 34).

APN: 035-200-06 and 035-200-54

Parcel 35:

The Southeast quarter of the Southwest quarter and the Southwest quarter of the Southeast of Section 17, the North one half of the Northeast quarter of Section 20, and the Northwest quarter of the Northwest quarter of Section 21, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17993 (CC 35).

APN: 035-050-62 and 035-200-55

Parcel 36:

The Northwest quarter of the Northeast quarter, the East one half of the Northwest quarter, and the East one half of the Southwest quarter of Section 21, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17994 (CC 36).

APN: 035-200-56

Parcel 37:

The South one half of the Northeast quarter, and the Southeast quarter of Section 21, and the Southwest quarter of the Southwest quarter of Section 22, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17995 (CC 37).

APN: 035-200-57 and 035-210-03

Parcel 38:

The Southeast quarter (SE 1/4) of the Northwest quarter (NW 1/4), the North half (N 1/2) of the Southwest quarter (SW 1/4) and the Southeast quarter (SE 1/4) of the Southwest quarter (SW 1/4) of Section 22, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17996 (CC 38).

APN: 035-210-02

Parcel 39:

Lot 7 and Lot 8 of Section 14, Lot 1, Lot 2, Lot 8 and Lot 16 of Section 23; Lot 2, Lot 3, Lot 6 and Lot 7 of Section 24 and the North one half of the Northeast quarter of Section 26, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-17997 (CC 39).

APN: 035-070-18 and 035-210-24

Parcel 40:

Lot 1 and Lot 4 of Section 13; and Lot 1 and Lot 4 of Section 24, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-17998 (CC 40).

APN: 035-070-20 and 035-210-10

Parcel 41:

The West one half of the Southeast quarter of Section 13; and the West one half of the Northeast quarter of Section 24, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-17999 (CC 41).

APN: 035-070-51 and 035-210-25

Parcel 42:

The East one half of the Southeast quarter of Section 13; and the East one half of the Northeast quarter of Section 24, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18000 (CC 42).

APN: 035-070-52 and 035-210-26

Parcel 43:

The Southeast quarter of Section 24, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18001 (CC 43).

APN: 035-210-27

Parcel 44:

The North one half of the Southwest quarter, the Southeast quarter of the Southwest quarter, and the Northwest quarter of the Southeast quarter of Section 20, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18002 (CC 44).

APN: 035-200-59

Parcel 45:

The Southeast quarter of the Northeast quarter, and the East one half of the Southeast quarter of Section 20; and the Southwest quarter of the Northwest quarter, and the Northwest quarter of the Southwest quarter of Section 21, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18003 (CC 45).

APN: 035-200-60

Parcel 46:

The Southwest quarter of the Southeast quarter of Section 20; and the North one half of the Northeast quarter, and the Southeast quarter of the Northeast quarter of Section 29, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18004 (CC 46).

APN: 035-200-61

Parcel 47:

The Southwest quarter of the Southwest quarter of Section 21, and the West one half of the Northwest quarter, and the Northwest quarter of the Southwest quarter of Section 28, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18005 (CC 47).

APN: 035-200-62 and 035-200-63

Parcel 48:

The East one half of the West one half of Section 28, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18006 (CC 48).

APN: 035-200-64

Parcel 49:

The Southwest quarter of the Northwest quarter, and the North one half of the Northwest quarter of Section 27; and the North one half of the Northeast quarter of Section 28, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18007 (CC 49).

APN: 035-200-65, 035-200-66 and 035-210-28

Parcel 50:

The Southeast quarter of the Northwest quarter and the Northeast quarter of Section 27, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18008 (CC 51).

APN: 035-210-29

Parcel 51:

The North one half of the Northwest quarter, the Southeast quarter of the Northwest quarter and the Southwest quarter of the Northeast quarter of Section 26, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18009 (CC 52).

APN: 035-210-30

Parcel 52:

The North one half of the Northwest quarter, and the Northeast quarter of Section 25, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18010 (CC 54).

APN: 035-210-31

Parcel 53:

The South one half of Section 19; the South one half of Section 20; the North one half of Section 29; and Section 30, all in Township 21 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18011 (CC 55).

APN: 035-220-15, 035-220-25, 035-370-08, 035-370-15, 035-370-16 and 035-370-21

Parcel 54:

The South one half of Section 29, Section 31, Section 32, and the West one half of the West one half of Section 33, all in Township 21 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18012 (CC 56).

APN: 035-370-18, 035-370-19, 035-370-22 and 035-370-23

Parcel 55:

The Southeast quarter of Section 25, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18013 (CC 57).

APN: 035-210-32

Parcel 56:

The South one half of the Northwest quarter and the North one half of the Southwest quarter of Section 25, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18014 (CC 58).

APN: 035-210-20 and 035-210-33

Parcel 57:

The Southeast quarter of the northeast quarter, the North one half of the Southeast quarter and the Northeast quarter of the Southwest quarter of Section 26, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18015 (CC 59).

APN: 035-210-34, 035-210-35, 035-210-36 and 035-210-37

Parcel 58:

The Northwest quarter of the Southwest quarter and the Southwest quarter of the Northwest quarter of Section 26, and the North one half of the Southeast quarter of Section 27, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18016 (CC 60).

APN: 035-210-38

Parcel 59:

The Northeast quarter of the Southwest quarter and the South half of the Southwest quarter of Section 27, and the Southeast quarter of the Southeast quarter of Section 28, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18017 (CC 61).

APN: 035-200-67 and 035-210-39

Parcel 60:

The Northwest quarter of the Southwest quarter of Section 27, and the South one half of the Northeast quarter, and the Northeast quarter of the Southeast quarter of Section 28, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18018 (CC 62).

APN: 035-200-68, 035-200-69 and 035-210-40

Parcel 61:

The West one half of the Southeast quarter of Section 28, and the North one half of the Northeast quarter of Section 33, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18019 (CC 63).

APN: 035-200-70 and 035-350-53

Parcel 62:

The Southwest quarter of the Southwest quarter of Section 28, the East one half of the Southeast quarter of Section 29, and the North one half of the Northwest quarter of Section 33, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18020 (CC 64).

APN: 035-200-71 and 035-350-54

Parcel 63:

The North one half of the Southwest quarter, and the West one half of the Southeast quarter of Section 29, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18021 (CC 65).

APN: 035-200-72

Parcel 64:

The Northeast quarter of Section 32, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18022 (CC 66).

APN: 035-350-55

Parcel 65:

The South one half of the Northwest quarter, and Lot 1 of Section 33, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18023 (CC 67).

APN: 035-350-56

Parcel 66:

The South one half of the Northeast quarter of Section 33, and the South one half of the Northwest quarter of Section 34, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18024 (CC 68).

APN: 035-350-57 and 035-360-09

Parcel 67:

The Northeast quarter, and the North one half of the Northwest quarter of Section 34, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18025 (CC 69).

APN: 035-360-10

Parcel 68:

The South one half of the Southwest quarter of Section 26, and the South one half of the Southeast quarter of Section 27, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18026 (CC 70).

APN: 035-210-41 and 035-210-43

Parcel 69:

The Northwest quarter and the Northwest quarter of the Northeast quarter of Section 35, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18027 (CC 71).

APN: 035-360-11

Parcel 70:

The South one half of the Southwest quarter of Section 25 and the South one half of the Southeast quarter of Section 26, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18028 (CC 72).

APN: 035-210-21 and 035-210-42

Parcel 71:

The North one half of Section 36, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18029 (CC 73).

APN: 035-360-12

Parcel 72:

Lots 1, 2, 13 and 14 of Section 36, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18030 (CC 74).

APN: 035-360-13 and 035-360-14

Parcel 73:

The East one half of Lot 9, the East one half of Lot 10, and the East one half of the Northeast quarter of Section 35, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18031 (CC 75).

APN: 035-360-15 and 035-360-16

Parcel 74:

The East half of Lot 2, the West half of Lots 9 and 10 and the Southwest quarter of the Northeast quarter of Section 35, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as 2006-18032 (CC 76).

APN: 035-360-17

Parcel 75:

Lot 10 Section 34, and Lot 1 of Section 35, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18033 (CC 77).

APN: 035-360-18

Parcel 76:

Lot 10 Section 33, and Lot 1 of Section 34, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18034 (CC 78).

APN: 035-350-58 and 035-360-19

Parcel 77:

Lot 9 and Lot 10 Section 32, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18035 (CC 79).

APN: 035-350-59

Parcel 78:

Lot 6, Lot 7 and Lot 8 of Section 32, and the West one half of Lot 2, the West one half of Lot 3 and Lot 4 of Section 33, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18036 (CC 80).

APN: 035-350-60

Parcel 79:

The East one half of Lot 2, the East one half of Lot 3, Lot 8 and Lot 9 of Section 33, and the West one half of Lot 2 of Section 34, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18037 (CC 81).

APN: 035-350-61 and 035-360-20

Parcel 80:

The East one half of Lot 2 and Lot 9 of Section 34; and the West one half of Lot 2 of Section 35, all in Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18038 (CC 82).

APN: 035-360-21

Parcel 81:

Lot 3, Lot 4, Lot 5, Lot 6, and the West one half of Lot 8, Section 35, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18039 (CC 83).

APN: 035-360-22

Parcel 82:

Lots 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 of Section 36, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18040 (CC 84).

APN: 035-360-23

Parcel 83:

The North one half of Section 5, the North one half of Section 6, the Southwest quarter of Section 6, and the Northwest quarter of Section 7, all in Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18041 (CC 85).

APN: 036-290-17, 036-290-18 and 036-290-19

Parcel 84:

The Southeast quarter of Section 5, Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18042 (CC 86).

APN: 036-290-20 and 036-290-21

Parcel 85:

The Southwest quarter of Section 5, Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18043 (CC 87).

APN: 036-290-22 and 036-290-23

Parcel 86:

The Southeast quarter of Section 6, Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18044 (CC 88).

APN: 036-290-24

Parcel 87:

Lots 1, 2, 3 and 4 of Section 1; Lots 1, 2, 3, 4 and the Northwest quarter of the Southeast quarter of Section 2, all in Township 20 North, Range 13 West, Mount Diablo Meridian; and the East one half of Lot 8 and Lot 7 of Section 35, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18045 (CC 89).

APN: 035-360-24 and 036-260-27

Parcel 88:

Lots 1, 2, 3, 4 and the North one half of the Southeast quarter of Section 3, Township 20 North, Range 13 West, Mount Diablo Meridian; and Lots 5, 6, 7 and 8 of Section 34, Township 21 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18046 (CC 90).

APN: 035-360-25 and 036-260-28

Parcel 89:

Lots 5, 6, 7 of Section 33, and Lots 3 and 4 of Section 34, all in Township 21 North, Range 13 West, Mount Diablo Meridian; Lot 1, the East one half of the Southeast quarter of Section 4; the Southwest quarter of Section 3 and the North one half of the Northwest quarter of Section 10, all in Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18047 (CC 91).

APN: 035-350-62, 035-360-26, 036-230-71 and 036-260-29

Parcel 90:

Lots 2, 3 and 4, the North one half of the Southwest quarter and the Northwest quarter of the Southeast quarter of Section 4, the South one half of the Southwest quarter of Section 4, and the East one half of the Southeast quarter, Lots 1 and 2 of Section 5, all in Township 20 North, Range 13 West, Mount Diablo Meridian.

Excepting therefrom that portion conveyed in the deed to Hugh B. Codding, Trustee, recorded April 15, 1996 in Book 2324 of Official Records, Page 325, Mendocino County Records.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18048 (CC 92).

APN: 036-230-72

Parcel 91:

The Northwest quarter, the Northwest quarter of the Northeast quarter, and the Southeast quarter of the Northeast quarter of Section 9, the Southeast quarter, and the East one half of the Southwest quarter of Section 9, all in Township 20 North, Range 13 West, Mount Diablo Meridian.

Excepting therefrom all that portion lying west of the centerline of the Eel River.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18049 (CC 93).

APN: 036-230-70

Parcel 92:

The South one half of the Southeast quarter of Section 3, the East one half of the Northeast quarter, and the North one half of the Southeast quarter of Section 10, and the Southwest quarter, and the Southwest quarter of the Southeast quarter of Section 11, all in Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18050 (CC 94).

APN: 036-260-30

Parcel 93:

The Northwest quarter of the Northwest quarter, the South one half of the Northwest quarter, the Southwest quarter of the Northeast quarter, and the North one half of the Northeast quarter of Section 11, and the Northwest quarter of the Northwest quarter of Section 12, all in Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18051 CC 95).

APN: 036-260-31

Parcel 94:

The West one half of the Northeast quarter, the East one half of the Northwest quarter, and the Northeast quarter of the Southwest quarter of Section 12, Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18052 (CC 96).

APN: 036-260-32

Parcel 95:

The Northeast quarter of Section 7, Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18053 (CC 97).

APN: 036-290-25

Parcel 96:

The Northwest quarter of Section 8, Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18054 (CC 98).

APN: 036-290-06

Parcel 97:

The South one half of Section 7, Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18055 (CC 99).

APN: 036-290-26

Parcel 98:

The Southwest quarter of the Northwest quarter, the Northwest quarter of the Southwest quarter, and the South one half of the Southwest quarter of section 12, and the Northwest quarter of the northwest quarter of Section 13, all in Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18056 (CC 100).

APN: 036-260-33 and 036-270-06

Parcel 99:

The Southeast quarter of the Northeast quarter, the North one half of the Southeast quarter, and the Southeast quarter of the Southeast quarter of Section 11, Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18057 (CC 101).

APN: 036-260-34

Parcel 100:

The South half of the Southeast quarter and the Southeast quarter of the Southwest quarter of Section 10, and the Northeast quarter of the Northwest quarter of Section 15, Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18058 (CC 102).

APN: 036-260-12 and 036-270-33

Parcel 101:

The Northeast quarter of Section 15, Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18059 (CC Parcel 103).

APN: 036-270-34

Parcel 102:

The North one half of the North one half of Section 14, Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18060 (CC 104).

APN: 036-270-35

Parcel 103:

The North one half of Lot 1, and the North one half of Lot 2 of Section 18, Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18061 (CC 105).

APN: 036-300-01

Parcel 104:

The Northeast quarter of the Northeast quarter of Section 18, Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18062 (CC 106).

APN: 036-300-14

Parcel 105:

The Southeast quarter of the northeast quarter, Lots 3, 4, 9 and 10 of Section 18, and Lot 1 of Section 19, all in Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18063 (CC 107).

APN: 036-300-22 and 036-300-23

Parcel 106:

The South one half of Lot 1, the South one half of Lot 2, Lots 5, 6, 7 and 8, and the Southwest quarter of the Northeast of Section 18 and Lot 4 of Section 19, all in Township 20 North, Range 12 West, Mount Diablo Meridian; and the Southeast quarter of the Northeast quarter, and the Northeast quarter of the Southeast quarter of Section 13, Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18064 (CC 108).

APN: 036-270-26, 036-300-24 and 036-300-25

Parcel 107:

The Southeast quarter of the Northwest quarter, the Southwest quarter of the Northeast quarter, the Northeast quarter of the Southwest quarter, and the Northwest quarter of the Southeast quarter of Section 13, Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18065 (CC 109).

APN: 036-270-24

Parcel 108:

The Southeast quarter of the Southeast quarter of Section 13, and the North one half of the Northeast quarter, the Southwest quarter of the Northeast quarter, and the Northwest quarter of the Southeast quarter of Section 24, Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18066 (CC 110).

APN: 036-270-36

Parcel 109:

Lots 2, 3, 6 and 7 of Section 19, Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18067 (CC 111).

APN: 036-300-26

Parcel 110:

Lots 8, 9, 10 and 16 of Section 19, Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18068 (CC 112).

APN: 036-300-09

Parcel 111:

Lots 5, 12, 13 and 14 of Section 19, and Lot 3 of Section 30, all in Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18069 (CC 113).

APN: 036-300-27 and 036-310-02

Parcel 112:

The Southeast quarter of the Northeast quarter, the East one half of the Southeast quarter, and the Southwest quarter of the Southeast quarter of Section 24, and the North one half of the Northeast quarter of Section 25, all in Township 20 North, Range 13 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18070 (CC 114).

APN: 036-270-37 and 036-280-09

Parcel 113:

Lots 7, 9, 10 and 16 of Section 30, Township 20 North, Range 12 West, Mount Diablo Meridian.

The above legal description is pursuant to Certificate of Compliance recorded September 12, 2006 as Instrument No. 2006-18071 (CC 115).

APN: 036-310-03

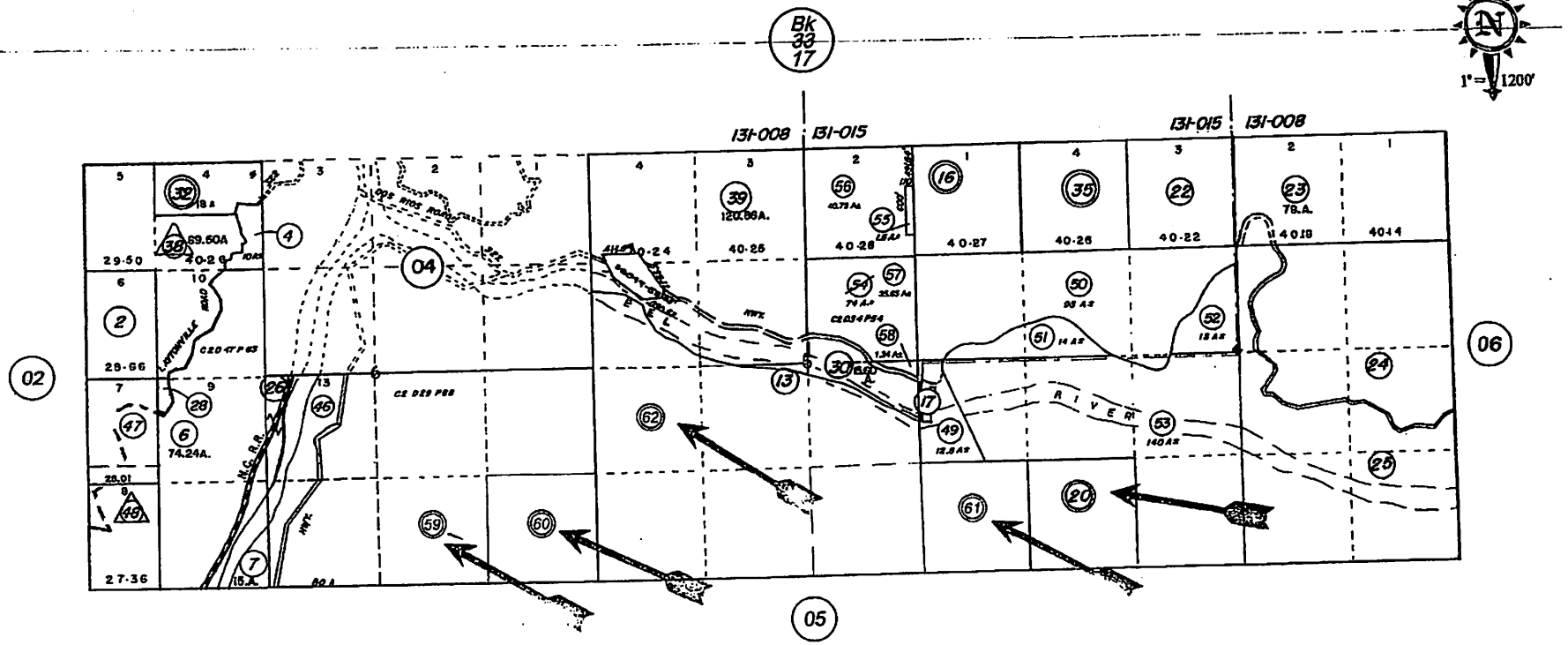
Mendocino, CA , 2012-2013 - 035-030-59-00, Sheet: 1 of 1

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 4,5,6 T.21N. R.13W. M.D.B.& M.

131-015
131-008

35 - 03



JAN 0 4 2007

NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

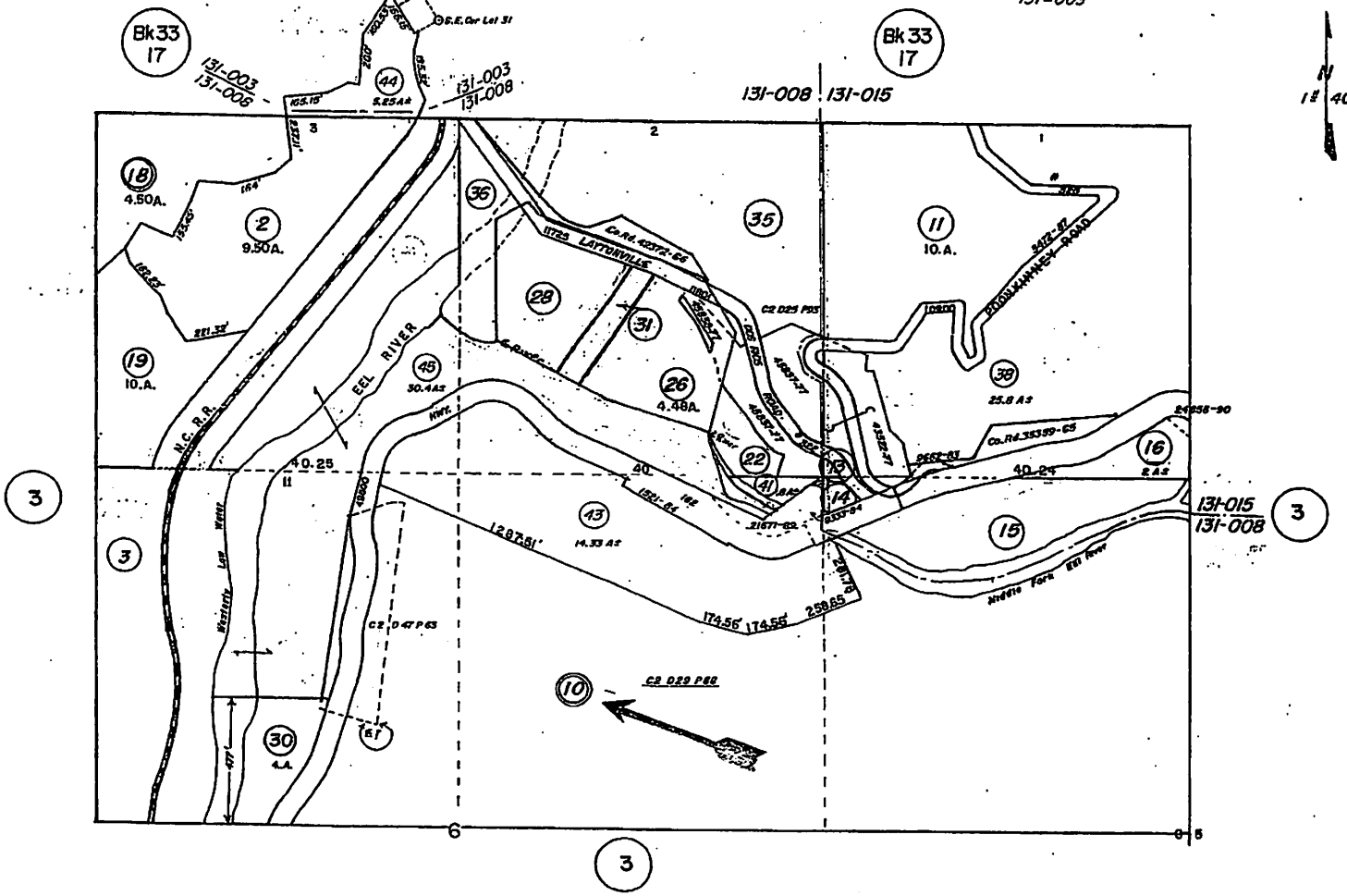
Assessor's Map
County of Mendocino, Calif.
Updated November 29, 2006

Mendocino, CA , 2012-2013 - 035-04, Sheet: 1 of 1

Lots 1, 2, 3, 11, 12, of Sec. 6 T. 21N. R. 13W. M.D.B. & M.

131-015
131-008
131-003

35-04



"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

Assessor's Map
County of Mendocino, Calif.
March, 1949

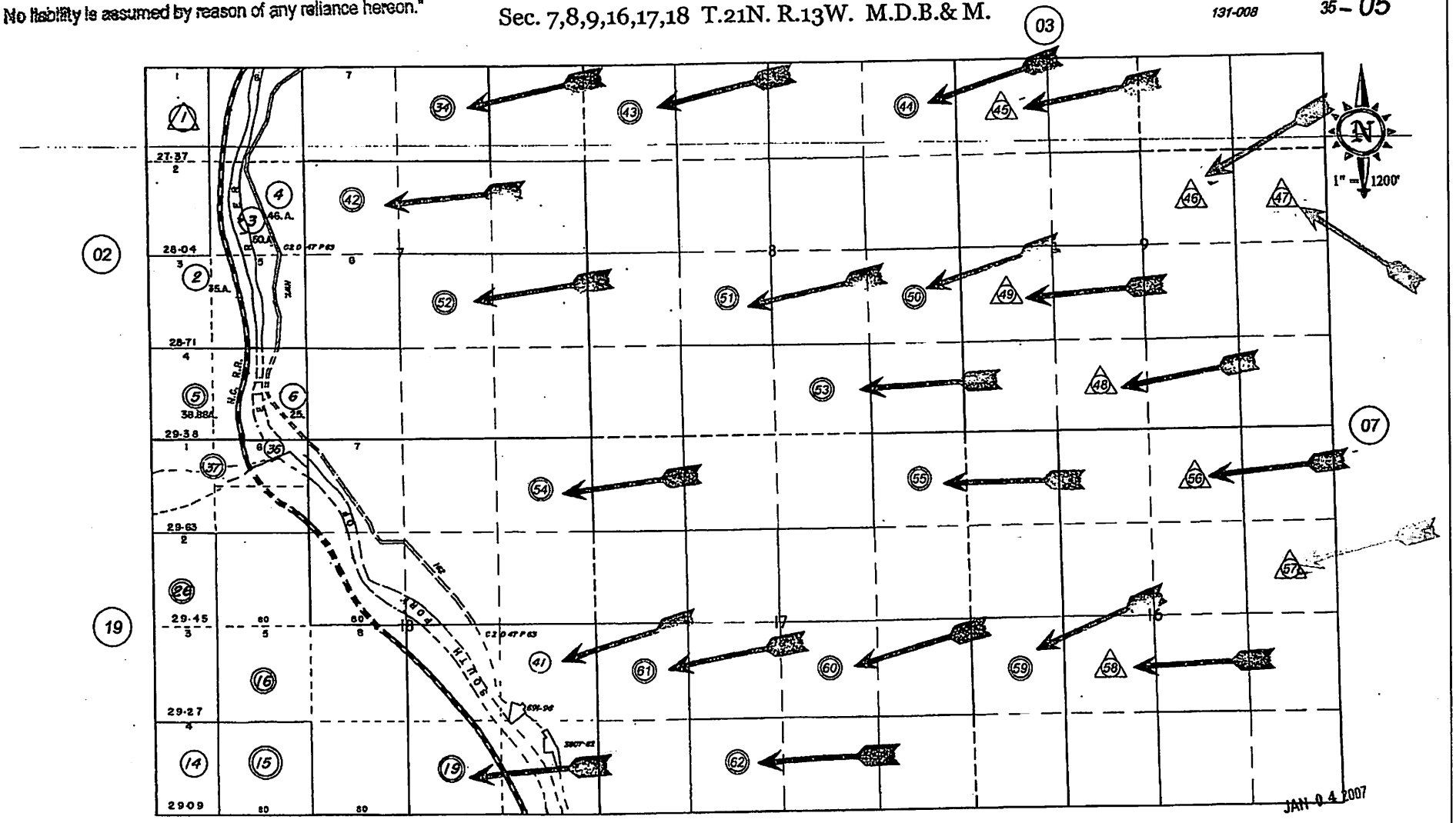
Mendocino, CA , 2012-2013 - 035-05, Sheet: 1 of 1

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 7,8,9,16,17,18 T.21N. R.13W. M.D.B.& M.

131-008

35 – 05



JAN 04 2007

NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

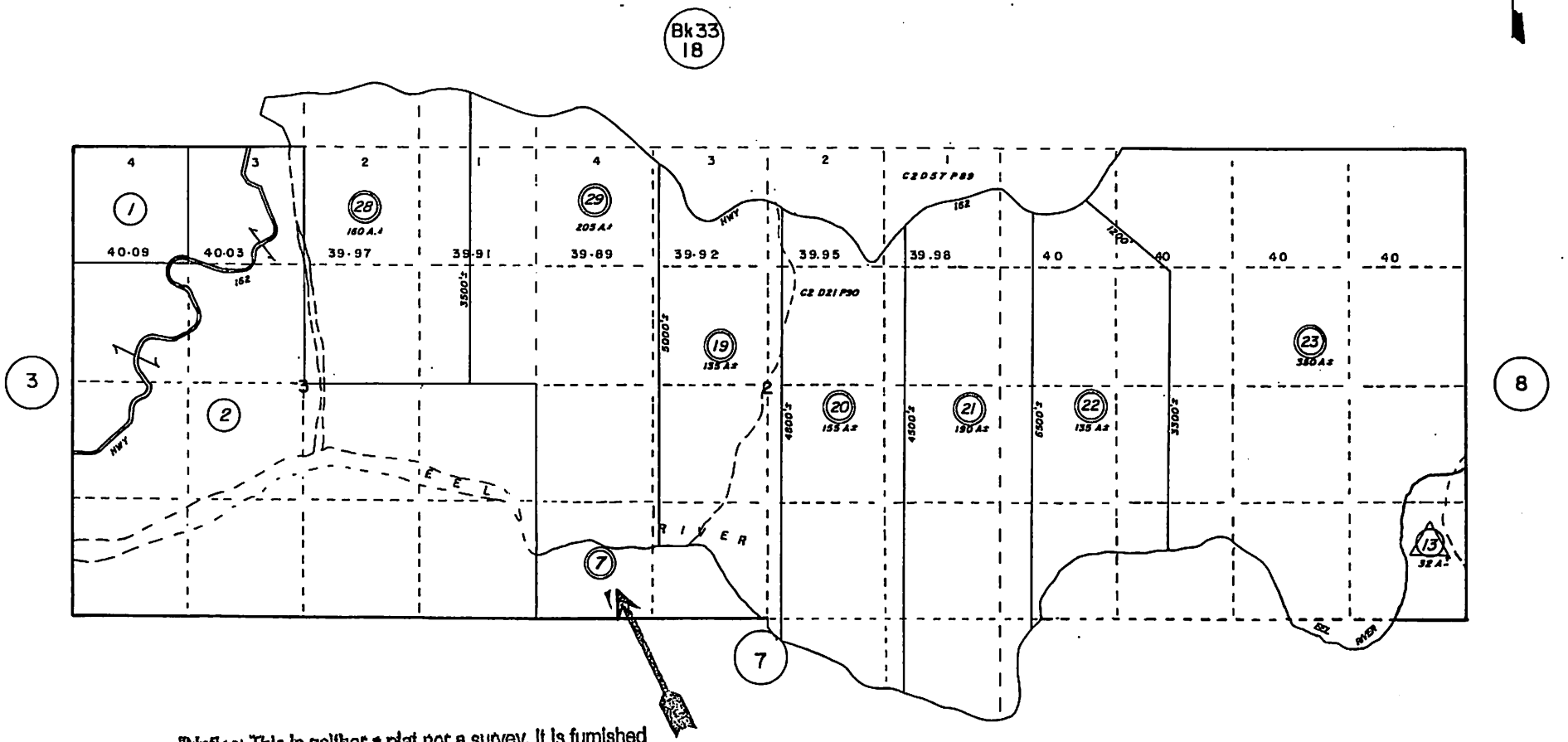
Assessor's Map
County of Mendocino, Calif.
Updated November 30, 2006

35-06

Sec. 1, 2, 3, T.21N. R.13W. M.D.B. & M.

131-008

N
1" = 1200'



"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

NOTE: This map was prepared for

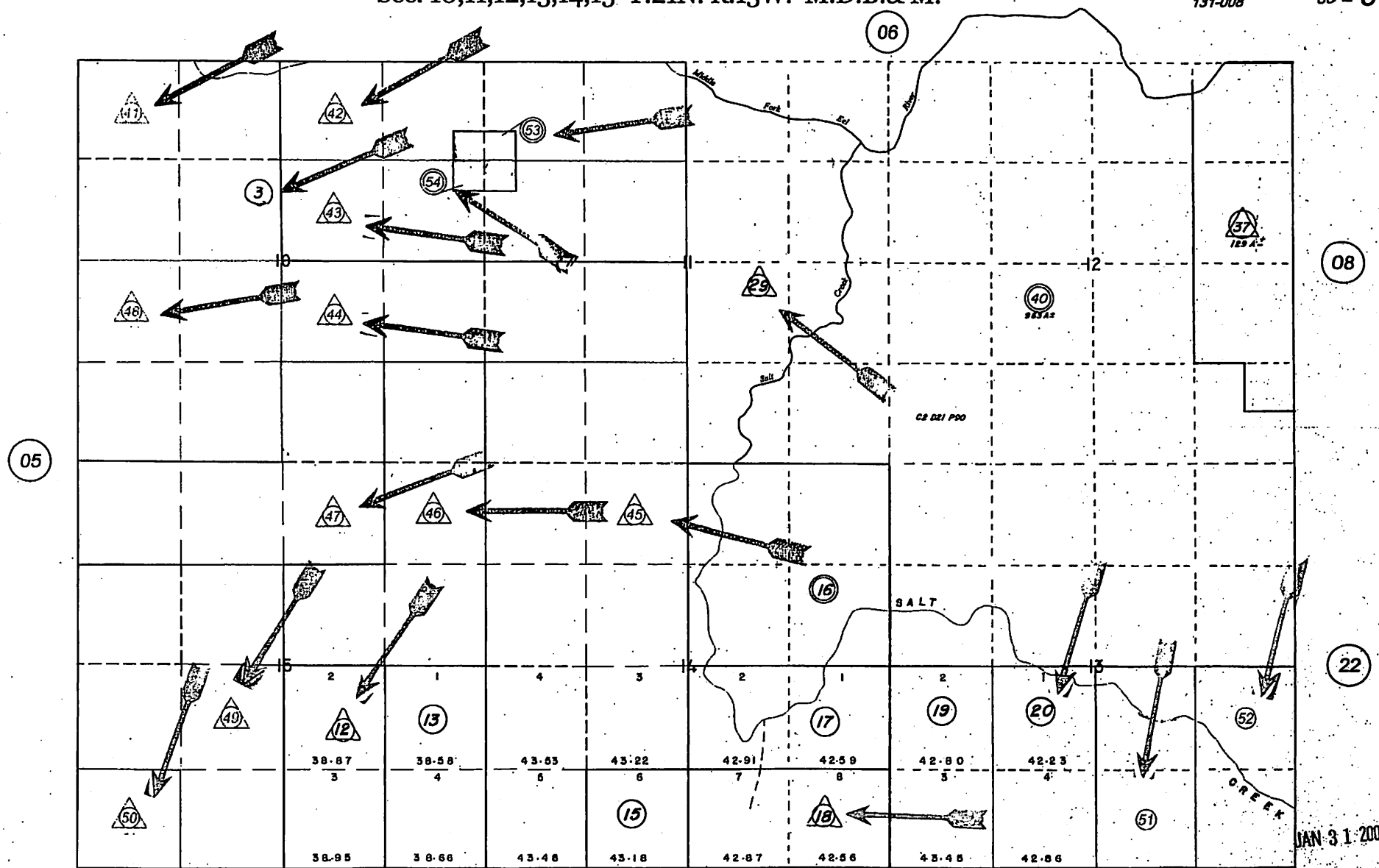
Assessor's Map,

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 10,11,12,13,14,15 T.21N. R.13W. M.D.B.& M.

131-008

35 - 07



NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated

JAN 31 2008

Assessor's Map
County of Mendocino, Calif.

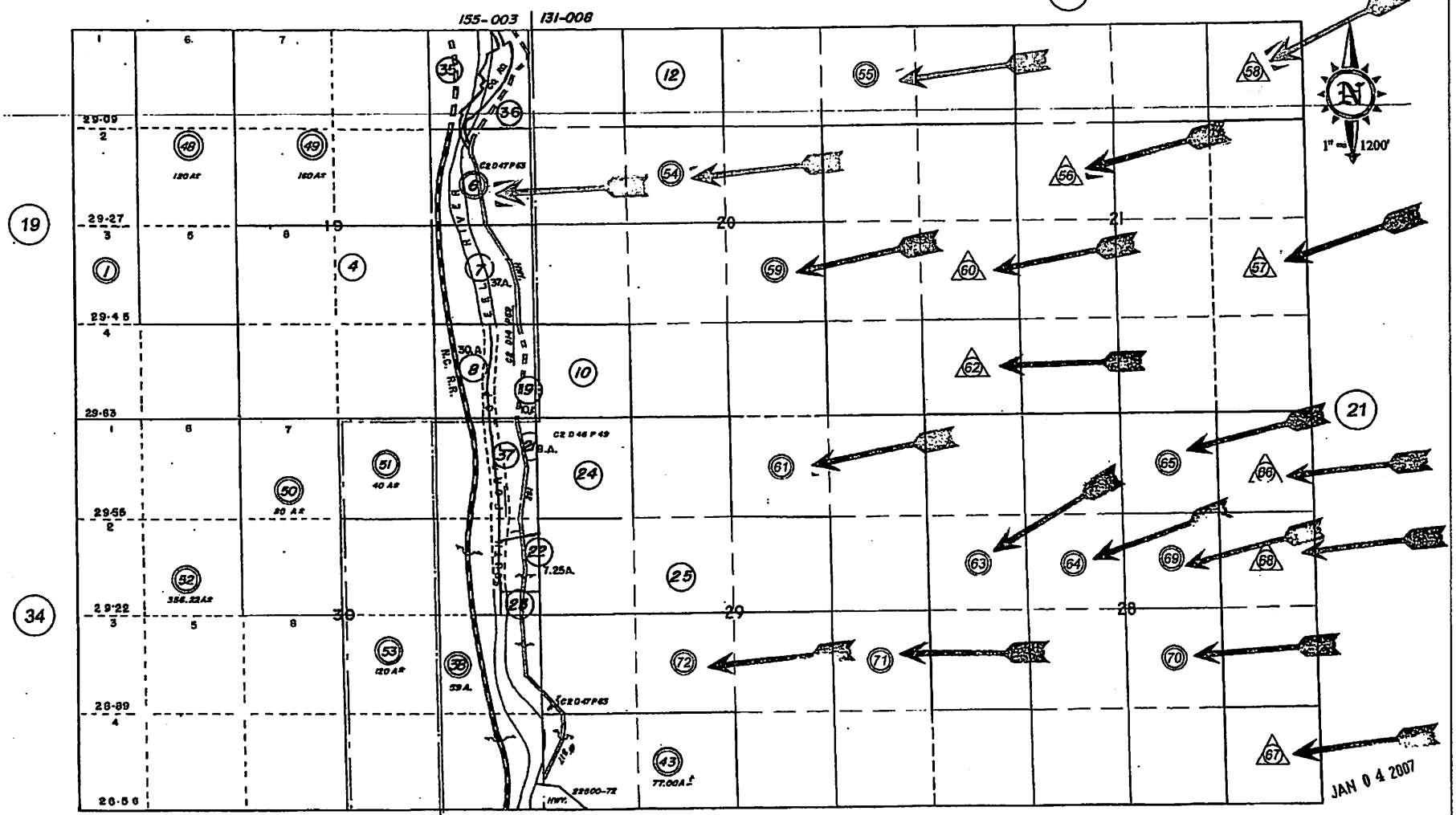
Mendocino, CA , 2012-2013 - 035-200-56-00, Sheet: 1 of 1

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 19,20,21,28,29,30 T.21N. R.13W. M.D.B.& M.

131-008
155-003
155-001

35 – 20



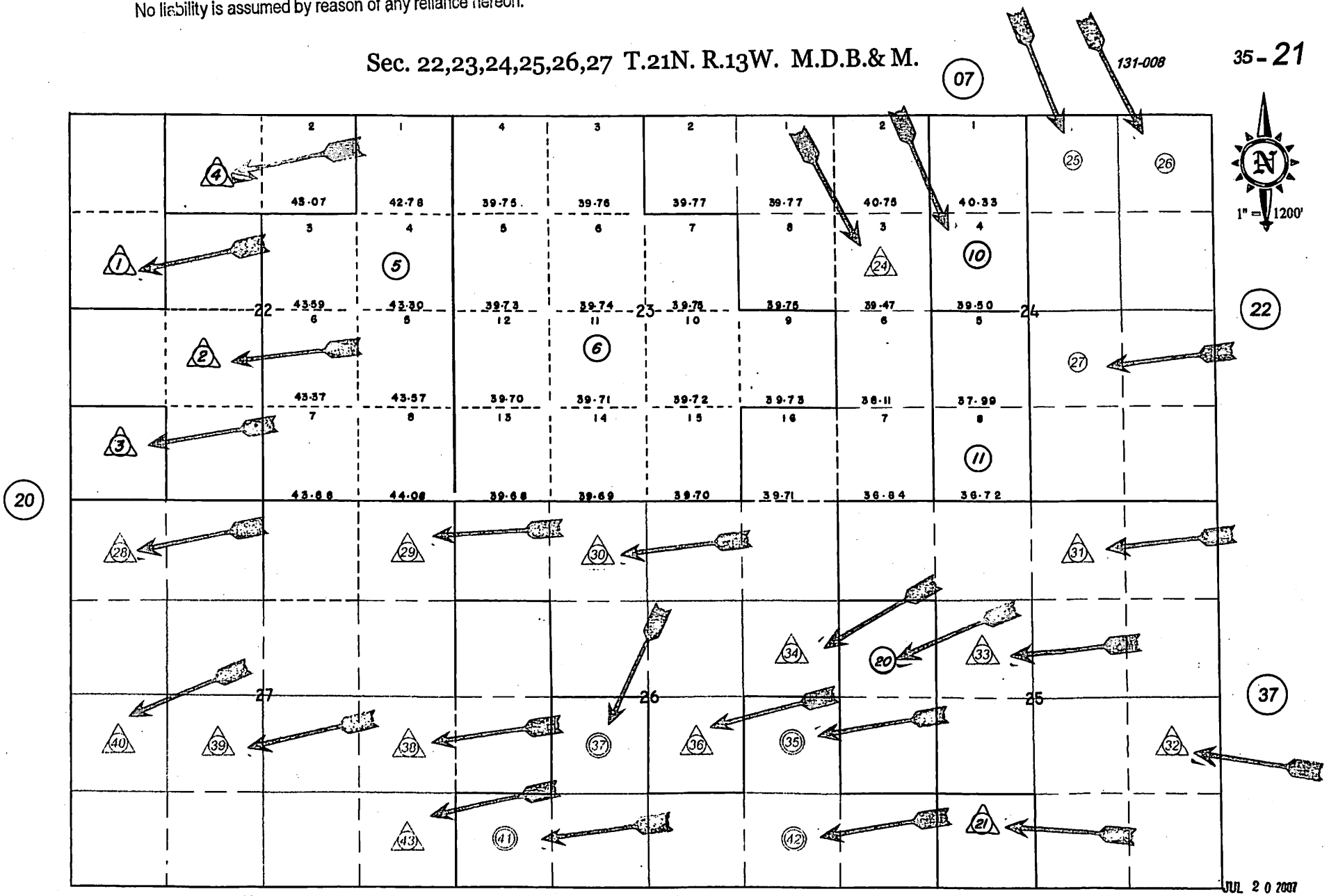
NOTE: This map was prepared for assessment purposes only.
No liability is assumed for the data delineated hereon.

Assessor's Map
County of Mendocino, Calif.
Updated November 30, 2006

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 22,23,24,25,26,27 T.21N. R.13W. M.D.B.& M.

35 - 21



NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

JUL 2 0 2007

Assessor's Map
County of Mendocino, Calif.
Updated December 4, 2006

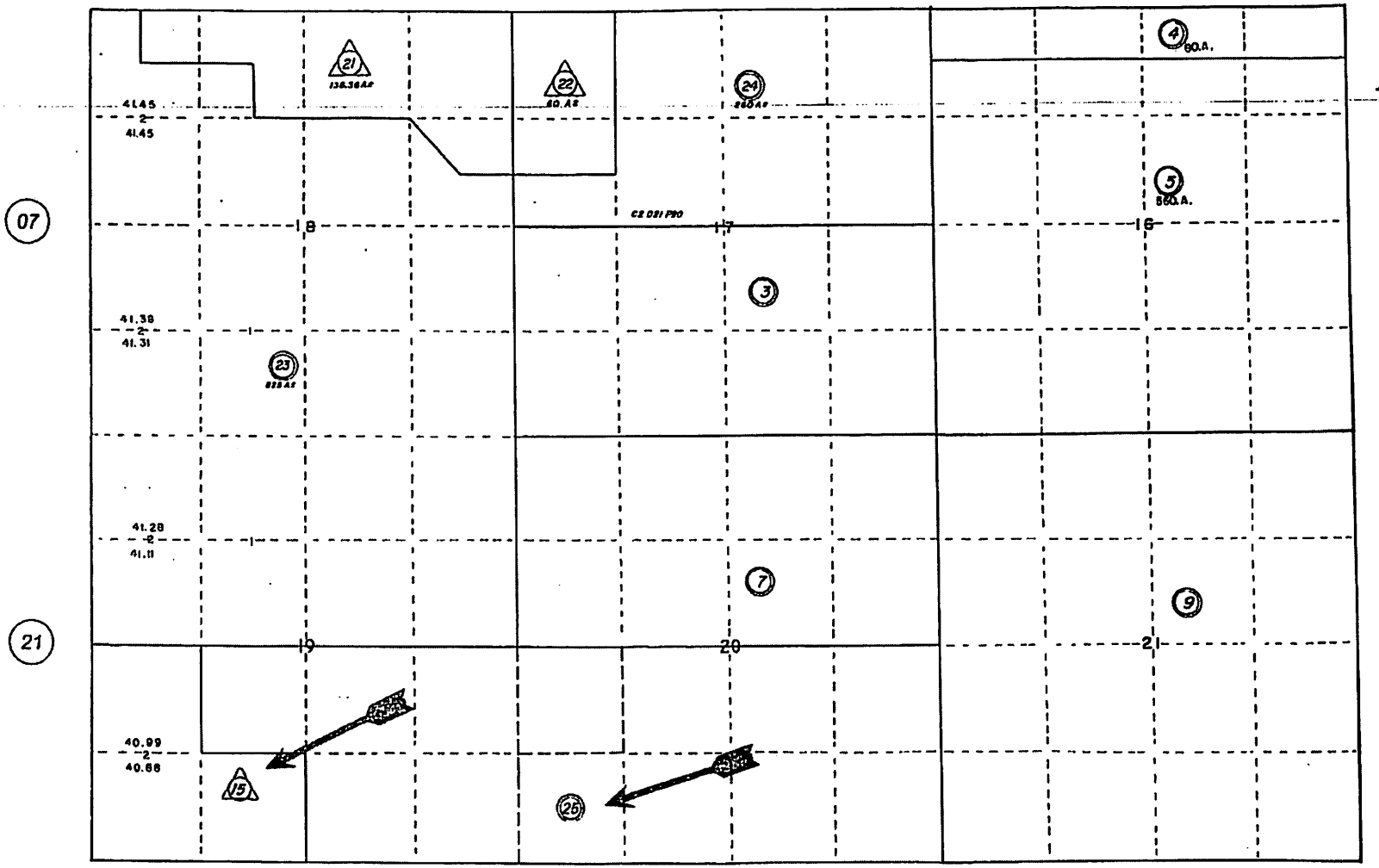
Mendocino, CA . 2012-2013 - 035-220-25-00, Sheet: 1 of 1

Sec. 16,17,18,19,20,21 T.21N. R.12W. M.D.B.& M.

08

131-003

35 – 22



JAN 0 4 2007

NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

37

Assessor's Map
County of Mendocino, Calif.
Updated December 5, 2006

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

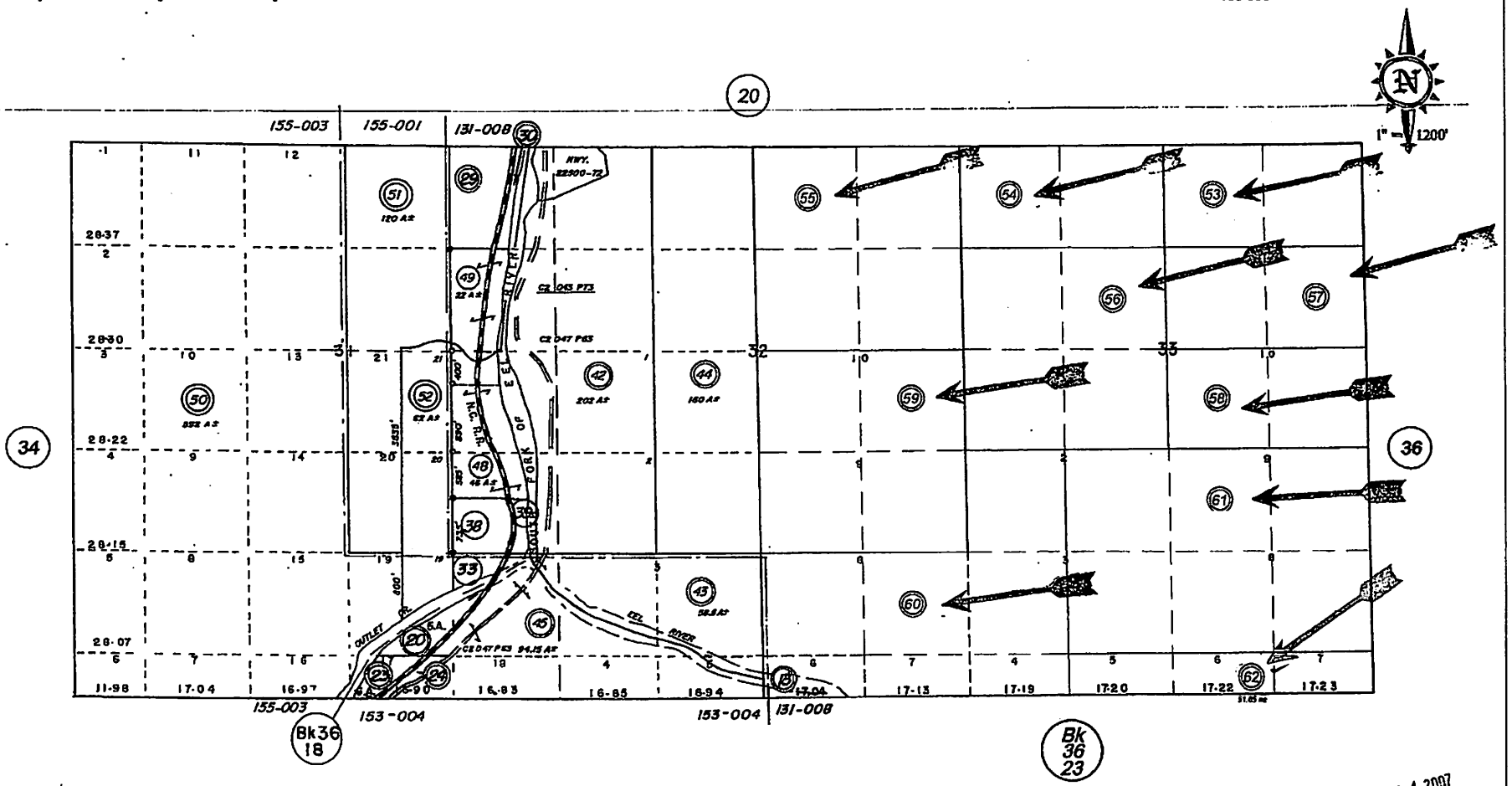
Mendocino, CA , 2012-2013 - 035-35, Sheet 1 of 1

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 31,32,33 T.21N. R.13W. M.D.B.& M.

131-008
155-001
155-003

35 – 35



JAN 0 4 2007

NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

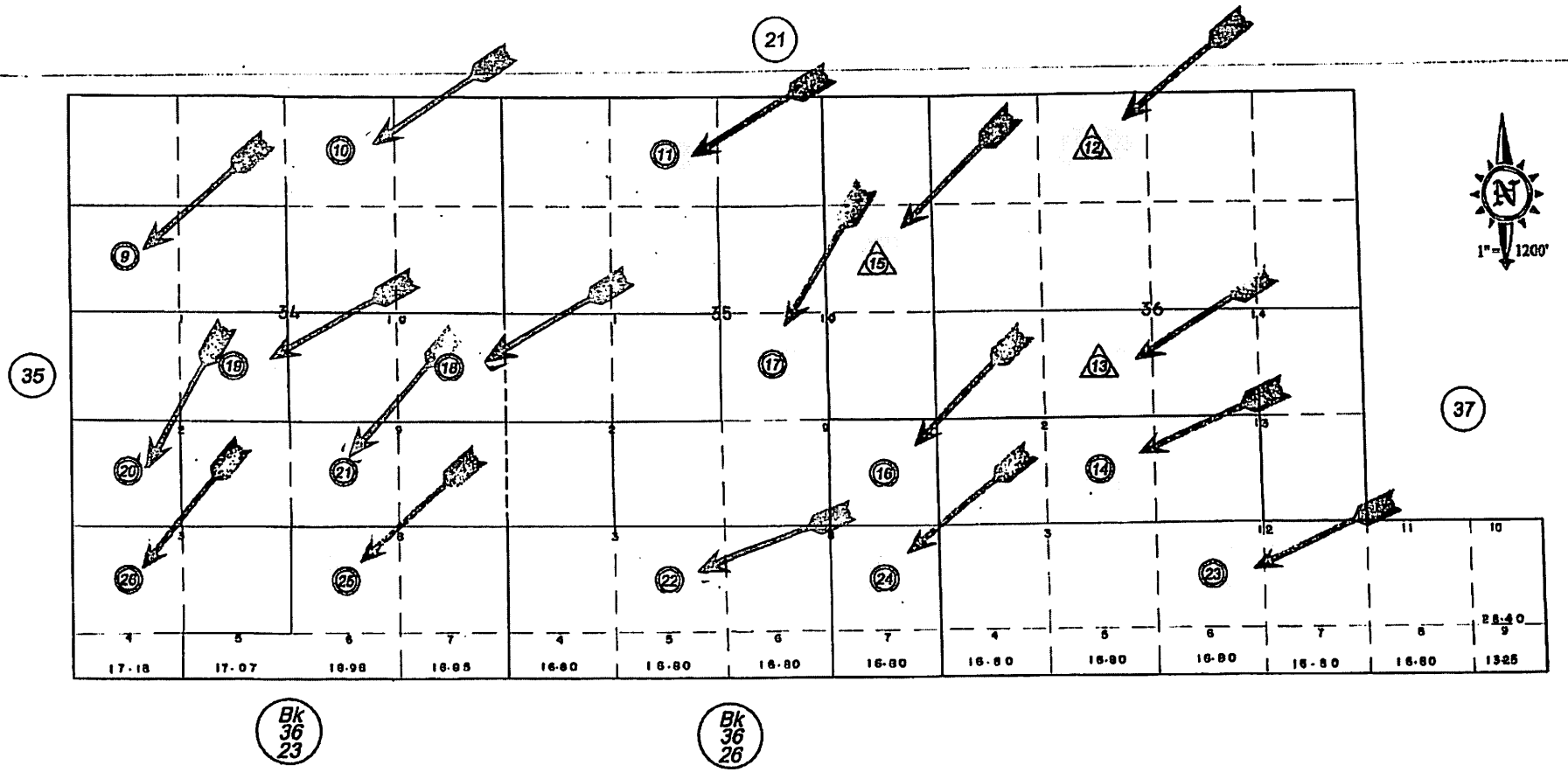
Assessor's Map
County of Mendocino, Calif.
Updated December 5, 2006

Mendocino, CA , 2012-2013 - 035-360-09-00, Sheet: 1 of 1

Sec. 34,35,36 T.21N. R.13W. M.D.B.& M.

131-008

35 - 36



JAN 0 4 2007

NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

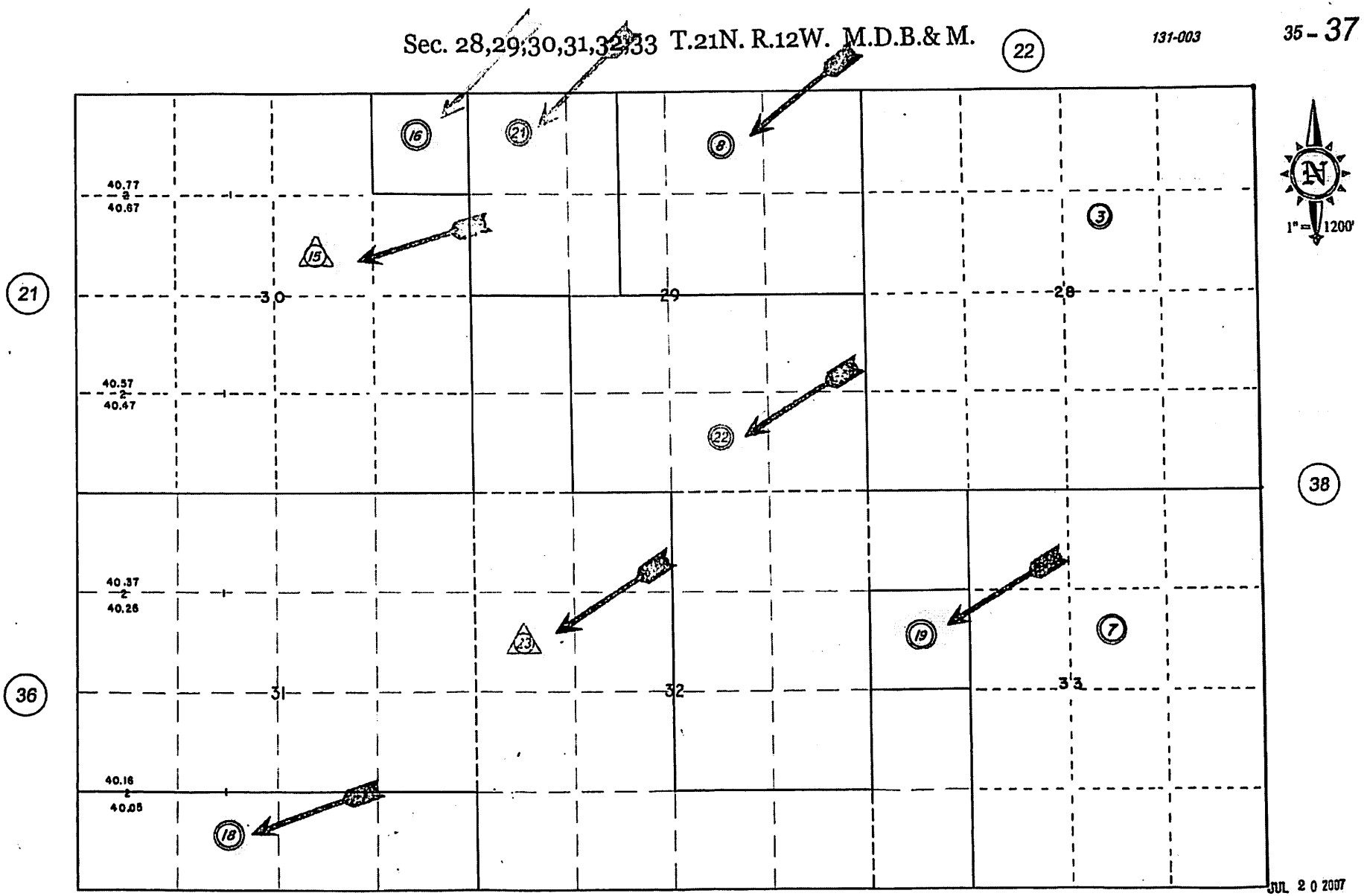
Assessor's Map
County of Mendocino, Calif.
Updated December 5, 2006

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Sec. 28,29,30,31,32,33 T.21N. R.12W. M.D.B.& M.

131-003

35 - 37



JUL 2 0 2007

NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

Bk 36 29

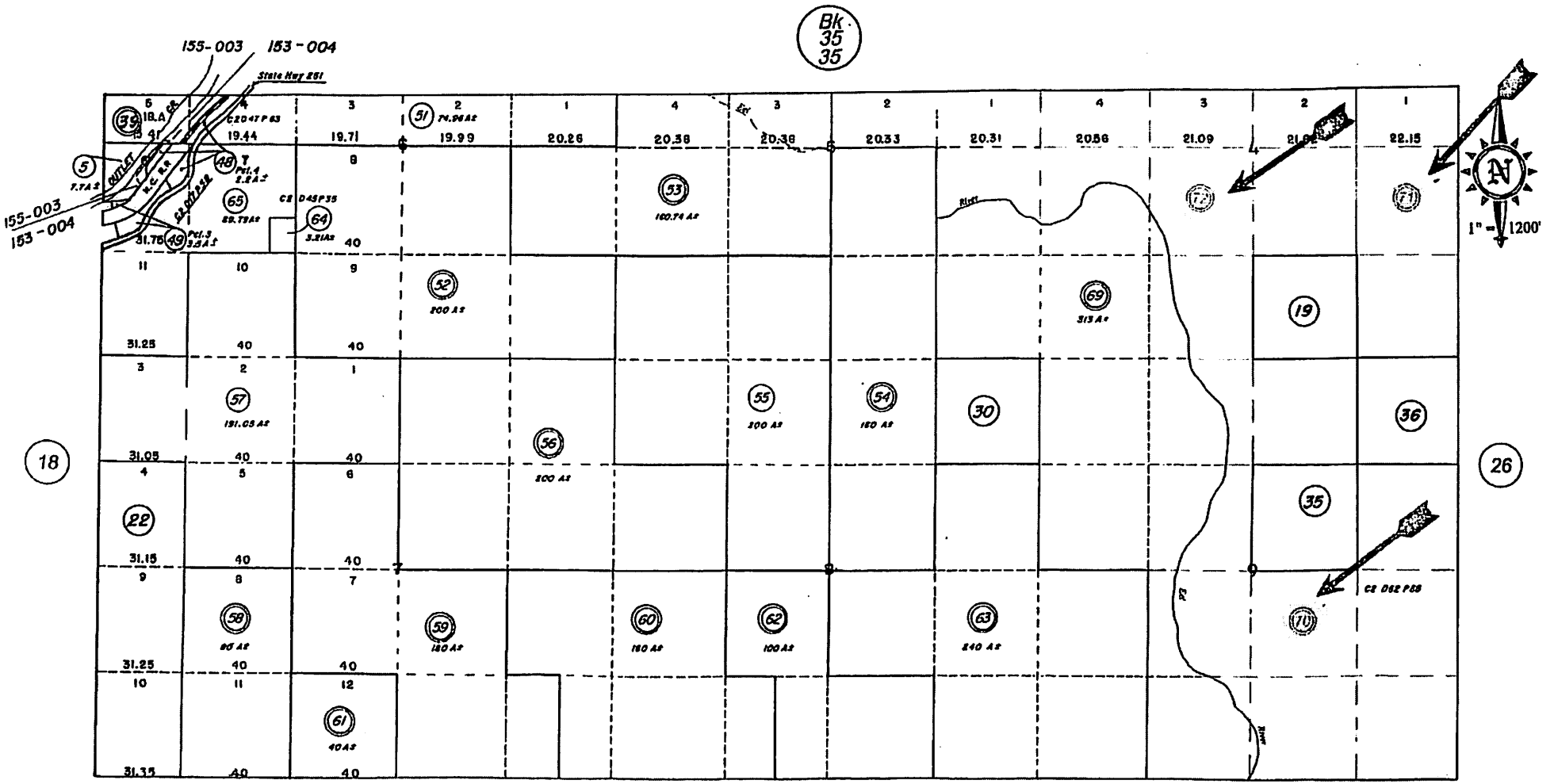
Assessor's Map
County of Mendocino, Calif.
Updated December 5, 2006

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Sec. 4,5,6,7,8,9 T.20N. R.13W. M.D.B.& M.

155-003
153-004

36 - 23



NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

JAN 31 2008

Assessor's Map
County of Mendocino, Calif.
Updated January 24, 2007

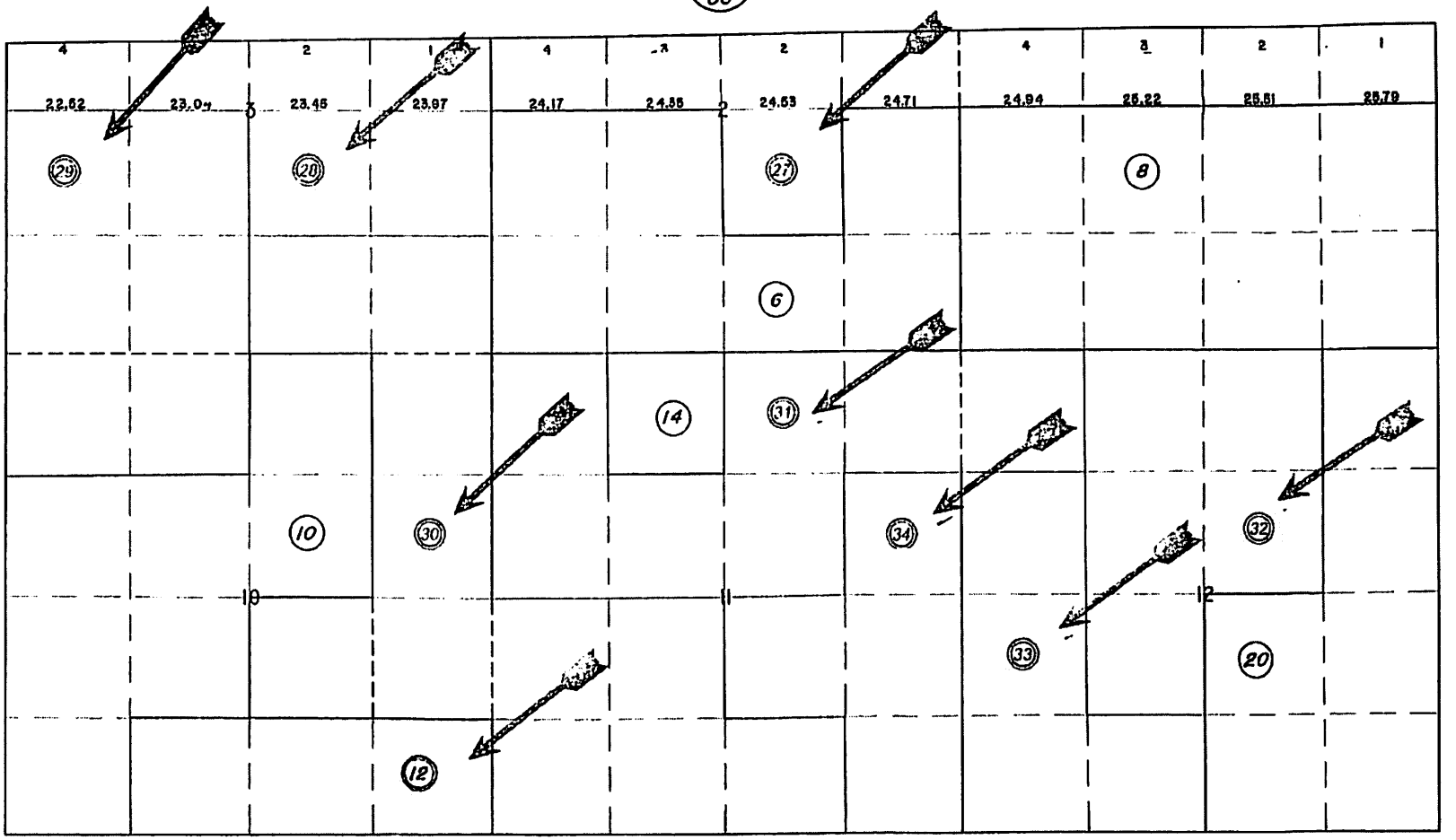
"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 1,2,3,10,11,12 T.20N. R.13W. M.D.B.& M.

153-004

36 - 26

BK 35 36



1" = 1200'

27

APR 03 2007

NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

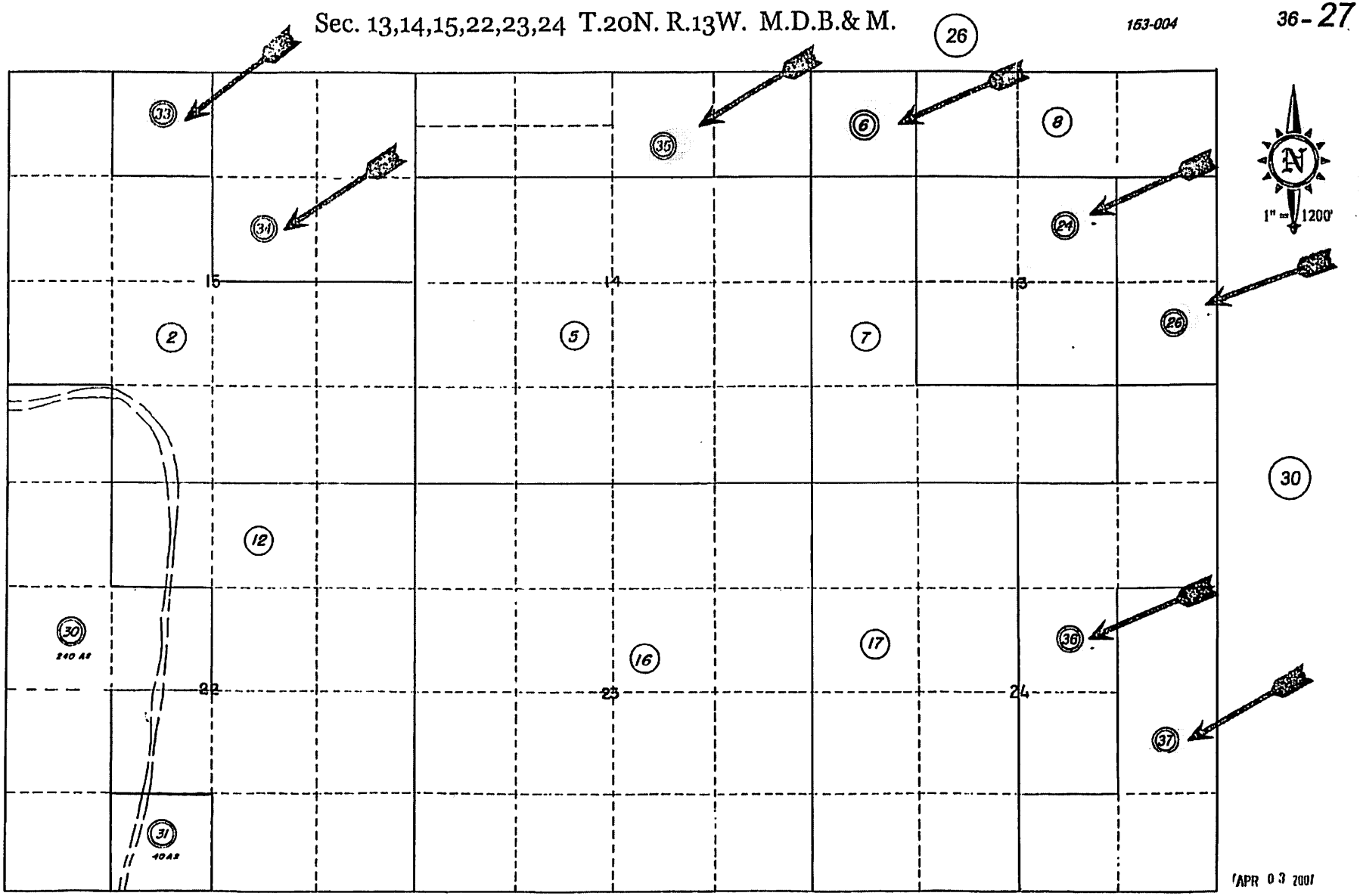
Assessor's Map
County of Mendocino, Calif.
Updated January 24, 2007

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 13,14,15,22,23,24 T.20N. R.13W. M.D.B.& M.

153-004

36-27



APR 03 2007

NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

28

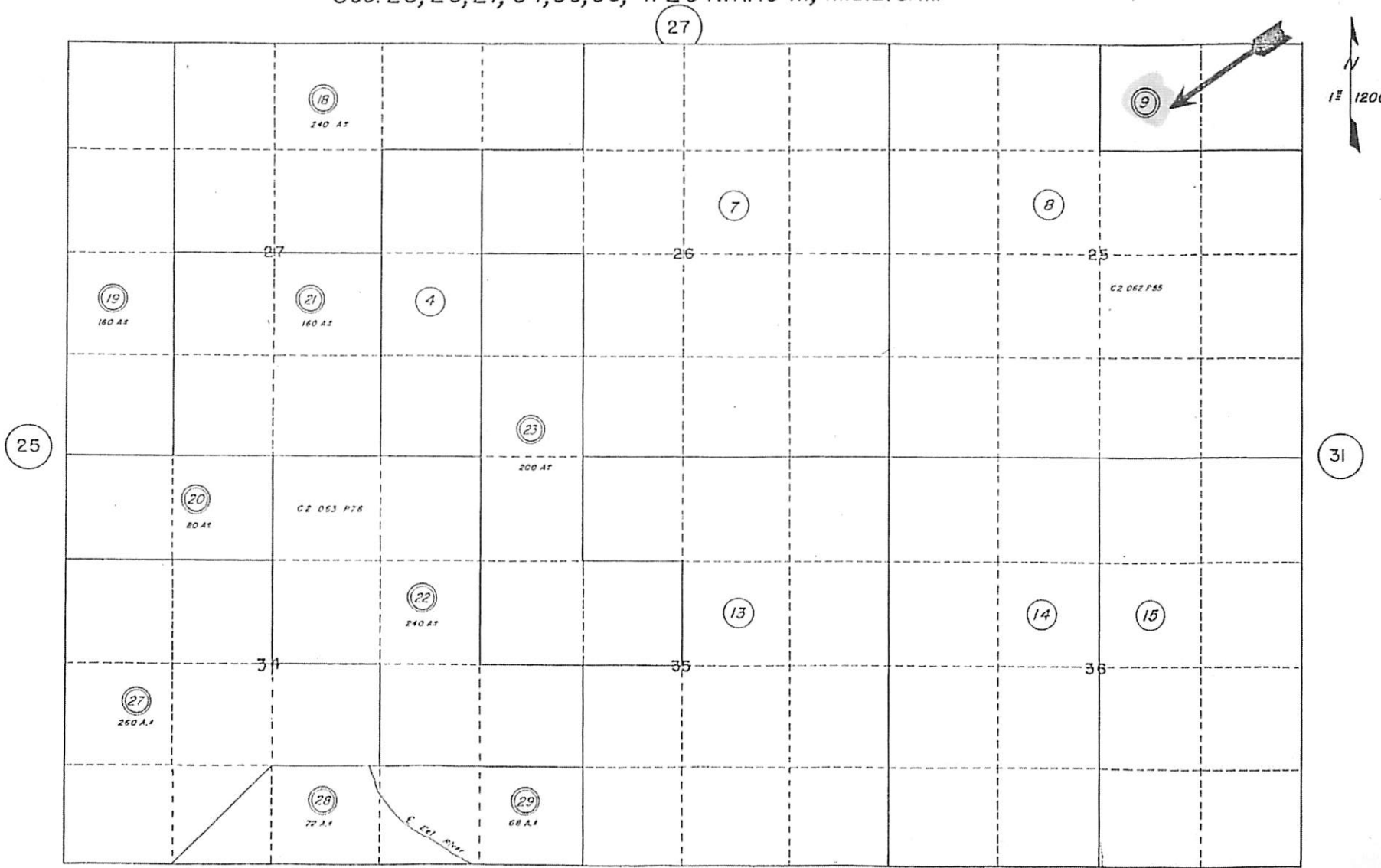
Assessor's Map
County of Mendocino, Calif.
Updated January 24, 2007

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 25, 26, 27, 34, 35, 36, T. 20 N. R. 13 W., M.D.B. & M.

153-004

36 - 28



Assessor's Map AUG 08 1997
County of Mendocino, Calif.
March, 1950

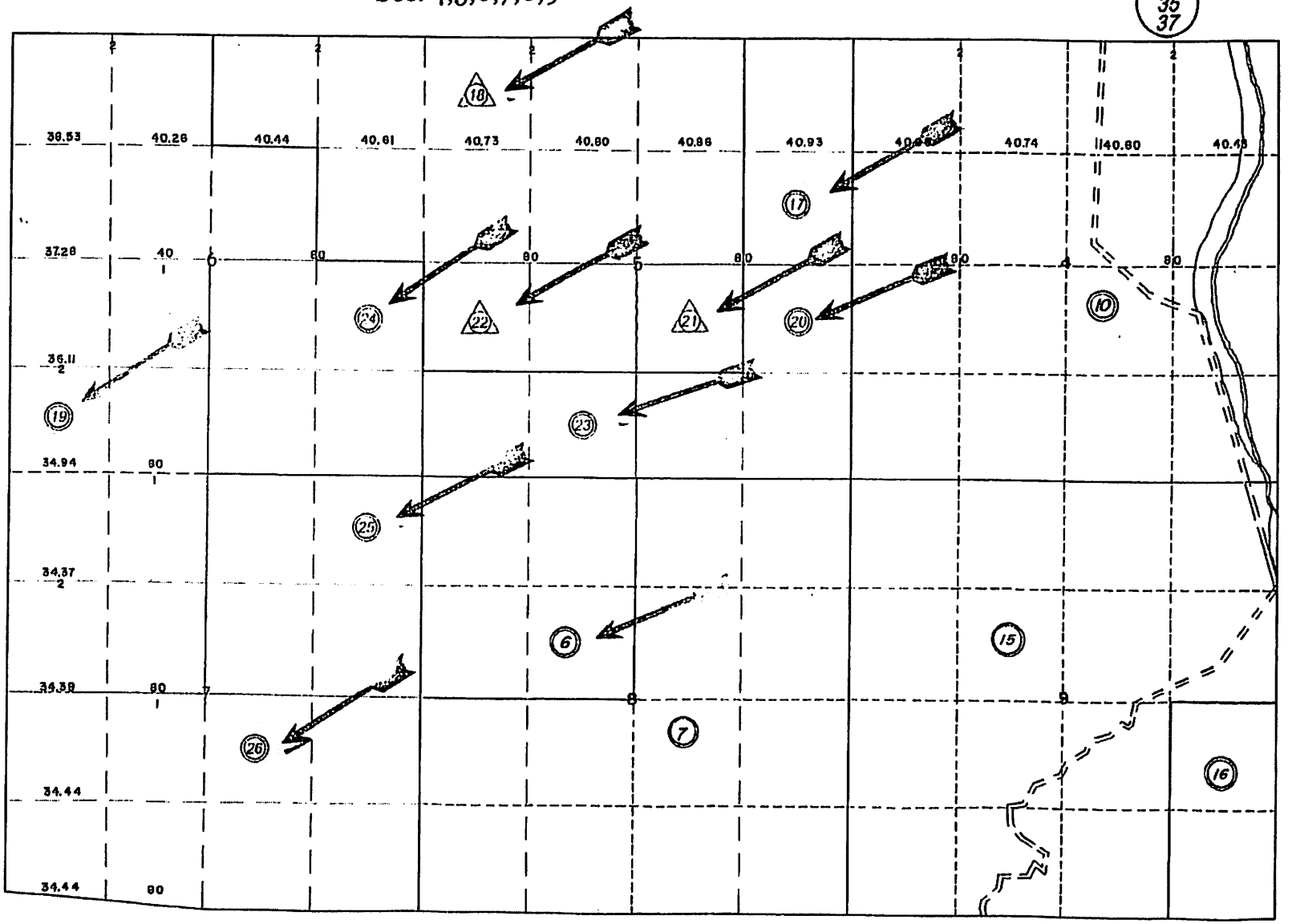
"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 4,5,6,7,8,9 T.20N. R.12W. M.D.B.& M.

Bk 35 37

131-003

36 - 29



N

1" = 1200'

26

32

30

APR 03 2007

NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

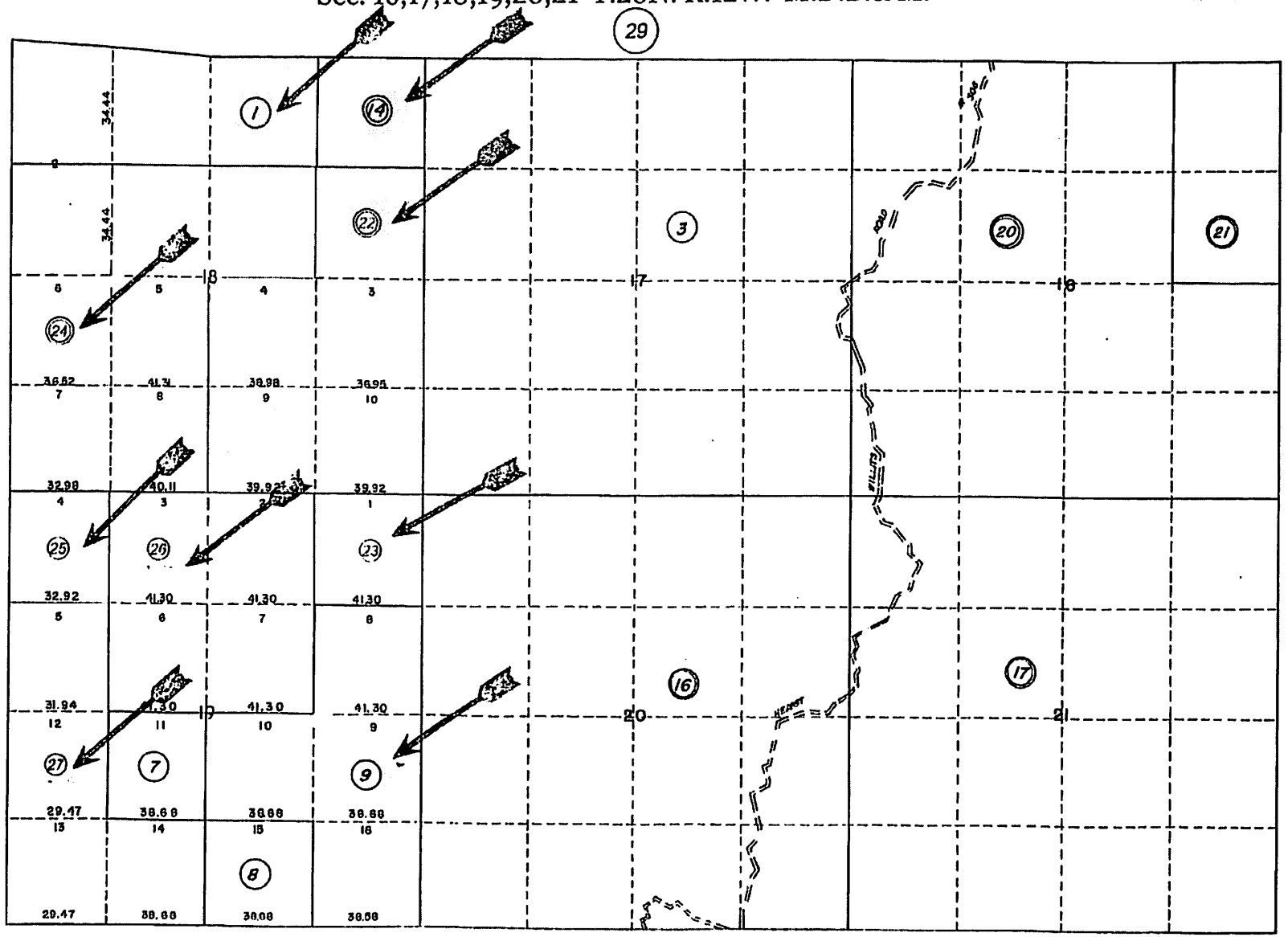
Assessor's Map
County of Mendocino, Calif.
Updated January 24, 2007

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 16,17,18,19,20,21 T.20N. R.12W. M.D.B.& M.

131-003

36 - 30



NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

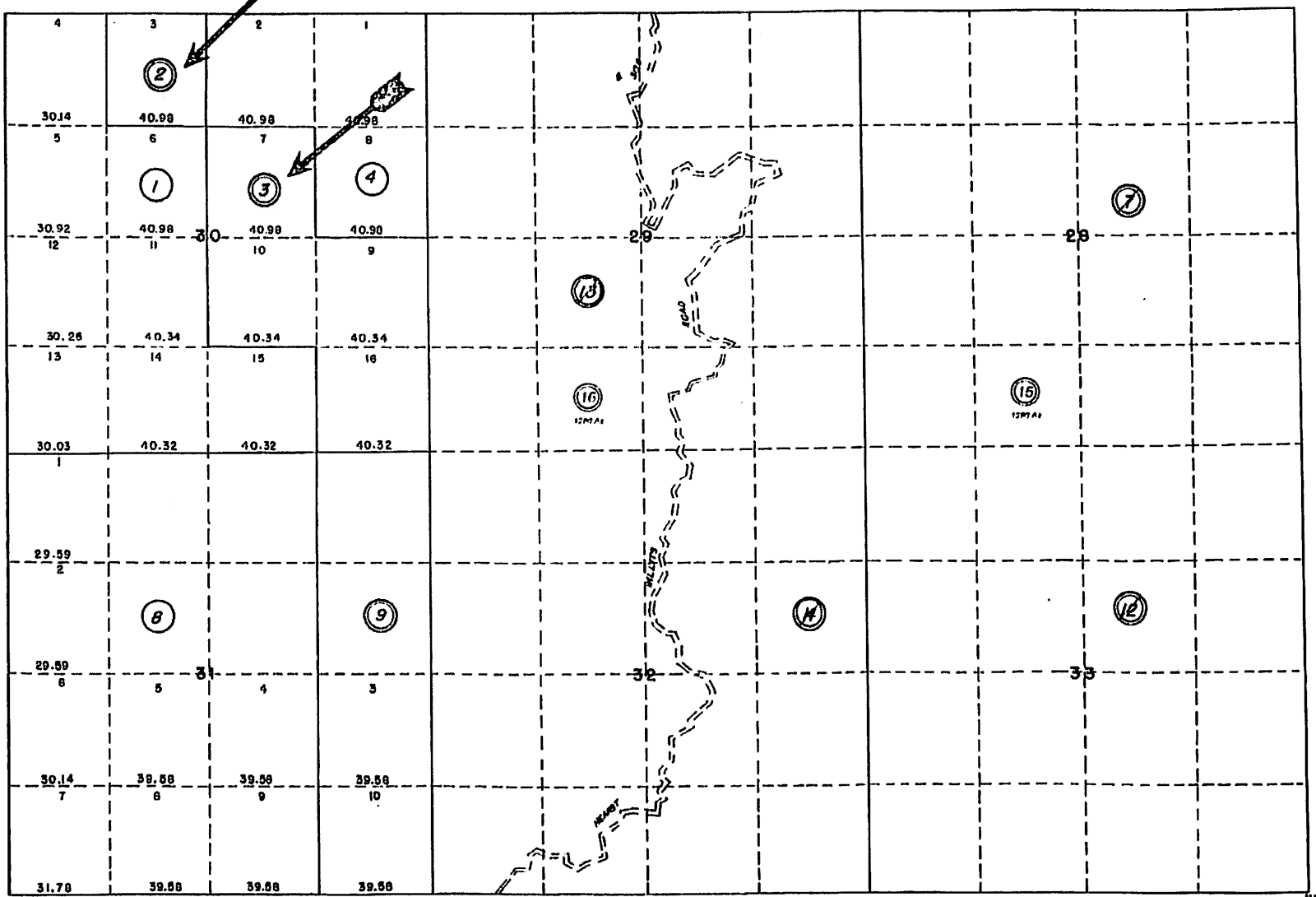
Assessor's Map
County of Mendocino, Calif.
Updated January 25, 2007

Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon.

Sec. 28,29,30,31,32,33 T.20N. R.12W. M.D.B.M.

131-003

36 - 31



JUL 2 0 2007

Assessor's Map
County of Mendocino, Calif.
Updated May 30, 2007

NOTE: This map was prepared for assessment purposes only.
No liability is assumed for the data delineated hereon.

CLTA PRELIMINARY REPORT FORM (EXHIBIT A) (01-01-08)

CALIFORNIA LAND TITLE ASSOCIATION
STANDARD COVERAGE POLICY - 1990

EXCLUSIONS FROM COVERAGE

The following matters are expressly excluded from the coverage of this policy and the Company will not pay loss or damage, costs, attorneys' fees or expenses which arise by reason of:

1. (a) Any law, ordinance or governmental regulation (including but not limited to building or zoning laws, ordinances, or regulations) restricting, regulating, prohibiting or relating (i) the occupancy, use, or enjoyment of the land; (ii) the character, dimensions or location of any improvement now or hereafter erected on the land; (iii) a separation in ownership or a change in the dimensions or area of the land or any parcel of which the land is or was a part; or (iv) environmental protection, or the effect of any violation of these laws, ordinances or governmental regulations, except to the extent that a notice of the enforcement thereof or a notice of a defect, lien, or encumbrance resulting from a violation or alleged violation affecting the land has been recorded in the public records at Date of Policy.

   (b) Any governmental police power not excluded by (a) above, except to the extent that a notice of the exercise thereof or notice of a defect, lien or encumbrance resulting from a violation or alleged violation affecting the land has been recorded in the public records at Date of Policy.

2. Rights of eminent domain unless notice of the exercise thereof has been recorded in the public records at Date of Policy, but not excluding from coverage any taking which has occurred prior to Date of Policy which would be binding on the rights of a purchaser for value without knowledge.

3. Defects, liens, encumbrances, adverse claims or other matters:

   (a) whether or not recorded in the public records at Date of Policy, but created, suffered, assumed or agreed to by the insured claimant;

   (b) not known to the Company, not recorded in the public records at Date of Policy, but known to the insured claimant and not disclosed in writing to the Company by the insured claimant prior to the date the insured claimant became an insured under this policy;

   (c) resulting in no loss or damage to the insured claimant;

   (d) attaching or created subsequent to Date of Policy; or

   (e) resulting in loss or damage which would not have been sustained if the insured claimant had paid value for the insured mortgage or for the estate or interest insured by this policy.

4. Unenforceability of the lien of the insured mortgage because of the inability or failure of the insured at Date of Policy, or the inability or failure of any subsequent owner of the indebtedness, to comply with the applicable doing business laws of the state in which the land is situated.

5. Invalidity or unenforceability of the lien of the insured mortgage, or claim thereof, which arises out of the transaction evidenced by the insured mortgage and is based upon usury or any consumer credit protection or truth in lending law.

6. Any claim, which arises out of the transaction vesting in the insured the estate of interest insured by this policy or the transaction creating the interest of the insured lender, by reason of the operation of federal bankruptcy, state insolvency or similar creditors' rights laws.

EXCEPTIONS FROM COVERAGE - SCHEDULE B, PART I

This policy does not insure against loss or damage (and the Company will not pay costs, attorneys' fees or expenses) which arise by reason of:

1. Taxes or assessments which are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the public records.

   Proceedings by a public agency which may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the public records.

2. Any facts, rights, interests, or claims which are not shown by the public records but which could be ascertained by an inspection of the land or which may be asserted by persons in possession thereof.

3. Easements, liens or encumbrances, or claims thereof, not shown by the public records.

4. Discrepancies, conflicts in boundary lines, shortage in area, encroachments, or any other facts which a correct survey would disclose, and which are not shown by the public records.

5. (a) Unpatented mining claims; (b) reservations or exceptions in patents or in Acts authorizing the issuance thereof; (c) water rights, claims or title to water, whether or not the matters excepted under (a), (b) or (c) are shown by the public records.

2006 ALTA LOAN POLICY (06-17-06)

EXCLUSIONS FROM COVERAGE

The following matters are expressly excluded from the coverage of this policy, and the Company will not pay loss or damage, costs, attorneys' fees, or expenses that arise by reason of:

1. (a) Any law, ordinance, permit, or governmental regulation (including those relating to building and zoning) restricting, regulating, prohibiting, or relating to

      (i) the occupancy, use, or enjoyment of the Land;

      (ii) the character, dimensions, or location of any improvement erected on the Land;

      (iii) the subdivision of land; or

      (iv) environmental protection;

      or the effect of any violation of these laws, ordinances, or governmental regulations. This Exclusion 1(a) does not modify or limit the coverage provided under Covered Risk 5.

   (b) Any governmental police power. This Exclusion 1(b) does not modify or limit the coverage provided under Covered Risk 6.

2. Rights of eminent domain. This Exclusion does not modify or limit the coverage provided under Covered Risk 7 or 8.

3. Defects, liens, encumbrances, adverse claims, or other matters:

   (a) created, suffered, assumed, or agreed to by the Insured Claimant;

(b) not Known to the Company, not recorded in the Public Records at Date of Policy, but Known to the Insured Claimant and not disclosed in writing to the Company by the Insured Claimant prior to the date the Insured Claimant became an Insured under this policy;

(c) resulting in no loss or damage to the Insured Claimant;

(d) attaching or created subsequent to Date of Policy (however, this does not modify or limit the coverage provided under Covered Risk 11, 13, or 14); or

(e) resulting in loss or damage that would not have been sustained if the Insured Claimant had paid value for the Insured Mortgage.

4. Unenforceability of the lien of the Insured Mortgage because of the inability or failure of an Insured to comply with applicable doing-business laws of the state where the Land is situated.

5. Invalidity or unenforceability in whole or in part of the lien of the Insured Mortgage that arises out of the transaction evidenced by the Insured Mortgage and is based upon usury or any consumer credit protection or truth-in-lending law.

6. Any claim, by reason of the operation of federal bankruptcy, state insolvency, or similar creditors' rights laws, that the transaction creating the lien of the Insured Mortgage, is

(a) a fraudulent conveyance or fraudulent transfer, or

(b) a preferential transfer for any reason not stated in Covered Risk 13(b) of this policy.

7. Any lien on the Title for real estate taxes or assessments imposed by governmental authority and created or attaching between Date of Policy and the date of recording of the Insured Mortgage in the Public Records. This Exclusion does not modify or limit the coverage provided under Covered Risk 11(b).

The above policy form may be issued to afford either Standard Coverage or Extended Coverage. In addition to the above Exclusions from Coverage, the Exceptions from Coverage in a Standard Coverage policy will also include the following Exceptions from Coverage:

EXCEPTIONS FROM COVERAGE

This policy does not insure against loss or damage (and the Company will not pay costs, attorneys' fees or expenses) that arise by reason of:

1. (a) Taxes or assessments that are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the Public Records; (b) proceedings by a public agency that may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the Public Records.

2. Any facts, rights, interests, or claims that are not shown by the Public Records but that could be ascertained by an inspection of the Land or that may be asserted by persons in possession of the Land.

3. Easements, liens or encumbrances, or claims thereof, not shown by the Public Records.

4. Any encroachment, encumbrance, violation, variation, or adverse circumstance affecting the Title that would be disclosed by an accurate and complete land survey of the Land and not shown by the Public Records.

5. (a) Unpatented mining claims; (b) reservations or exceptions in patents or in Acts authorizing the issuance thereof; (c) water rights, claims or title to water, whether or not the matters excepted under (a), (b), or (c) are shown by the Public Records.

2006 ALTA OWNER'S POLICY (06-17-06)

EXCLUSIONS FROM COVERAGE

The following matters are expressly excluded from the coverage of this policy, and the Company will not pay loss or damage, costs, attorneys' fees, or expenses that arise by reason of:

1. (a) Any law, ordinance, permit, or governmental regulation (including those relating to building and zoning) restricting, regulating, prohibiting, or relating to

(i) the occupancy, use, or enjoyment of the Land;

(ii) the character, dimensions, or location of any improvement erected on the Land;

(iii) the subdivision of land; or

(iv) environmental protection;

or the effect of any violation of these laws, ordinances, or governmental regulations. This Exclusion 1(a) does not modify or limit the coverage provided under Covered Risk 5.

(b) Any governmental police power. This Exclusion 1(b) does not modify or limit the coverage provided under Covered Risk 6.

2. Rights of eminent domain. This Exclusion does not modify or limit the coverage provided under Covered Risk 7 or 8.

3. Defects, liens, encumbrances, adverse claims, or other matters:

(a) created, suffered, assumed, or agreed to by the Insured Claimant;

(b) not Known to the Company, not recorded in the Public Records at Date of Policy, but Known to the Insured Claimant and not disclosed in writing to the Company by the Insured Claimant prior to the date the Insured Claimant became an Insured under this policy;

(c) resulting in no loss or damage to the Insured Claimant;

(d) attaching or created subsequent to Date of Policy (however, this does not modify or limit the coverage provided under Covered Risk 9 and 10); or

(e) resulting in loss or damage that would not have been sustained if the Insured Claimant had paid value for the Title.

4. Any claim, by reason of the operation of federal bankruptcy, state insolvency, or similar creditors' rights laws, that the transaction vesting the Title as shown in Schedule A, is

(a) a fraudulent conveyance or fraudulent transfer; or

(b) a preferential transfer for any reason not stated in Covered Risk 9 of this policy.

5. Any lien on the Title for real estate taxes or assessments imposed by governmental authority and created or attaching between Date of Policy and the date of recording of the deed or other instrument of transfer in the Public Records that vests Title as shown in Schedule A.

The above policy form may be issued to afford either Standard Coverage or Extended Coverage. In addition to the above Exclusions from Coverage, the Exceptions from Coverage in a Standard Coverage policy will also include the following Exceptions from Coverage:

EXCEPTIONS FROM COVERAGE

This policy does not insure against loss or damage (and the Company will not pay costs, attorneys' fees or expenses) that arise by reason of:

1. (a) Taxes or assessments that are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the Public Records; (b) proceedings by a public agency that may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the Public Records.
2. Any facts, rights, interests, or claims that are not shown in the Public Records but that could be ascertained by an inspection of the Land or that may be asserted by persons in possession of the Land.
3. Easements, liens or encumbrances, or claims thereof, not shown by the Public Records.
4. Any encroachment, encumbrance, violation, variation, or adverse circumstance affecting the Title that would be disclosed by an accurate and complete land survey of the Land and that are not shown by the Public Records.
5. (a) Unpatented mining claims; (b) reservations or exceptions in patents or in Acts authorizing the issuance thereof; (c) water rights, claims or title to water, whether or not the matters excepted under (a), (b), or (c) are shown by the Public Records.

Privacy Statement
July 1, 2001

We recognize and respect the privacy expectations of today's consumers and the requirements of applicable federal and state privacy laws. We believe that making you aware of how we use your non-public personal information ("Personal Information"), and to whom it is disclosed, will form the basis for a relationship of trust between us and the public we serve. This Privacy Statement provides that explanation. We reserve the right to change this Privacy Statement from time to time consistent with applicable privacy laws.

In the course of our business, we may collect Personal Information about you from the following sources:

- From applications or other forms we receive from you or your authorized representative;
- From your transactions with, or from the services being performed by us, our affiliates, or others;
- From our Internet web sites;
- From the public records maintained by governmental entities that we either obtain directly from those entities, or from our affiliates or others; and
- From consumer or other reporting agencies.

Our Policies Regarding the Protection of the Confidentiality and Security of Your Personal Information

We maintain physical, electronic and procedural safeguards to protect your Personal Information from unauthorized access or intrusion. We limit access to the Personal Information only to those employees who need such access in connection with providing products or services to you or for other legitimate business purposes.

Our Policies and Practices Regarding the Sharing of Your Personal Information

We may share your Personal Information with our affiliates, such as insurance companies, agents, and other real estate settlement providers. We may also disclose your Personal Information:

- to agents, brokers or representatives to provide you with services you have requested.
- to third-party contractors or service providers who provide services or perform marketing or other functions on our behalf; and
- to others with whom we enter into joint marketing agreements for products or services that we believe you may find of interest.

In addition, we will disclose your Personal Information when you direct or give us permission, when we are required by law to do so, or when we suspect fraudulent or criminal activities. We may also disclose your Personal Information when otherwise permitted by applicable privacy laws such as, for example, when disclosure is needed to enforce our rights arising out of any agreement, transaction or relationship with you.

One of the important responsibilities of some of our affiliated companies is to record documents in the public domain. Such documents may contain your Personal Information.

Right to Access Your Personal Information and Ability to Correct Errors or Request Changes or Deletion

Certain states afford you the right to access your Personal Information and, under certain circumstances, to find out to whom your Personal Information has been disclosed. Also, certain states afford you the right to request correction, amendment or deletion of your Personal Information. We reserve the right, where permitted by law, to charge a reasonable fee to cover the costs incurred in responding to such requests.

All requests must be made in writing to the following address:

Privacy Compliance Officer
Redwood Empire Title Company
P.O. Box 238
Ukiah, CA 95482

Multiple Products or Services

If we provide you with more than one financial product or service, you may receive more than one privacy notice from us. We apologize for any inconvenience this may cause you.

Redwood Empire Title Company of Mendocino County

617 South State Street, P. O. Box 238
Ukiah, CA 95482
Phone: (707)462-8666 Ÿ Fax: (707)462-5010

Our No.: 20120078DN
Your No.:
Seller:
Buyer:

When replying Please Contact:
ESCROW OFFICER: Debbie Niesen
dniesen@redwoodtitle.com

Updated PRELIMINARY REPORT

Property Address: **"Summer Camp", Willits, CA 95490**

In response to the above referenced application for a policy of title insurance, **Redwood Empire Title Company of Mendocino County** hereby reports that it is prepared to issue, or cause to be issued, as of the date hereof, a Policy or Policies of Title Insurance describing the land and the estate or interest therein hereinafter set forth, insuring against loss which may be sustained by reason of any defect, lien or encumbrance not shown or referred to as an Exception below or not excluded from coverage pursuant to the printed Schedules, Conditions and Stipulations of said Policy forms.

The printed Exceptions and Exclusions from the coverage and Limitations on Covered Risks of said Policy or Policies are set forth in Exhibit A attached. Copies of the Policy forms should be read. They are available from the office which issued this report.

Please read the exceptions shown or referred to below and the exceptions and exclusions set forth in Exhibit A of this report carefully. The exceptions and exclusions are meant to provide you with notice of matters which are not covered under the terms of the title insurance policy and should be carefully considered.

It is important to note that this preliminary report is not a written representation as to the condition of title and may not list all liens, defects and encumbrances affecting title to the land.

This report (and any supplements or amendments hereto) is issued solely for the purpose of facilitating the issuance of a policy of title insurance and no liability is assumed hereby. If it is desired that liability be assumed prior to the issuance of a policy of title insurance, a Binder or Commitment should be requested.

Dated as of July 16, 2014 at 07:30AM.

John Baron
Chief Title Officer

jbaron@redwoodtitle.com

The form of policy of title insurance contemplated by this report is:
CLTA Standard 1990 Owners Policy

Underwritten by Old Republic National Title Insurance Company

SCHEDULE A

1. The estate or interest in the land hereinafter described or referred to covered by this Report is:

   a Fee

2. Title to said estate or interest at the date hereof is vested in:

   Richard L. Padula, a single man

3. The land referred to in this report is situated in the State of California, County of Mendocino and is described as follows:

   See Exhibit A attached hereto and made a part hereof.

SCHEDULE B

At the date hereof exceptions to coverage in addition to the printed Exceptions and Exclusions in the said policy form would be as follows:

1. Taxes and assessments, general and special, for the fiscal year 2014 - 2015, a lien not yet due or ascertainable.

2. The lien of supplemental taxes, if any, assessed pursuant to the provisions of Section 75, et seq. of the Revenue and Taxation Code of the State of California.

3. Any easement for water course over that portion of said land lying within the banks of Eel River and any changes in the boundary lines of said land that have occurred or may hereafter occur from natural causes.

4. (a) Any adverse claim based upon the assertion that some portion of said land has been created by artificial means, or has accreted to such portion so created; some portion of said land has been brought within the boundaries thereof by an avulsive movement of Eel River, or has been formed by accretion to any such portion.

   (b) Rights and easements for navigation and fishery which may exist over that portion of said land lying beneath the waters of Eel River.

5. Rights of the public, County and/or City, in and to that portion of said land lying within the lines of Hearst-Willits Road.

6. An easement for the purposes stated herein and incidental purposes as provided in the document:
   Recorded: January 29, 1949 in Book 254, Page 281, Official Records
   For: pole lines, ingress, egress
   In favor of: PG&E

7. Terms and provisions as contained in an instrument,
   Entitled : Deed
   Recorded: December 18, 1959 in Book 529, Page 223, and recorded June 15, 1960 in Book 542, Page 417, Official Records

8. Terms, provisions, covenants, restrictions and conditions contained in a document executed pursuant to the California Land Conservation Act of 1965 (Williamson Act) and recorded February 22, 1977 in Book 1076, Page 461, Official Records.

   a. Notices of Implementation Under Williamson Act recorded December 29, 2010 as 2010-18377 and December 27, 2011 as 2011-17950 and December 27, 2012 as 2012-19731 and December 27, 2013 as 2013-19038, Official Records.

9. Terms, provisions, covenants, restrictions and conditions contained in a document executed pursuant to the California Land Conservation Act of 1965 (Williamson Act) and recorded February 22, 1977 in Book 1076, Page 474, Official Records.

   a. Notices of Implementation Under Williamson Act recorded December 29, 2010 as 2010-18377 and December 27, 2011 as 2011-17950 and December 27, 2012 as 2012-19731 and December 27, 2013 as 2013-19038, Official Records.

10. Easements and rights of way reserved in the deed executed by Robert E. Harrah, et ux, to Eel River Sawmills, Inc., recorded Janaury 4, 1978 in Book 1126, Page 50, Official Records.

11. Terms, provisions, covenants, restrictions and conditions contained in a document executed pursuant to the California Land Conservation Act of 1965 (Williamson Act) and recorded November 14, 1978 in Book 1180, Page 262, Official Records.

    a. Notices of Implementation Under Williamson Act recorded December 29, 2010 as 2010-18377 and December 27, 2011 as 2011-17950 and December 27, 2012 as 2012-19731 and December 27, 2013 as 2013-19038, Official Records.

12. An easement for the purposes stated herein and incidental purposes as provided in the document:
    Recorded: December 21, 1981 in Book 1334, Page 629, Official Records
    For: aerial and underground communication facilities, ingress, egress
    In favor of: PT&T

13. An easement for the purposes stated herein and incidental purposes as provided in the document:
    Recorded: April 21, 1982 in Book 1349, Page 106, Official Records
    For: ingress, egress and for all reasonable and necessary purposes, except hunting

    a. Terms and provisions contained in the document above referred to.

14. An easement for the purposes stated herein and incidental purposes as provided in the document:
    Recorded: July 3, 1984 in Book 1464, Page 459, Official Records
    For: roadway

15. An easement for the purposes stated herein and incidental purposes as provided in the document:
    Recorded: February 13, 1986 in Book 1545, Page 85, Official Records
    For: roadway hauling national forest products and for forest service administrative use
    In favor of: United States of America

16. An easement for the purposes stated herein and incidental purposes as provided in the document:
    Recorded: December 4, 1986 in Book 1593, Page 513, Official Records
    For: roadway

17. An easement for the purposes stated herein and incidental purposes as provided in the document:
    Recorded: June 7, 1989 in Book 1756, Page 23, Official Records
    For: ingress, egress, public utilities

18. An easement for the purposes stated herein and incidental purposes as provided in the document:
    Recorded: June 7, 1989 in Book 1756, Page 58, Official Records
    For: ingress, egress, public utilities

19. Deed of Trust to secure an indebtedness of the amount stated below and any other amounts payable under the terms thereof,
    Amount : $100,000.00
    Trustor/Borrower : Richard L. Padula, an unmarried man
    Trustee: Redwood Empire Title Company of Mendocino County
    Beneficiary/Lender: Bryan W. Gaynor
    Dated: April 3, 2014
    Recorded: April 4, 2014 as 2014-03912, Official Records

    (affects a portion)

END OF SCHEDULE B

INFORMATIONAL NOTES:

1. Taxes and assessments, general and special, for the fiscal year 2013 - 2014, 1st and 2nd installments are paid.

2. NOTE: According to the public records, there have been no deeds conveying the property described in this report recorded within a period of 24 months prior to the date hereof except as follows:
NONE

EXHIBIT "A"

All that certain real property situated in the County of Mendocino, State of California, more particularly described as follows:

In Township 19 North, Range 12 West, Mount Diablo Base and Meridian:

Section 2: Lots 3, 4, 8 and 9; Southeast quarter of Northwest quarter and Southwest quarter

APN: 037-350-04

Section 3: Lots 1, 2, 3 and 4; South half of North half; Southeast quarter and Southwest quarter

APN: 037-350-01 and 037-350-02

Section 10: North half

APN: 037-350-15

In Township 20 North, Range 12 West, Mount Diablo Base and Meridian:

Section 25: West half of West half; West half of East half of West half

APN: 036-340-14

Section 26: All

APN: 036-340-02 and 036-340-03

Section 27: All

APN: 036-340-01

Section 34: All

APN: 036-340-07

Section 35: West half

APN: 033-340-08

Section 33: All

Section 28: All

APN: 036-310-15

In Township 19 North, Range 12 West, Mount Diablo Base and Meridian:

Section 17: Southeast quarter of Southeast quarter; all that portion of Northeast quarter of Southeast quarter lying East of County Road, as same existed on November 5, 1900; all that portion of Southwest quarter of Southeast quarter lying East of County Road, as same existed on December 5, 1900.

Section 16: North half; North half of South half

APN: 037-330-79

Section 9: All

Section 5: Lot 1; Southeast quarter of Northeast quarter; Southeast quarter of Southeast quarter

Section 4: All

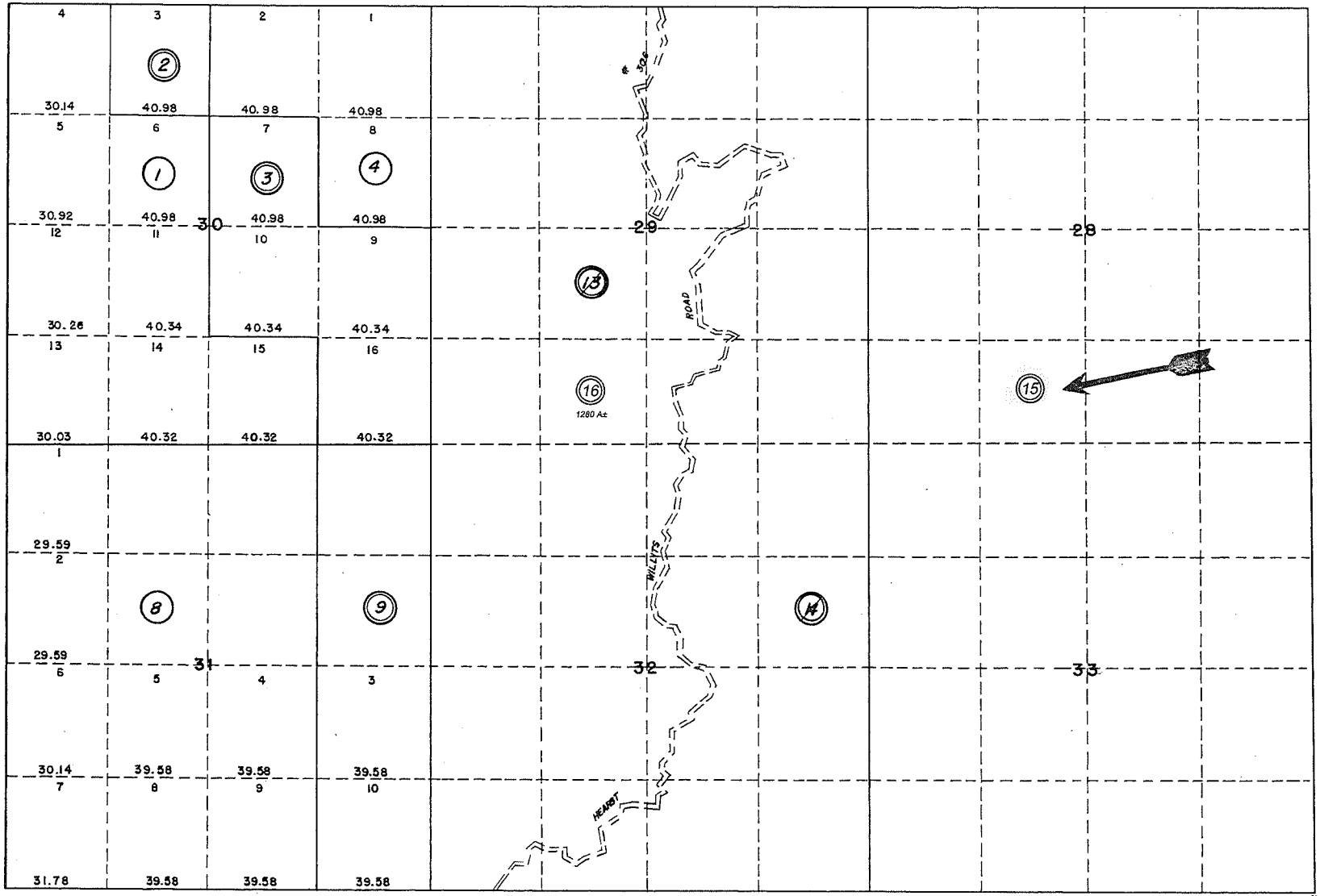
APN: 037-320-27

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 28,29,30,31,32,33 T.20N. R.12W. M.D.B.M.

131-003

36 - 31



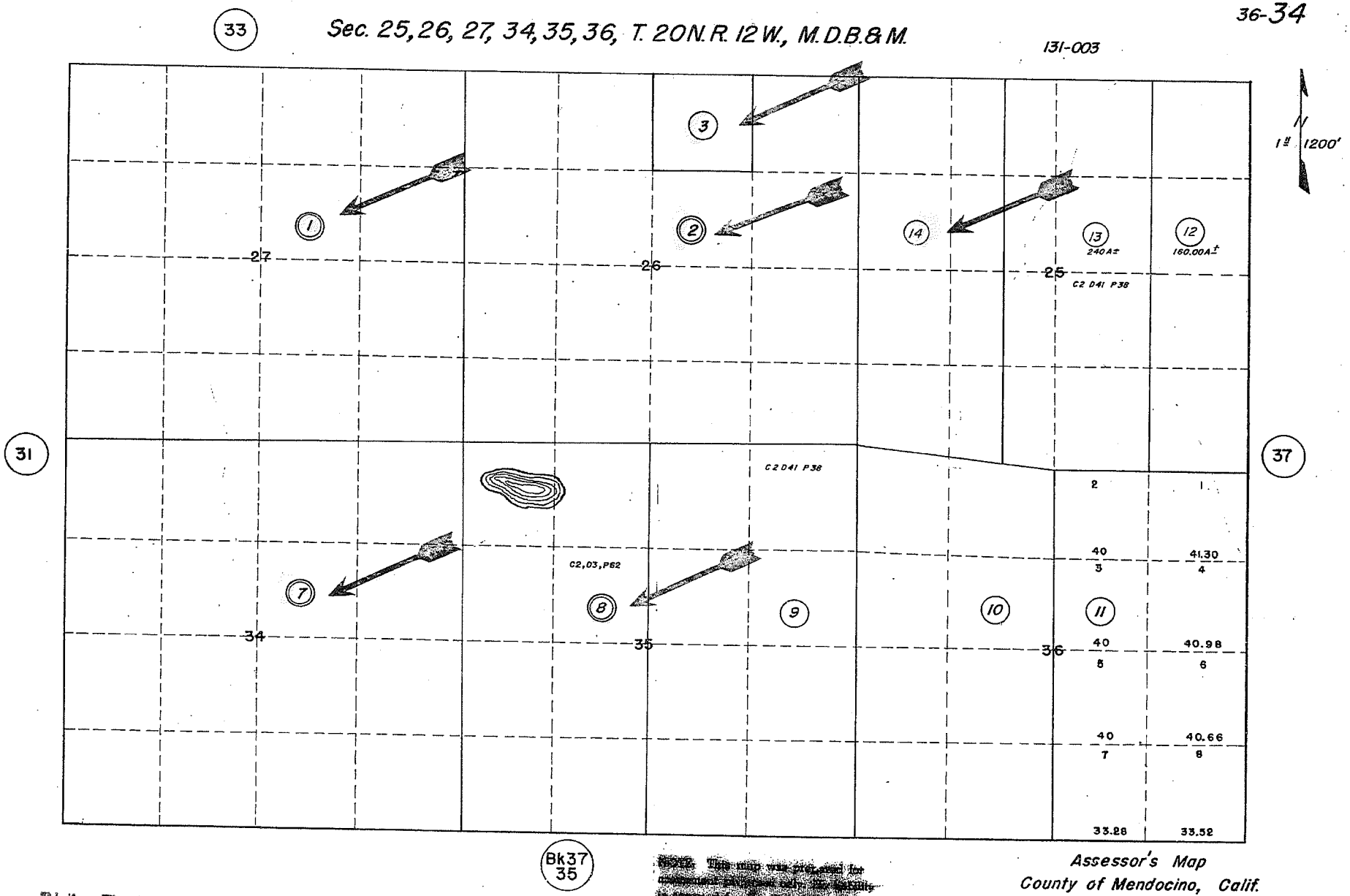
Bk 37 32

JUL 2 0 2007

Assessor's Map
County of Mendocino, Calif.
Updated May 30, 2007

NOTE: This map was prepared for assessment purposes only.
No liability is assumed for the data delineated hereon.

Mendocino, CA , 2012-2013 - 036-340-14-00, Sheet: 1 of 1



Assessor's Map
County of Mendocino, Calif.
March, 1950

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

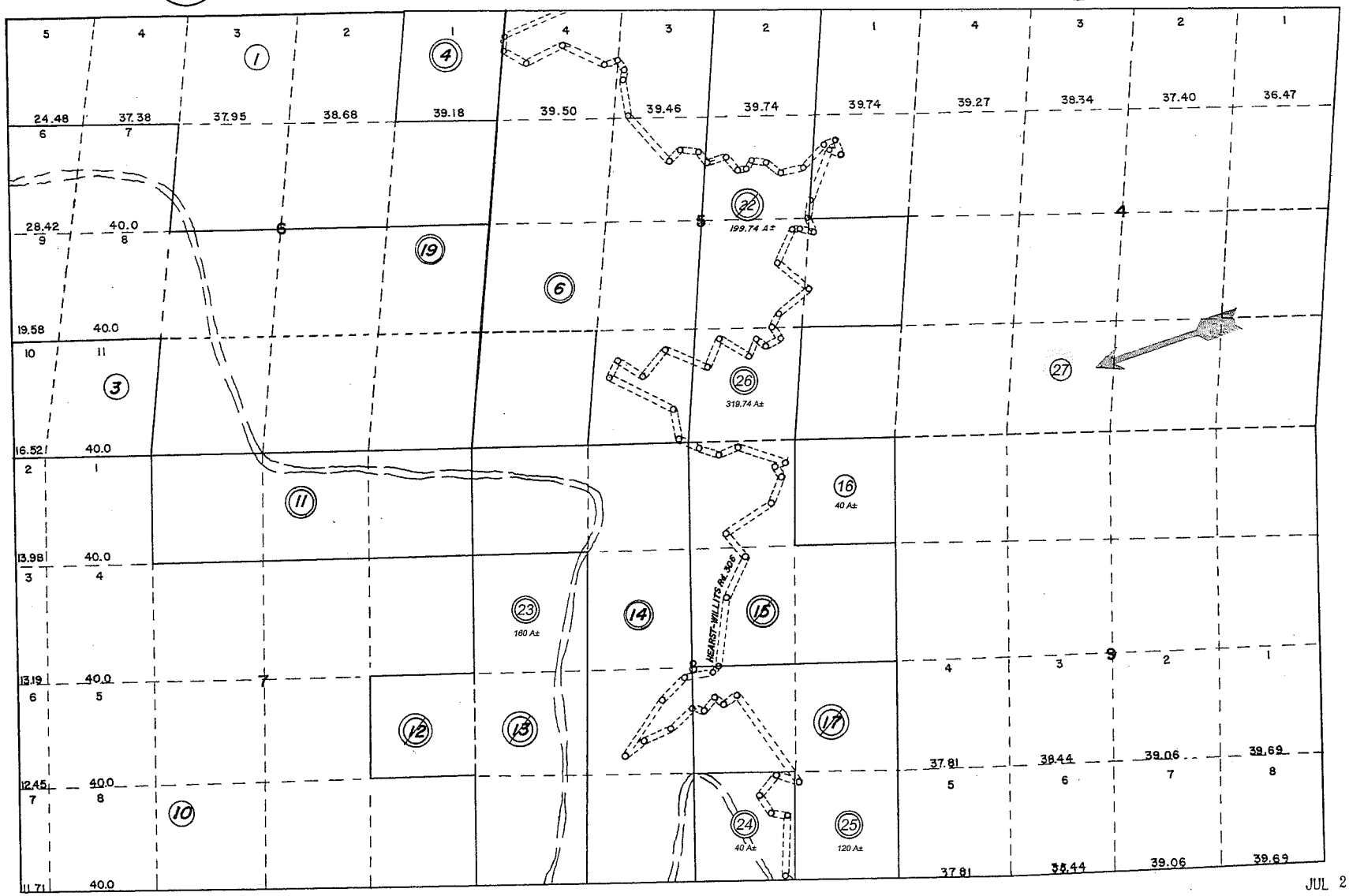
Sec. 4,5,6,7,8,9 T.19N. R.12W. M.D.B.& M.

Bk 36 28

Bk 36 31

153-003

37 - 32



NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

JUL 2 0 2007

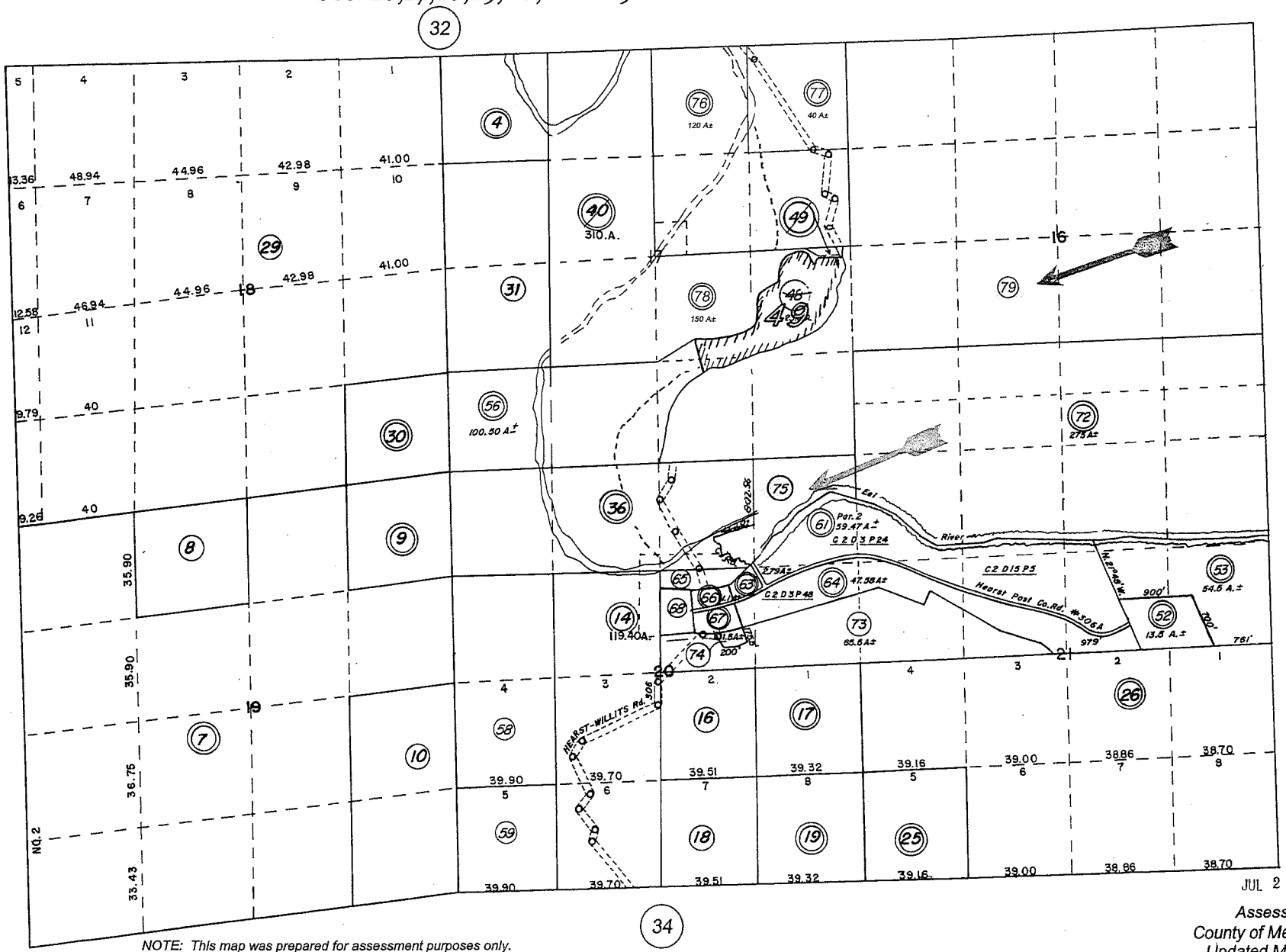
Assessor's Map
County of Mendocino, Calif.
Updated May 30, 2007

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

Sec. 16,17,18,19,20,21 T.19N. R.12W. M.D.B.& M.

153-003

37 - 33



NOTE: This map was prepared for assessment purposes only.
No liability is assumed for the data delineated hereon.

JUL 2 0 2007

Assessor's Map
County of Mendocino, Calif.
Updated May 30, 2007

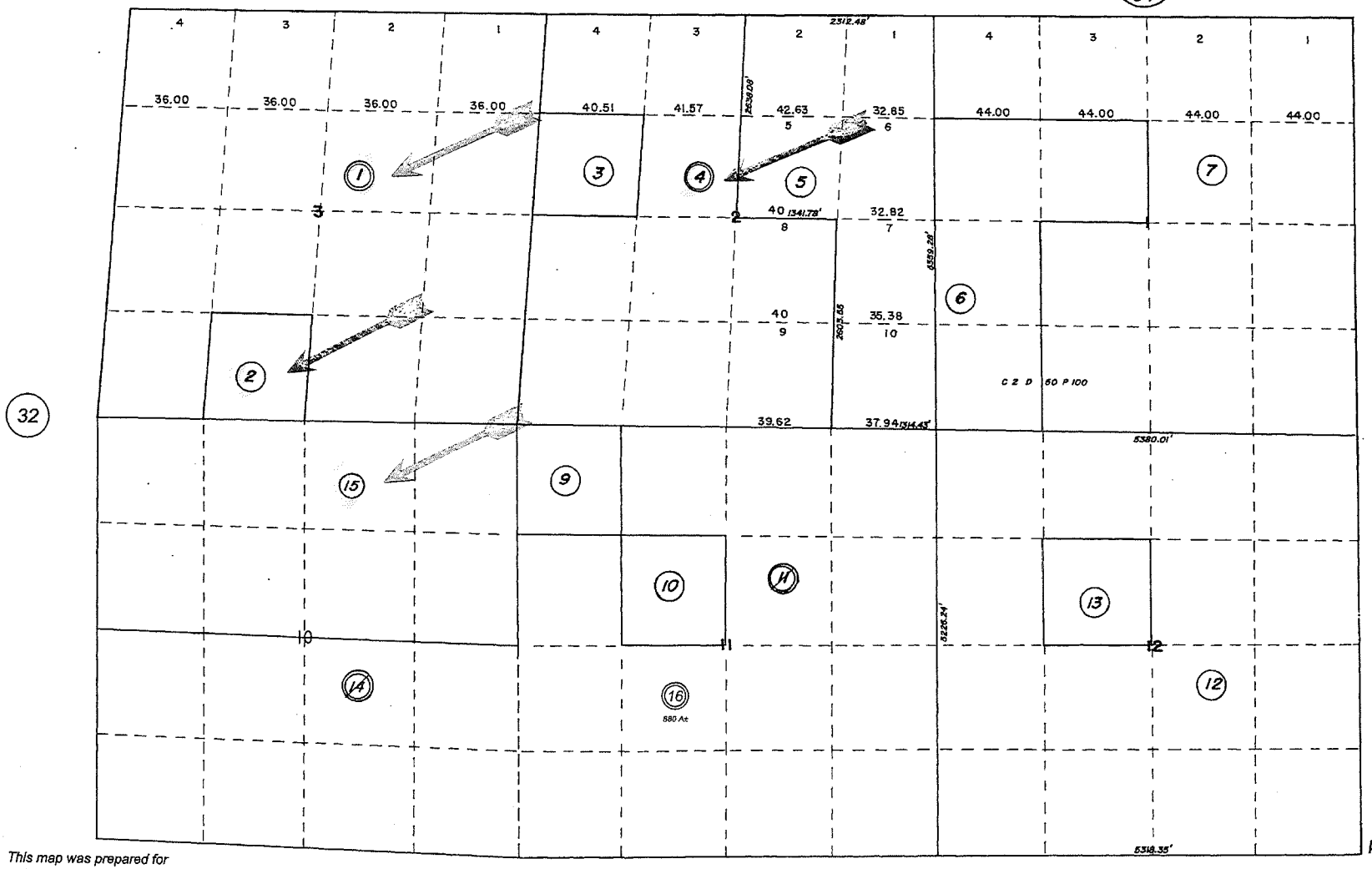
Mendocino, CA , 2012-2013 - 037-350-04-00, Sheet: 1 of 1

Sec. 1,2,3,10,11,12 T.19N. R.12W. M.D.B.& M.

Bk 36 34

153-003

37 - 35



NOTE: This map was prepared for assessment purposes only. No liability is assumed for the data delineated hereon.

AUG 0 2 2007

Assessor's Map
County of Mendocino, Calif.
Updated May 30, 2007

"Notice: This is neither a plat nor a survey. It is furnished merely as a convenience to aid you in locating the land indicated hereon with reference to streets and other land. No liability is assumed by reason of any reliance hereon."

CLTA PRELIMINARY REPORT FORM (EXHIBIT A) (01-01-08)

CALIFORNIA LAND TITLE ASSOCIATION
STANDARD COVERAGE POLICY - 1990

EXCLUSIONS FROM COVERAGE

The following matters are expressly excluded from the coverage of this policy and the Company will not pay loss or damage, costs, attorneys' fees or expenses which arise by reason of:

1. (a) Any law, ordinance or governmental regulation (including but not limited to building or zoning laws, ordinances, or regulations) restricting, regulating, prohibiting or relating (i) the occupancy, use, or enjoyment of the land; (ii) the character, dimensions or location of any improvement now or hereafter erected on the land; (iii) a separation in ownership or a change in the dimensions or area of the land or any parcel of which the land is or was a part; or (iv) environmental protection, or the effect of any violation of these laws, ordinances or governmental regulations, except to the extent that a notice of the enforcement thereof or a notice of a defect, lien, or encumbrance resulting from a violation or alleged violation affecting the land has been recorded in the public records at Date of Policy.

   (b) Any governmental police power not excluded by (a) above, except to the extent that a notice of the exercise thereof or notice of a defect, lien or encumbrance resulting from a violation or alleged violation affecting the land has been recorded in the public records at Date of Policy.

2. Rights of eminent domain unless notice of the exercise thereof has been recorded in the public records at Date of Policy, but not excluding from coverage any taking which has occurred prior to Date of Policy which would be binding on the rights of a purchaser for value without knowledge.

3. Defects, liens, encumbrances, adverse claims or other matters:

   (a) whether or not recorded in the public records at Date of Policy, but created, suffered, assumed or agreed to by the insured claimant;

   (b) not known to the Company, not recorded in the public records at Date of Policy, but known to the insured claimant and not disclosed in writing to the Company by the insured claimant prior to the date the insured claimant became an insured under this policy;

   (c) resulting in no loss or damage to the insured claimant;

   (d) attaching or created subsequent to Date of Policy; or

   (e) resulting in loss or damage which would not have been sustained if the insured claimant had paid value for the insured mortgage or for the estate or interest insured by this policy.

4. Unenforceability of the lien of the insured mortgage because of the inability or failure of the insured at Date of Policy, or the inability or failure of any subsequent owner of the indebtedness, to comply with the applicable doing business laws of the state in which the land is situated.

5. Invalidity or unenforceability of the lien of the insured mortgage, or claim thereof, which arises out of the transaction evidenced by the insured mortgage and is based upon usury or any consumer credit protection or truth in lending law.

6. Any claim, which arises out of the transaction vesting in the insured the estate of interest insured by this policy or the transaction creating the interest of the insured lender, by reason of the operation of federal bankruptcy, state insolvency or similar creditors' rights laws.

EXCEPTIONS FROM COVERAGE - SCHEDULE B, PART I

This policy does not insure against loss or damage (and the Company will not pay costs, attorneys' fees or expenses) which arise by reason of:

1. Taxes or assessments which are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the public records.

   Proceedings by a public agency which may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the public records.

2. Any facts, rights, interests, or claims which are not shown by the public records but which could be ascertained by an inspection of the land or which may be asserted by persons in possession thereof.

3. Easements, liens or encumbrances, or claims thereof, not shown by the public records.

4. Discrepancies, conflicts in boundary lines, shortage in area, encroachments, or any other facts which a correct survey would disclose, and which are not shown by the public records.

5. (a) Unpatented mining claims; (b) reservations or exceptions in patents or in Acts authorizing the issuance thereof; (c) water rights, claims or title to water, whether or not the matters excepted under (a), (b) or (c) are shown by the public records.

2006 ALTA LOAN POLICY (06-17-06)

EXCLUSIONS FROM COVERAGE

The following matters are expressly excluded from the coverage of this policy, and the Company will not pay loss or damage, costs, attorneys' fees, or expenses that arise by reason of:

1. (a) Any law, ordinance, permit, or governmental regulation (including those relating to building and zoning) restricting, regulating, prohibiting, or relating to

      (i) the occupancy, use, or enjoyment of the Land;

      (ii) the character, dimensions, or location of any improvement erected on the Land;

      (iii) the subdivision of land; or

      (iv) environmental protection;

      or the effect of any violation of these laws, ordinances, or governmental regulations. This Exclusion 1(a) does not modify or limit the coverage provided under Covered Risk 5.

   (b) Any governmental police power. This Exclusion 1(b) does not modify or limit the coverage provided under Covered Risk 6.

2. Rights of eminent domain. This Exclusion does not modify or limit the coverage provided under Covered Risk 7 or 8.

3. Defects, liens, encumbrances, adverse claims, or other matters:

   (a) created, suffered, assumed, or agreed to by the Insured Claimant;

(b) not Known to the Company, not recorded in the Public Records at Date of Policy, but Known to the Insured Claimant and not disclosed in writing to the Company by the Insured Claimant prior to the date the Insured Claimant became an Insured under this policy;

(c) resulting in no loss or damage to the Insured Claimant;

(d) attaching or created subsequent to Date of Policy (however, this does not modify or limit the coverage provided under Covered Risk 11, 13, or 14); or

(e) resulting in loss or damage that would not have been sustained if the Insured Claimant had paid value for the Insured Mortgage.

4. Unenforceability of the lien of the Insured Mortgage because of the inability or failure of an Insured to comply with applicable doing-business laws of the state where the Land is situated.

5. Invalidity or unenforceability in whole or in part of the lien of the Insured Mortgage that arises out of the transaction evidenced by the Insured Mortgage and is based upon usury or any consumer credit protection or truth-in-lending law.

6. Any claim, by reason of the operation of federal bankruptcy, state insolvency, or similar creditors' rights laws, that the transaction creating the lien of the Insured Mortgage, is

(a) a fraudulent conveyance or fraudulent transfer, or

(b) a preferential transfer for any reason not stated in Covered Risk 13(b) of this policy.

7. Any lien on the Title for real estate taxes or assessments imposed by governmental authority and created or attaching between Date of Policy and the date of recording of the Insured Mortgage in the Public Records. This Exclusion does not modify or limit the coverage provided under Covered Risk 11(b).

The above policy form may be issued to afford either Standard Coverage or Extended Coverage. In addition to the above Exclusions from Coverage, the Exceptions from Coverage in a Standard Coverage policy will also include the following Exceptions from Coverage:

EXCEPTIONS FROM COVERAGE

This policy does not insure against loss or damage (and the Company will not pay costs, attorneys' fees or expenses) that arise by reason of:

1. (a) Taxes or assessments that are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the Public Records; (b) proceedings by a public agency that may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the Public Records.

2. Any facts, rights, interests, or claims that are not shown by the Public Records but that could be ascertained by an inspection of the Land or that may be asserted by persons in possession of the Land.

3. Easements, liens or encumbrances, or claims thereof, not shown by the Public Records.

4. Any encroachment, encumbrance, violation, variation, or adverse circumstance affecting the Title that would be disclosed by an accurate and complete land survey of the Land and not shown by the Public Records.

5. (a) Unpatented mining claims; (b) reservations or exceptions in patents or in Acts authorizing the issuance thereof; (c) water rights, claims or title to water, whether or not the matters excepted under (a), (b), or (c) are shown by the Public Records.

2006 ALTA OWNER'S POLICY (06-17-06)

EXCLUSIONS FROM COVERAGE

The following matters are expressly excluded from the coverage of this policy, and the Company will not pay loss or damage, costs, attorneys' fees, or expenses that arise by reason of:

1. (a) Any law, ordinance, permit, or governmental regulation (including those relating to building and zoning) restricting, regulating, prohibiting, or relating to

(i) the occupancy, use, or enjoyment of the Land;

(ii) the character, dimensions, or location of any improvement erected on the Land;

(iii) the subdivision of land; or

(iv) environmental protection;

or the effect of any violation of these laws, ordinances, or governmental regulations. This Exclusion 1(a) does not modify or limit the coverage provided under Covered Risk 5.

(b) Any governmental police power. This Exclusion 1(b) does not modify or limit the coverage provided under Covered Risk 6.

2. Rights of eminent domain. This Exclusion does not modify or limit the coverage provided under Covered Risk 7 or 8.

3. Defects, liens, encumbrances, adverse claims, or other matters:

(a) created, suffered, assumed, or agreed to by the Insured Claimant;

(b) not Known to the Company, not recorded in the Public Records at Date of Policy, but Known to the Insured Claimant and not disclosed in writing to the Company by the Insured Claimant prior to the date the Insured Claimant became an Insured under this policy;

(c) resulting in no loss or damage to the Insured Claimant;

(d) attaching or created subsequent to Date of Policy (however, this does not modify or limit the coverage provided under Covered Risk 9 and 10); or

(e) resulting in loss or damage that would not have been sustained if the Insured Claimant had paid value for the Title.

4. Any claim, by reason of the operation of federal bankruptcy, state insolvency, or similar creditors' rights laws, that the transaction vesting the Title as shown in Schedule A, is

(a) a fraudulent conveyance or fraudulent transfer; or

(b) a preferential transfer for any reason not stated in Covered Risk 9 of this policy.

5. Any lien on the Title for real estate taxes or assessments imposed by governmental authority and created or attaching between Date of Policy and the date of recording of the deed or other instrument of transfer in the Public Records that vests Title as shown in Schedule A.

The above policy form may be issued to afford either Standard Coverage or Extended Coverage. In addition to the above Exclusions from Coverage, the Exceptions from Coverage in a Standard Coverage policy will also include the following Exceptions from Coverage:

EXCEPTIONS FROM COVERAGE

This policy does not insure against loss or damage (and the Company will not pay costs, attorneys' fees or expenses) that arise by reason of:

1. (a) Taxes or assessments that are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the Public Records; (b) proceedings by a public agency that may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the Public Records.
2. Any facts, rights, interests, or claims that are not shown in the Public Records but that could be ascertained by an inspection of the Land or that may be asserted by persons in possession of the Land.
3. Easements, liens or encumbrances, or claims thereof, not shown by the Public Records.
4. Any encroachment, encumbrance, violation, variation, or adverse circumstance affecting the Title that would be disclosed by an accurate and complete land survey of the Land and that are not shown by the Public Records.
5. (a) Unpatented mining claims; (b) reservations or exceptions in patents or in Acts authorizing the issuance thereof; (c) water rights, claims or title to water, whether or not the matters excepted under (a), (b), or (c) are shown by the Public Records.

Privacy Statement
July 1, 2001

We recognize and respect the privacy expectations of today's consumers and the requirements of applicable federal and state privacy laws. We believe that making you aware of how we use your non-public personal information ("Personal Information"), and to whom it is disclosed, will form the basis for a relationship of trust between us and the public we serve. This Privacy Statement provides that explanation. We reserve the right to change this Privacy Statement from time to time consistent with applicable privacy laws.

In the course of our business, we may collect Personal Information about you from the following sources:

- From applications or other forms we receive from you or your authorized representative;
- From your transactions with, or from the services being performed by us, our affiliates, or others;
- From our Internet web sites;
- From the public records maintained by governmental entities that we either obtain directly from those entities, or from our affiliates or others; and
- From consumer or other reporting agencies.

Our Policies Regarding the Protection of the Confidentiality and Security of Your Personal Information

We maintain physical, electronic and procedural safeguards to protect your Personal Information from unauthorized access or intrusion. We limit access to the Personal Information only to those employees who need such access in connection with providing products or services to you or for other legitimate business purposes.

Our Policies and Practices Regarding the Sharing of Your Personal Information

We may share your Personal Information with our affiliates, such as insurance companies, agents, and other real estate settlement providers. We may also disclose your Personal Information:

- to agents, brokers or representatives to provide you with services you have requested.
- to third-party contractors or service providers who provide services or perform marketing or other functions on our behalf; and
- to others with whom we enter into joint marketing agreements for products or services that we believe you may find of interest.

In addition, we will disclose your Personal Information when you direct or give us permission, when we are required by law to do so, or when we suspect fraudulent or criminal activities. We may also disclose your Personal Information when otherwise permitted by applicable privacy laws such as, for example, when disclosure is needed to enforce our rights arising out of any agreement, transaction or relationship with you.

One of the important responsibilities of some of our affiliated companies is to record documents in the public domain. Such documents may contain your Personal Information.

Right to Access Your Personal Information and Ability to Correct Errors or Request Changes or Deletion

Certain states afford you the right to access your Personal Information and, under certain circumstances, to find out to whom your Personal Information has been disclosed. Also, certain states afford you the right to request correction, amendment or deletion of your Personal Information. We reserve the right, where permitted by law, to charge a reasonable fee to cover the costs incurred in responding to such requests.

All requests must be made in writing to the following address:

Privacy Compliance Officer
Redwood Empire Title Company
P.O. Box 238
Ukiah, CA 95482

Multiple Products or Services

If we provide you with more than one financial product or service, you may receive more than one privacy notice from us. We apologize for any inconvenience this may cause you.

ATTACHMENT E

Brushy Mountain Project Map

May 27, 2015
Version 1.0D

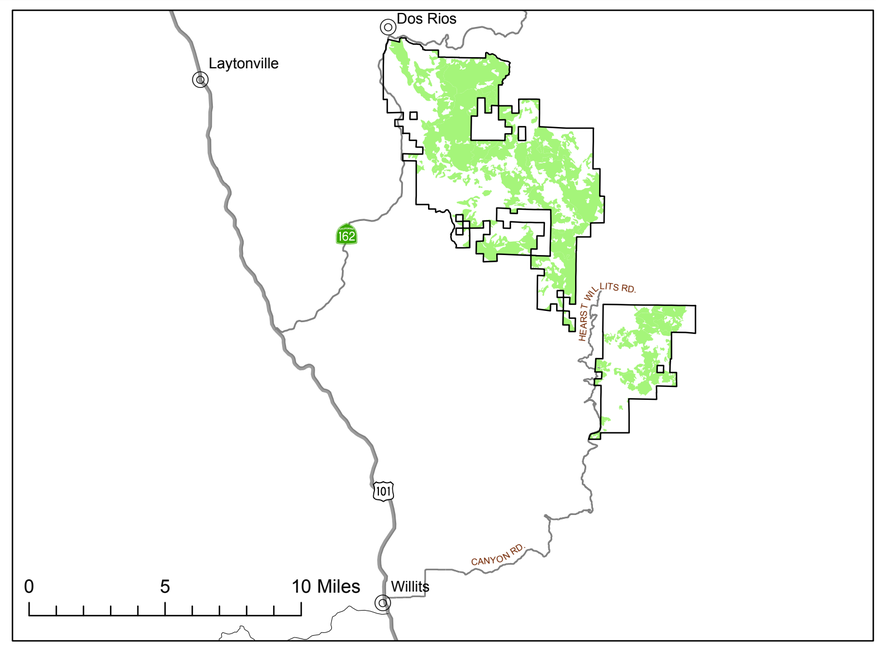
Property Boundary
Project Area
Major Watercourse

Roads
Public
Mainline
Seasonal

NCRM Inc.

0 0.5 1 2 Miles

N W E S



Brushy Mountain Project Map

May 27, 2015
Version 1.0D

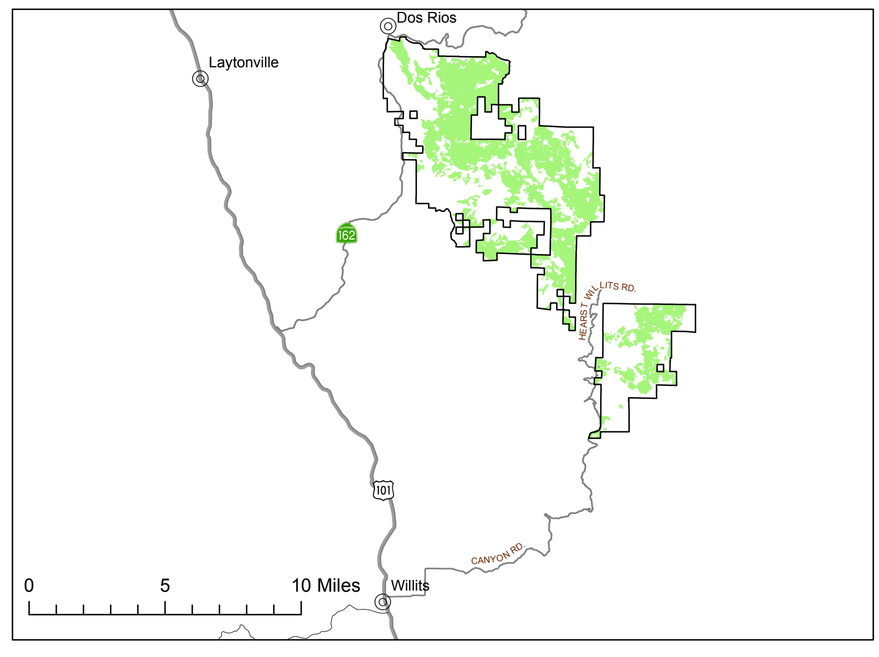
Property Boundary
Project Area
Watersheds

Roads
Public
Mainline
Seasonal

NCRM Inc.

0 0.5 1 2 Miles

N W E S



ATTACHMENT F

Brushy Mountain Project Map

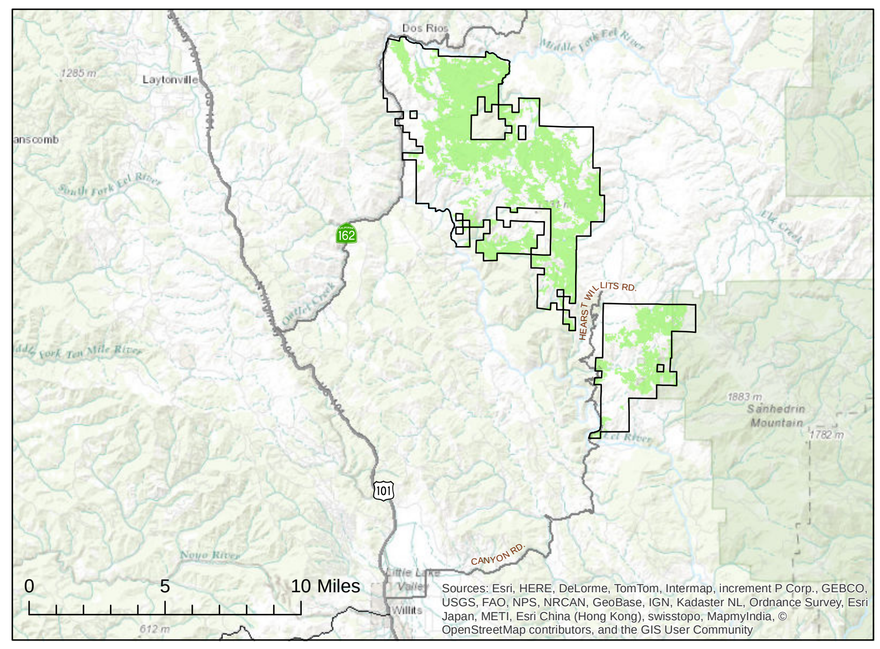
May 27, 2015
Version 1.0D

Property Boundary
Project Area

Roads
Public
Mainline
Seasonal

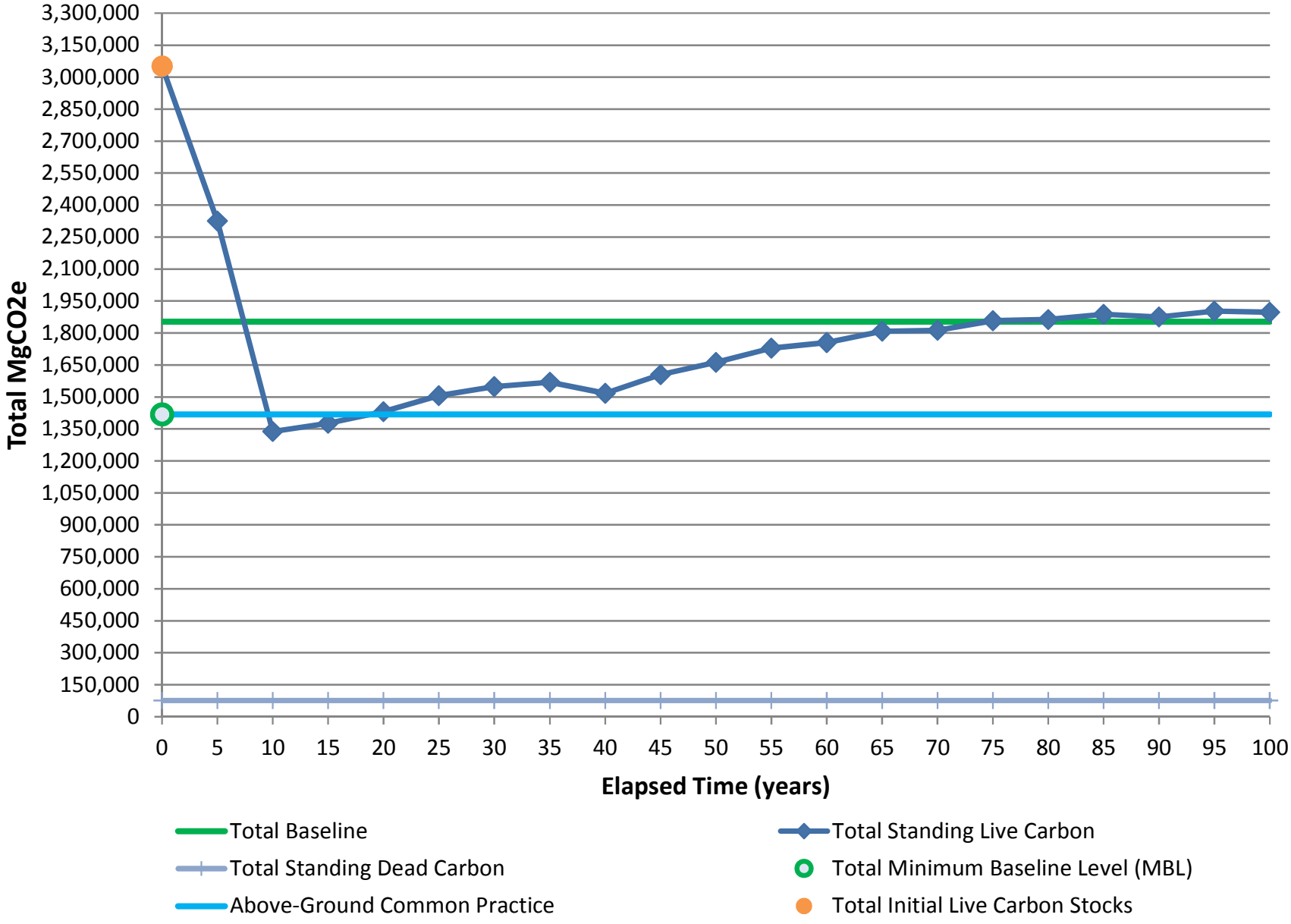
0 0.5 1 2 Miles

N
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ATTACHMENT G

Attachment G Baseline Graph



ATTACHMENT H

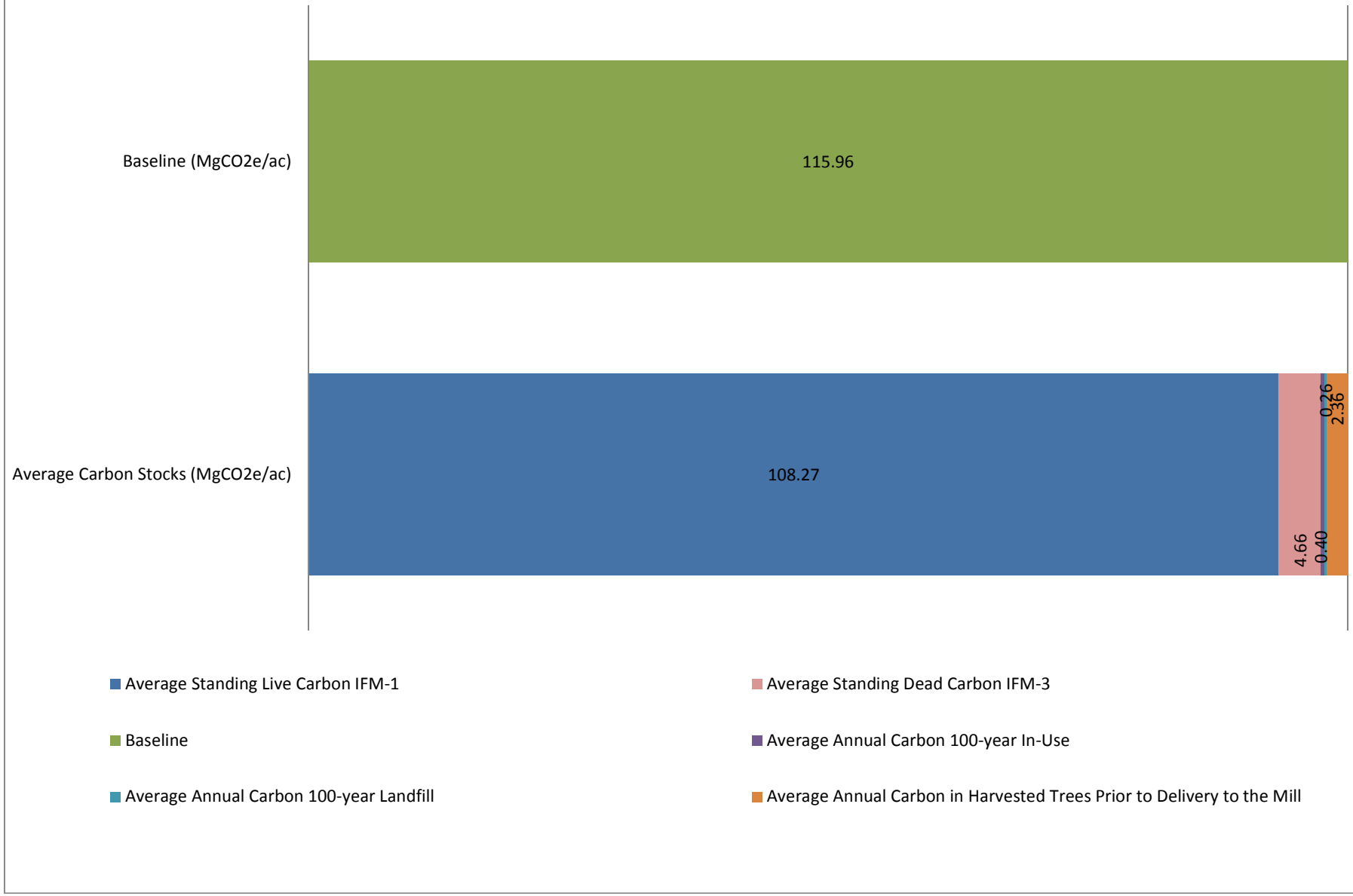
Attachment H

Baseline Carbon Stocks ($MgCO_2e$ per Acre)

Elapsed Time	Standing Live Carbon Pool IFM-1	Standing Dead Carbon Pool IFM-3	Baseline
0	185.94	4.66	112.93
5	141.67	4.66	112.93
10	81.50	4.66	112.93
15	83.86	4.66	112.93
20	87.23	4.66	112.93
25	91.80	4.66	112.93
30	94.34	4.66	112.93
35	95.61	4.66	112.93
40	92.40	4.66	112.93
45	97.79	4.66	112.93
50	101.29	4.66	112.93
55	105.37	4.66	112.93
60	106.92	4.66	112.93
65	110.14	4.66	112.93
70	110.40	4.66	112.93
75	113.16	4.66	112.93
80	113.49	4.66	112.93
85	115.03	4.66	112.93
90	114.27	4.66	112.93
95	115.93	4.66	112.93
100	115.58	4.66	112.93
Average	108.27	4.66	112.93

Carbon Pool	Mg C/ acre	Mg CO2e/acre	Total Mg CO2e
Average Standing Live and Standing Dead Pools	30.82	112.93	1,853,549
Average Annual Carbon 100-year In-Use	0.11	0.40	6,626
Average Annual Carbon 100-year Landfill	0.07	0.26	4,250
Average Annual Carbon in Harvested Trees Prior to Delivery to the Mill	0.64	2.36	38,813

Attachment H - Carbon Stocks and Baseline



ATTACHMENT J

Attachment J
Legal Constraints Affecting Forest Management Activities on the Project Area

- Z'Berg-Nejedly Forest Practice Act of 1973 (California Public Resources Code – Division 4, Chapter 8): Designed to protect, enhance & restore California's timberland.

- California Forest Practice Rules (Title 14, California Code of Regulations, Chapter 4): Regulations used to implement the Forest Practice Act that govern timber operations.

- California Timberland Productivity Act of 1982 (Gov.C. 51100 et seq.): The intent of this Act is to *"encourage investment in timberlands based on reasonable expectation of harvest",* and to *"discourage premature or unnecessary conversion of timberland to urban and other uses".*

- California Environmental Quality Act (CEQA) (Pub.Res.C. 21000 et seq.): statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.

- Porter-Cologne Water Quality Control Act (California Water Code, Division 7. Water Quality): This is the primary vehicle for implementation of California's responsibilities under the federal 1972 Clean Water Act.

- Clean Water Act of 1972 (33 U.S.C. §1251 et seq.): The Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.

- California Endangered Species Act (Fish & G.C. 2050 et seq.): Protects and Preserves all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, that are threatened with extinction.

- Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884): The Act provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend.

ATTACHMENT K

Brushy Mountain Modeling Plan

By Jim Clark, RPF #2528

July 30, 2015

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Growth and Yield Modeling:

The growth and yield modeling described in this modeling plan is performed using the FORSEE model and the AllCA_ResLib resource library, and is based on the following:

Plot Data:

The modeling presented in this document is based on 350 cruise plots installed in 2014 across the Brushy Mountain Project Area. The 350 inventory plots were installed systematically across the Project Area as described in the Inventory Specification included as Attachment L to the OPDR.

Volume Calculations:

Conifer board foot volume calculations presented in Table 5a below utilize the standard FORSEE volume equations taken from Wensel and Olson's Hilgardia 5 for interior conifers. Reported volumes are in board feet Scribner Scale for all conifers 8.5 inches DBH and larger. The FIA volume and biomass equations described in the OPDR are used for the calculation of all carbon stock values presented below.

Biomass Calculations:

Biomass calculations utilized in the modeling are described in detail in the OPDR. The OPDR lists all of the species' specific volume and biomass equations utilized which are in compliance with the Compliance Offset Protocol U.S. Forest Projects.

Adjusting the Inventory Data to 1/17/2014:

As the measurement of the plots was not completed until August 2014, the cruise data was adjusted backward to the Offset Project Commencement date of 1/17/2014 by adjusting the height and diameter of each tree in the inventory database based on applying one half of the one-year height and diameter increment produced by growing the plot data five years forward in FORSEE.

Projecting the Inventory Data to 9/30/2014:

The 2014 plot data was grown forward in FORSEE for one half year to estimate the inventory as of 9/30/2014, the end of the first reporting period by adjusting the height and diameter of each tree in the inventory database based on applying one half of the one-year height and diameter increment produced by growing the plot data one year forward in FORSEE. As the majority of the inventory data was collected in May through June of the year, this adjustment is reasonable.

Updating the Inventory:

The inventory methodology included as Attachment L to the OPDR provides a detailed description of the methods that will be used to maintain and update the Brushy Mountain inventory. FORSEE will be used to project inventory data either forward or backward as needed so that inventory plot data can be adjusted to the appropriate date for reporting of carbon stocks in future OPDRs. The following procedures will apply to inventory updates using average diameter and height increment data derived from 5-year FORSEE projections:

1. Inventory data gathered less than 3 months from the end of the reporting period will not be adjusted to the reporting period date.
2. Inventory data gathered between 3 months and 6 months from the end of the reporting period will be adjusted for one-half year's growth to represent the reporting period date.
3. Inventory data gathered between 6 months and 12 months from the end of the reporting period will be adjusted for one year's growth to represent the reporting period date.

Alternatively, if the inventory data needs to be adjusted in whole year increments, the inventory update feature of FORSEE may be utilized.

Calibration:

The FORSEE model allows the assignment of 'calibration' factors to each species for height, DBH, and crown growth and mortality. Calibration factors can be applied to certain harvest regimes in order to adjust the model output to local conditions. The harvest regimes described in Table 3b below do not use calibration with the exception of the "No-Harvest" regime (R9). As FORSEE was never designed to perform 100-year no-harvest analyses, a basal area calibration of 0.83 was applied to all species. If the "No-Harvest" regime were allowed to run uncalibrated, the resulting carbon stocking levels at the end of the 100-year baseline analysis period would be unrealistically high.

In order to assess the reasonableness of the no-harvest regime output, the basal area per acre values for the regime were compared to values predicted by normal yield tables for Douglas-fir. The basal area per acre value for a fully stocked stand of Douglas-fir for site index 120 and stand age 160 taken from McArdle and Meyer, Technical Bulletin No. 201, (Table 4) is 295 square feet per acre (trees 12" DBH and larger). The Brushy Mountain timber stands are on average approximately 60 years old, thus at the end of the 100-year baseline analysis period, they would be approximately 160 years old. The site index of 120 (100-year base age) is approximately equivalent to the Brushy Mountain Project's average 50-year base age site index of approximately 92.

At the end of the 100-year baseline analysis period, the Brushy Mountain stands treated under the R9 prescription contain approximately 209 square feet of conifer basal area per acre in trees 12" DBH and larger. These conifers 12" DBH and larger represent approximately 71% of the total stands basal area per acre at that time. If the modeled conifer stocking output is compared to 71% of the yield table estimate of 295 square feet per acre, the modeled output is just over 100% of the value predicted by the normal yield table.

Missing Volume:

The inventory data upon which the baseline growth and yield analysis is based gathered data on missing volume from trees with broken tops, or from trees that included defects that reduced the tree's net carbon value. FORSEE outputs all growth and yield results in terms of gross volume or biomass. The carbon stock values presented in the OPDR as of the project commencement date, and the end of the initial reporting period are net of the missing volume recorded in the inventory data. In order to represent this missing volume in

the baseline analysis, the average percentage of missing standing live carbon stocks as of the Project start date are used to adjust the baseline growth and yield output from FORSEE.

Ingrowth:

Ingrowth in FORSEE is handled through the sprouting of species such as tanoak, madrone, live oak, black oak, and white oak, and the addition of regeneration to bring the stand up to a minimum Forest Practice point count. The sprouting function in FORSEE (FSE.fsprout) was set to sprout 20% of sprouting species, as well as bringing the point count up to the minimum point count defined by the Forest Practice Rules (150 points per acre for sites IV and V and 300 points per acre for site III).This is done by calculating the minimum TPA needed to reach the minimum point count and applying the FORSEE TPA regeneration function (FSE.fRegen_Plots).

Tables 1 and 2 below represent the regeneration tree list, and sprout tree list used by FORSEE as a part of the regeneration functions.

Table 1: Regeneration Tree List

SpeciesID	SpNum	DBH	TotalHT	CRatio	RegenYears	Relative Weight
DFI	4	1	6	35	15	60
pp	18	1	5	35	15	40

Table 2: Sprout Tree List

SpeciesID	SpNum	DBH	TotalHT	CRatio	RegenYears	Relative Weight
hILO	62	1	7	80	5	4
hOWO	67	1	7	80	5	2
hTO	69	1	7	80	5	3
hBO	53	1	7	80	5	5
hMD	64	1	7	80	5	2

Site Index:

In order to conduct growth modeling for the property, it was necessary to develop an estimate of average 50-year base age site index by species for the Project Area. FORSEE calculates 50-year base age site index for all species on the project area based on estimated 50-year site index value input for Douglas-fir.

Average site index values by soil type were used to calculate an average site index for each stand type found on the Brushy Mountain Project by calculating the weighted average site index based on the acres of each soil type in a given stand type. Average site index by soil type was used as a method of capturing the variability of site potential across each stand type. Douglas-fir 50-year site index for the project area is calculated from site index data provided by the Soil Survey of Mendocino County (United States Department of Agriculture, Soil Conservation Service, January 1991) as described below:

Site index was estimated at the stand level using soil survey data and site index data for associated soil components. Soils were categorized by map unit symbol. For those with Douglas-fir site index data (DFSI) for major components, average DFSI was calculated by weighting major component site index data by their relative percentages within the map unit symbol. For soil map unit symbols with only DFSI data for minor components, relative percentages for weighting were not available. The average DFSI of each minor component within the map unit symbol was calculated. This minor component DFSI data was then averaged again to estimate average DFSI for each soil map unit symbol without major component DFSI data. Some soil map unit symbols on the property lacked both major component and minor component DFSI data. These soil map unit symbols were reassigned to others that had DFSI data based on similarities assessed using orthographic photos. Site indices for each map unit symbol in a stand were weighted by the relative acreage of that symbol's area within the stand to calculate average stand site index.

Individual site class assignments by plot were calculated using a method similar to the one described above. Plots were assigned a soil map unit symbol and its associated site class if they were within its bounds. These site class assignments were used in assigning silvicultural prescriptions only. Site indices used to grow plots forward or to apply regimes were consistent with the site indices at the stand level.

Site index estimates from soil data are reported as 100-year base age from McArdle and Meyer, Bulletin 201. These site indices were converted to the

King 50-year base age values using table 1 from Research Note No 10 (Krumland and Wensel, 1979). The proportional difference between a plot's 100-year site index and the upper and lower bounds of its class according to Bulletin 201 was applied to the site index ranges of that class according to King to yield an estimate of each plot's 50-year base site index. The average Douglas-fir 50-year base age site index for each stand type are shown in Table 3a below.

Table 3a: 50-year Site Index Values

Strata	Site Index
High Stocked DF	92
Low Stocked Hwd/DF	91
Low Stocked Mixed	91
Mod Stocked DF	92
Mod Stocked DF/PP	91
Weighted Average	**92**

Project Acreage:

The Brushy Mountain Improved Forest Management Project is comprised of approximately 16,412.83 acres of timberland. The topographic map included in Attachment E of the OPDR shows the Project Area boundary. Attachment E also includes GIS data in the form of a geodatabase that includes the Project Area boundary.

Baseline Modeling:

The baseline modeling utilizes the above-described 2014 plot dataset, and an unevenaged management harvesting strategy employing selection, transition and rehabilitation of understocked stands combined with small group openings not exceeding 2.5 acres in size. Portions of the Brushy Mountain timber stands are dominated by hardwoods species, or are in an understocked condition. The baseline modeling assumes an aggressive treatment of hardwood species in order to release existing conifer regeneration, and convert areas dominated by hardwoods to conifer occupation. This reduction is accomplished through rehabilitation and hardwood release treatments.

At the Project's initiation on 1/17/2014 there were no approved Timber Harvest Plans (THPs) on the Project Area.

Baseline Harvest Strategy:

The baseline harvest strategy relies on the application of a series of harvest regimes across the Project Area timber stands. The regimes are modeled at the plot level and the growth and yield data is converted to stand level data. This group-selection harvest strategy results in the eventual harvest in small groups of those areas of the property located outside of WLPZs and no-harvest reserve areas within an 80-year period. Table 3b below describes the harvest regimes applied across the Brushy Mountain timber stands. The final baseline growth and yield analysis is determined by applying a percentage of each regime to each timber stand type.

The silvicultural prescriptions incorporated into the regimes are designed to best accommodate local timber stand conditions, while complying with the Forest Practice Rules as well as all other legal requirements. To accomplish this, a harvest strategy has been developed that evaluates each plot's stocking status in square feet of basal area per acre and point count stocking. Tables 4a-4c below illustrate the silviculture decision matrix upon which the growth and yield modeling is based. Harvesting under selection-transition, utilizes a BDq harvest strategy.

The "Bdq" formula is commonly used to describe the stand structure of uneven-aged forest stands and has been described extensively in the scientific literature. BDq refers to the stand structure with, in order of relative importance: B, the residual basal area; D, the maximum retained diameter class; and q, the ratio of the number of trees in adjacent (one inch) diameter classes.

Table 3b: Harvest Regime General Descriptions

Regime	Harvest Scenario Description
R1	This regime applies the silvicultural parameters outlined in tables 4a and 4b below. Simulates group selection by assigning plots to be group-selected in a given decade.
R9	No-harvest prescription applied to watercourse core zones and NSO activity centers. Assumes a basal area calibration of 0.83 for all species.
R3	WLPZ harvest prescription. Performs selection harvest every decade while retaining a minimum of 150 square feet of conifer and hardwood basal area per acre.
R10	WLPZ harvest / NSO Nesting/Roosting prescription. Performs selection harvest every decade while retaining a minimum of 150 square feet of conifer and hardwood basal area per acre, 8 TPA of trees 26" DBH or larger, and 60% canopy.
R2	NSO Low Quality Foraging Habitat prescription. Performs selection harvest every decade while retaining a minimum of 82 square feet of conifer and hardwood basal area per acre, and 40%-100% canopy.
R11	NSO High Quality Nesting/Roosting Habitat prescription. Performs selection harvest every decade while retaining a minimum of 210 square feet of conifer and hardwood basal area per acre, 8 TPA of trees 26" DBH or larger, and 60 canopy.
R12	NSO Foraging Habitat prescription. Performs selection harvest every decade while retaining a minimum of 120 square feet of conifer and hardwood basal area per acre, 5 TPA of trees 26" DBH or larger, and 40%-100% canopy.

General Harvest Constraints:

Harvest on the Brushy ownership is constrained by several factors. Firstly, the California Forest Practice Rules (FPR) create a minimum set of silvicultural standards below which harvest cannot occur.

Legal requirements include all laws, regulations, and legally-binding commitments applicable to the Project Area at the time of the project's initiation that could affect standing live carbon stocks. The Brushy Mountain Project is subject to the Z'berg- Nejedly Forest Practice Act of 1973 (FPA) and the corresponding Forest Practice Rules (FPR). As the Project was initiated in 2014, the Forest Practice Rules in place in 2014 are applicable to the baseline analysis described herein.

The rules that specifically effect the determination of baseline are those that include limits to silviculture activities. This includes the requirements for minimum basal area retention, rotation ages, harvest adjacency restrictions, watercourse buffer widths and sustained yield requirements.

The pertinent rules include the following:

-
- 14 CCR 933.11(c): Maximum Sustained Production of High Quality Timber Products;
- 14 CCR 933.2: Minimum basal area retention standards for Unevenaged Regeneration Methods;
- 14 CCR 933.2 (a)(2)(B): Group selection harvest limitations;
- 14 CCR 933.2 (b)(6): Minimum post-harvest residual basal area retention standards;
- 14 CCR 933.4 (b): standards for rehabilitation of Understocked Areas;
- 14 CCR 933.1 (c): standards for Seed Tree Seed Step;
- 14 CCR 936.9: details harvest limitations for Watercourse and Lake Protection Zones around Class 1, 2 and 3 streams;
- 14 CCR 919.9: Northern Spotted Owl
- 14 CCR 912.7(b): Resource Conservation Standards for Minimum Stocking

The methods by which the Forest Practice Rule constraints listed above as well as other legally binding constraints are incorporated into the baseline harvest scenario are described in the following sections. Take avoidance of Northern Spotted Owl (NSO) is required by the Federal Endangered Species Act, and follows US Fish and Wildlife Service guidance as described below.

Constraints Analysis

Characterization:

Timber harvesting was modeled over 100 years for the baseline scenario, taking legal constraints, financial feasibility, and physical limitations into consideration while maintaining average live above-ground carbon stocks above the minimum baseline level. Forest stand development was projected using a combination of uneven-aged systems to create multi-aged conditions depending on the arrangement of treatment types over space and time. Forest stands were subject to treatment types based primarily on their forest structure and site attributes as it relates to the California Forest Practice Rules, e.g. Timber Site III vs. Timber Site IV or designated northern spotted owl (NSO) habitat vs. non-designated NSO habitat.

Baseline Legal Constraints:

Constraints that affect land-use specific to forest management activities have been incorporated into the carbon modeling. For this project, legal constraints have the greatest effect on timber harvesting levels, as opposed to what is financially feasible or physically possible. These legal constraints dictate what types of silvicultural activities (treatment types) are allowed, and where (spatial) and when (temporal) they are allowed, that is, there are different legal constraints for different locations of the project area.). There are four general constraint types that determine what treatments are operable for any given area: 1) Timber Site; 2) NSO designated habitat; 3) Water and Lake Protection Zones; and 4) Watercourse core zones. Each constraint, and how it is applied in the modeling, is described below by constraint class.

Northern Spotted Owl:

Seven NSO activity centers are associated with the Brushy Mountain Project Area. Harvest activity is restricted using the following parameters taken from guidance from the US Fish and Wildlife Service Attachment B: Take Avoidance Analysis-Interior ("Attachment B"), Revised February 27, 2008:

NSO Habitat Protection:

Within 1000 feet of activity center

i. Outside breeding season (September 1 through January 31): no timber operations other than use of existing roads

ii. During the breeding season (February 1 through August 31): no timber operations other than the use of existing, permanent, year-round roads

b. Within 0.5 mile radius (502 acres) centered on activity center
    i. Retention of habitat should follow discussion below
    ii. At least 250 acres nesting/roosting habitat present, as follows:
        1. 100 acres High Quality Nesting/roosting Habitat, **and**
        2. 150 acres Nesting/roosting Habitat
            -AND-
    iii. At least 150 acres foraging habitat must be present, as follows:
        1. 100 acres Foraging Habitat, **and**
        2. 50 acres Low Quality Foraging Habitat
    iv. No more than 1/3 of the remaining suitable habitat may be harvested during the life of the THP
c. Between 0.5 mile radius and 1.3 miles radius circles centered on activity center
    i. Retention of habitat should follow discussion below
    ii. 935 acres suitable habitat must be present, as follows:
        1. At least 655 acres Foraging Habitat, **and**
        2. At least 280 acres Low Quality Foraging, **and**
        3. No more than 1/3 of the remaining suitable habitat may be harvested during the life of the THP

NSO Habitat Definitions:

Activity Center (AC): Area of concentrated activity of either a pair of NSO or a single territorial NSO, represented by a mapped location (e.g., usually a nest tree) that occurs within, but not necessarily in the exact center of, the "Core Area," defined below.

Core Area: 100 acres of the 200 acres of Nesting/Roosting habitat retained within a 0.7 mile radius contiguous with the Activity Center. If 100 acres of contiguous Nesting/Roosting is not available, then the highest quality habitat available shall be included.

Foraging Habitat: Habitat that contains a mix of basal areas ranging from 120-180+ square feet, **and**
≥13" QMD, **and** ≥ 5 TP A of trees ≥26" DBH, **and** a mix of ≥40% canopy closure.

Low Quality Foraging Habitat: Habitat that contains a mix of basal areas ranging from 80-120+ square feet, **and** ≥11" QMD, **and** ≥40% canopy closure.

High Quality Nesting/Roosting Habitat: Forested habitat that supports successful nesting and associated roosting behavior by NSO.

Basal area 210+ square feet, **and** ≥15" QMD, and ≥ 8 TPA of trees ≥ 26" DBH, **and** ≥ 60% canopy closure.

Nesting/Roosting Habitat: Forested habitat that supports successful nesting and associated roosting behavior by NSO. A mix of basal areas ranging from 150-180+ square feet, **and** ≥15" QMD, and ≥ 8 TPA of trees ≥ 26" DBH, **and** ≥ 60% canopy closure.

Regimes R2, R9, R10, R11, and R12 have been designed to retain the required basal area and tree sizes as described in tables 4a-4c below for each respective NSO habitat type description. A buffer analysis around the NSO activity centers was conducted to ensure that the required acreage of each type of NSO habitat was retained in the required quantity.

Application of the above listed harvest restrictions associated with NSO activity centers resulted in the application of certain amounts of each timber strata being assigned to regimes R2, R9, R10, R11, and R12. Table 3c below includes a summary of acres by strata included in each of the above listed regimes.

Class I and II no Harvest Core Zones:

Utilizing the Brushy Mountain GIS, areas located within class I or II core zones where harvesting is restricted were identified pursuant to 14 CCR 936.9 as indicated in tables 3d through 3g from the Forest Practice Rules, shown below. Class II-L watercourse segments were identified as those Class II watercourse segments within 1000 feet of a Class I watercourse. All other Class II watercourse segments were identified as Class II-S. Class I and Class II-L segments were given a 30 foot core zone on either side of the watercourse, and Class II-S watercourse segments were given a 15 foot core zone on either side of the watercourse. This analysis identified 277.2 acres within the core zone of Class I or Class II watercourses. In some instances, NSO no-harvest areas are coincident with watercourse core-zones.

These constraints are modeled by calculating the acreage by timber stand, and applying a 100-year no-harvest regime (Regime R9 in Table 3b above). The yield stream from this reduced harvest is weighted by the constrained acreage and combined with the baseline harvest regime weighted by the unconstrained acreage to determine the final baseline carbon stocks through the 100-year analysis period.

Harvesting WLPZ Areas:

Utilizing the Brushy Mountain GIS the acreage associated with class I and II WLPZs were estimated. These WLPZ acres will be harvested using a selection silvicultural prescription (R3). Harvest levels within the WLPZ are designed to meet FPR standards for shade canopy retention. FPR requirements for the retention of the largest trees, and restrictions on harvests within the channel zone are addressed by adhering to harvest methods allowed by zone and slope pursuant to 14 CCR 936.9 as indicated in tables 3d through 3g from the Forest Practice Rules, shown below.

An analysis of the potential distribution of WLPZ areas by slope class was performed. Based on this analysis, it was determined that the greatest horizontal distance for a Class II-S WLPZ would be approximately 85 feet, approximately 100 feet for a Class II-L WLPZ, and approximately 100 feet for a Class I WLPZ. Given a reasonable distribution of slope classes within any one of the watercourse class designations, the average WLPZ buffer distance would be less than the calculated maximum. The baseline modeling has been revised to include an 85 foot WLPZ buffer on Class II-S watercourses, and a 100 foot buffer on Class II-L and Class I watercourses. These buffer distances are felt to meet the definition of "Conservative" per Section 95802 of the Regulation in that these modeled buffer distances meet the largest potential buffer that would need to be applied per the Forest Practice Rules. Across the Brushy Mountain Project Area, this buffer analysis resulted in 1,401.1 acres being identified as WLPZ or approximately 8.5% of the Project acreage.

As with Class I and II core zones, in some instances, NSO no-harvest areas are coincident with WLPZ zones.

Table 3c: Acres by Regime following NSO, Core Zone and WLPZ Buffer Analysis

Stand	Acres	R9	R10	R11	R12	R2	R3	Constrained Acres
High Stocked DF	4,183.53	242.30	514.69	15.04	289.32	406.85	115.21	1583.41
Mod Stocked DF/PP	1,952.85	17.69	42.55	56.72	378.29	203.45	33.75	732.46
Mod Stocked DF	6,387.52	203.70	266.56	20.46	186.00	78.24	280.58	1035.55
Low Stocked Mixed	1,598.08	26.29	109.47	10.40	196.28	81.99	44.25	468.68
Low Stocked Hwd/DF	2,290.86	32.26					126.05	158.31
Total	**16412.83**	**522.25**	**933.28**	**102.62**	**1049.89**	**770.53**	**599.85**	**3978.41**

Table 3d: Procedure for Determining WLPZ Widths and Protective Measures Class I WLPZs - Confined Channels - Coastal Anadromy Zone						
Pursuant to 14 CCR 936.9 (f)(2)						
Zone Designation	**Zone width (ft.)**	**Overstory Canopy Cover**		**Large Tree Retention**	**Silviculture Requirements**	**Operational Requirements**
Channel Zone	Variable	Retain all trees except per 916.9 [936.9, 956.9](e)(1) A-F or 916.9 [936.9 956.9] (v)		Retain all trees except per 916.9 [936.9, 956.9](e) (1) A-F or 916.9 [936.9 956.9] (v)	Retain all trees except per 916.9 [936.9, 956.9] (e) (1) A-F or 916.9 [936.9, 956.9](v)	No timber operations except per 916.9 [936.9, 956.9] (e) (1)A-F or 916.9 [936.9, 956.9](v);
Core Zone per 916.9 [936.9 956.9] (f)(2)(A)	30 ft.	Retain all trees except per 916.9 [936.9, 956.9](e) (1)A-F or 916.9 [936.9 956.9] (v)		Retain all trees except per 916.9 [936.9, 956.9](e)(1) A-F or 916.9 [936.9 956.9] (v)	Retain all trees except per 916.9 [936.9, 956.9] (e) (1) A-F or 916.9 [936.9, 956.9](v); no sanitation salvage except 916.9 (s)(t)and (u).	No timber operations except per 916.9 [936.9, 956.9] (e) (1) A-For 916.9 [936.9, 956.9](v);
Inner Zone per 916.9 [936.9 956.9] (f)(2)(B)	70 ft.	80% Coast and Southern Forest District of Coastal Anadromy Zone per 916.9 [936.9 956.9] (f)(2)(B)3.	70% in Northern Forest District of Coastal Anadromy Zone per 916.9 [936.9 956.9] (f)(2)(B)3.	13 largest trees /ac. per 916.9 [936.9 956.9] (f)(2)(B)4.	Increase QMD; No sanitation salvage except 916.9 (s)(t)and (u); commercial thinning or single tree selection only.	Preferred Management Practices in 916.9[936.9, 956.9] (f)(2)(D)
Outer Zone per 916.9 [936.9 956.9] (f)(2)(C) Outer Zone applicable only where even-aged regeneration used adjacent to the WLPZ	50 ft.	50% per 916.9 [936.9 956.9] (f)(2)(C).1.		NA	Commercial thinning or single tree selection only; Retain wind firm trees.	Preferred Management Practices in 916.9[936.9, 956.9] (f)(2)(D)
Special Operating Zone per 916.9 [936.9 956.9] (f)(2)(E)	50 ft.	NA		NA	SOZ applicable only where even-aged regeneration used adjacent to the WLPZ . Retain understory and midstory trees per 916.9 [936.9, 956.9] (f)(2)(E)	All other Forest Practice Rules

Table 3e: Procedure for Determining WLPZ Widths and Protective Measures Class I WLPZs – with flood prone areas or channel migration zones						
Pursuant to 14 CCR 936.9 (f)(3)						
Zone Designation	**Zone width (ft.)**	**Overstory Canopy Cover**		**Large Tree Retention**	**Silviculture Requirements**	**Operational Requirements**
Channel Zone or Channel Migration Zone per 916.9 [936.9 956.9] (f)(3)(A)	Variable	Retain all trees except per 916.9 [936.9, 956.9](e) (1)A-F or 916.9 [936.9 956.9] (v)		Retain all trees except per 916.9 [936.9, 956.9](e) (1)A-F or 916.9 [936.9 956.9] (v)	Retain all trees except per 916.9 [936.9, 956.9] (e) (1) A-F or 916.9 [936.9, 956.9](v)	No timber operations except per 916.9 [936.9, 956.9] (e)(1) A-For 916.9 [936.9, 956.9](v);
Core Zone per 916.9 [936.9 956.9] (f)(3)(B)	30 ft.	Retain all trees except per 916.9 [936.9, 956.9](e) (1)A-F or 916.9 [936.9 956.9] (v)		Retain all trees except per 916.9 [936.9, 956.9](e) (1)A-F or 916.9 [936.9 956.9] (v)	Retain all trees except per 916.9 [936.9, 956.9] (e) (1) A-F or 916.9 [936.9, 956.9](v); no sanitation salvage except 916.9 (s)(t)and (u).	No timber operations except per 916.9 [936.9, 956.9] (e) (1)A-For 916.9 [936.9, 956.9](v);
Inner Zone A per 916.9 [936.9 956.9] (f)(3)(C)	Minimum 70 ft. Maximum 120 ft.	80% Coast and Southern Forest District of Coastal Anadromy Zone per 916.9 [936.9 956.9] (f)(3)(C)3.	70% in all other watersheds per 916.9 [936.9 956.9] (f)(3)(C)3.	13 largest trees /ac. per 916.9 [936.9 956.9] (f)(3)(C)4.	Increase QMD; No sanitation salvage except 916.9 (s)(t)and (u); commercial thinning or single tree selection only.	Preferred Management Practices in 916.9 [936.9, 956.9] (f)(3)(E)
Inner Zone B per 916.9 [936.9 956.9] (f)(3)(D)	Variable: distance from Inner Zone A to end of FPA.	50%		13 largest trees /ac. per 916.9 [936.9 956.9] (f)(3)(D)1.	Increase QMD; No sanitation salvage except 916.9 (s)(t)and (u); commercial thinning or single tree selection only.	Preferred Management Practices in 916.9[936.9, 956.9] (f)(3)(E)
Outer Zone per 916.9 [936.9 956.9] (f)(3)(F) Applicable only where even-aged regeneration used adjacent to the WLPZ	50 ft.	50%		NA	Commercial thinning or single tree selection only; Retain wind firm trees.	Preferred Management Practices in 916.9[936.9, 956.9] (f)(3)(E)

Table 3f: Procedure for Determining WLPZ Widths and Protective Measures Class I WLPZs - Confined Channels - Outside the Coastal Anadromy Zone					
Pursuant to 14 CCR 936.9 (f)(4)					
Zone Designation	**Zone width (ft.)**	**Overstory Canopy Cover**	**Large Tree Retention**	**Silviculture Requirements**	**Operational Requirements**
Channel Zone	Variable	Retain all trees except per 916.9 [936.9, 956.9](e)(1) A-F or 916.9 [936.9 956.9] (v)	Retain all trees except per 916.9 [936.9, 956.9](e)(1) A-F or 916.9 [936.9 956.9] (v)	Retain all trees except per 916.9 [936.9, 956.9] (e)(1) A-F or 916.9 [936.9, 956.9](v)	No timber operations except per 916.9 [936.9, 956.9] (e)(1) A-F or 916.9 [936.9, 956.9](v);
Core Zone per 916.9 [936.9 956.9] (f)(4)(A)	30 ft.	Retain all trees except per 916.9 [936.9, 956.9](e)(1) A-F or 916.9 [936.9 956.9] (v)	Retain all trees except per 916.9 [936.9, 956.9](e)(1) A-F or 916.9 [936.9 956.9] (v)	Retain all trees except per 916.9 [936.9, 956.9] (e)(1) A-F or 916.9 [936.9, 956.9](v); no sanitation salvage except 916.9 (s)(t)and (u).	No timber operations except per 916.9 [936.9, 956.9] (e)(1) A-F or 916.9 [936.9, 956.9](v);
Inner Zone per 916.9 [936.9 956.9] (f)(4)(B)	40 ft.	70% per 916.9 [936.9 956.9] (f)(4)(B)3.	7 largest trees /ac. per 916.9 [936.9 956.9] (f)(4)(B)4.	Increase QMD; No sanitation salvage except 916.9 (s)(t)and (u); commercial thinning or single tree selection only.	Preferred Management Practices in 916.9 [936.9, 956.9] (f)(4)(D)
Outer Zone per 916.9 [936.9 956.9] (f)(4)(C)1.	30 ft.	50% per 916.9 [936.9 956.9] (f)(4)(C).1.	NA	Commercial thinning or single tree selection only; Retain wind firm trees.	Preferred Management Practices in 916.9 [936.9, 956.9] (f)(4)(D)
ELZ Applicable only where even-aged regeneration used adjacent to the WLPZ	25 ft.	NA	NA	All other Forest Practice Rules	All other Forest Practice Rules

Table 3g. Core and Inner Zone widths.								
Water Class	**Class II-S (feet)**				**Class II-L (feet)**			
Geographic location	**Watersheds in the coastal anadromy zone**		**Watersheds outside the coastal anadromy zone**		**Watersheds in the coastal anadromy zone**		**Watersheds outside the coastal anadromy zone**	
Slope class	Core Zone (feet)	Inner Zone (feet)	Core Zone (feet)	Inner Zone (feet)	Core Zone (feet)	Inner Zone (feet)	Core Zone (feet)	Inner Zone (feet)
≤30%	15	35	10	40	30	70	20	80
30-50%	15	60	10	65	30	70	20	80
>50%	15	85	10	90	30	70	20	80

Timber Site:

All forest stands in the project area are subject to retention standards for uneven-aged silviculture based on their "Timber Site" or site class. Forest stands in the project area of this constraint class must follow these terms at a minimum:

1) All forest stands where uneven-aged silviculture is applied shall maintain the minimum basal area retention thresholds of 75 square feet per acre for Site III stands and 50 square feet per acre for Site IV and Site V stands for selection silviculture, and 50 square feet per acre for transition silviculture for Site III stands. There are no Site I or Site II stands on the Project Area.

   14 CCR 933.2: Minimum basal area retention standards for Unevenaged Regeneration Methods:

   Unevenaged management is utilized to establish and maintain an unevenaged stand structure. Unevenaged management attributes include the establishment and/or maintenance of a multi-aged, balanced stand structure, promotion of growth on leave trees throughout a broad range of diameter classes, and encouragement of natural reproduction.

   a) **Selection** Under the selection regeneration method, the trees are removed individually or in small groups sized from .25 acres to 2.5 acres.
      1) Trees to be harvested or trees to be retained shall be marked by or under the supervision of the RPF prior to felling operations. When openings greater than .25

acres will be created, the boundaries of the small group(s) may be designated in lieu of marking individual trees within the small group areas. A sample area must be marked prior to a preharvest inspection for evaluation. The sample area shall include at least 10% of the harvest area up to a maximum of 20 acres per stand type which is representative of the range of conditions present in the area.

2) Post harvest stand stocking levels shall be stated in the THP. The level of residual stocking shall be consistent with maximum sustained production of high quality timber products. In no case shall stocking be reduced below the following standards:

A. Selection System.

1. On Site I lands at least 100 square feet per acre of basal area shall be retained.

2. On Site II and III lands at least 75 square feet per acre of basal area shall be retained.

3. On Site IV and V lands at least 50 square feet per acre of basal area shall be retained.

4. Unless the plan submitter demonstrates how the proposed harvest will achieve MSP pursuant to 14 CCR § 933.11 (a) or (b), the residual stand shall contain sufficient trees to meet at least the basal area, size, and phenotypic quality of tree requirement specified under the seed tree method.

B. Group Selection.

1. At least 80% of the stocked plots must meet the Basal Area stocking standards of 14 CCR 933.2(a)(2)(A).

2. Not more than 20% of the stocked plots may meet stocking standards utilizing the 300 point count standard with trees that are at least 10 (ten) years old.

3. An RPF or supervised designee may offset up to 8 plots per 40 plots where those plot centers are initially placed within small group clearings created during the current harvest. Unless substantially damaged by fire, the RPF or supervised designee shall not exclude small group clearings created by

previous timber harvesting from the stocking survey.

4. Unless the plan submitter demonstrates how the proposed harvest will achieve MSP pursuant to 14 CCR 933.11 (a) or (b), the residual stand shall contain sufficient trees to meet at least the basal area, size, and phenotypic quality of tree requirements specified under the seed tree method.

3) Within any THP, small group clearings under the selection method shall be separated by a logical logging area.

4) Following completion of timber operations (including site preparation) not more than 20 percent of the THP area harvested by this method shall be covered by small group clearings.

b) Transition. The transition method may be used to develop an unevenaged stand from a stand that currently has an unbalanced irregular or evenaged structure. The transition method involves the removal of trees individually or in small groups from irregular or evenaged stands to create a balanced stand structure and to obtain natural reproduction.

1) Area for determination of preharvest seed tree retention levels shall be no greater than 20 acres in size.

2) This method is to be used to increase stocking and improve the balance of age classes so as to allow the residual stand to be managed by the selection regeneration method. This method shall not be used more than two times for a stand. The RPF shall delineate areas previously treated by the transition method on the plan map.

3) Stands suitable for the transition method contain adequate quantity and quality of seed producing trees to provide adequate regeneration for new age classes. Stands suitable for this method shall have no more than 50 sq. ft. of basal area greater than the selection basal area standards.

4) Trees to be harvested or trees to be retained shall be marked by or under the supervision of a RPF before felling operations. A sample area must be marked before the preharvest inspection for evaluation. The sample area shall include at least 10% of the harvest

area up to a maximum of 20 acres per stand type which is representative of the range of conditions present.

5) Immediately following the completion of timber operations, the minimum basal area standards in 14 CCR 932.7(b)(2) shall be met.

6) The post harvested residual stand shall contain at least 15 square feet of basal area per acre of seed trees at least 12 inches dbh or greater for timber sites I, II or III; or 12 square feet of basal area per acre of seed trees 12 inches dbh or greater for timber sites IV or V. Unless obviously stocked, these basal area requirements will be determined from sampling averaged across each harvested area required in 14 CCR § 933.2(b)(1). Unless the plan submitter demonstrates how the proposed harvest will achieve MSP pursuant to 14 CCR § 933.11(a) or (b) [953.11(a) or (b)], where present in the preharvest stand, disease free, undamaged seed trees 18 inches dbh or greater shall be retained post harvest until the stand exceeds the minimum seed tree requirements of 14 CCR § 933.1(c)(1)(A). The seed trees shall be full crown, capable of seed production and representative of the best phenotypes available in the present stand.

7) Following completion of timber operations (including site preparation) not more than 20 percent of the Plan area harvested by this method shall be occupied by small group clearings.

This overall constraint is emulated in the baseline by setting a minimum basal area target for uneven-aged stands when they are treated.

Baseline Activities:

All forest stands and baseline activities in the project area are subject to the Maximum Sustained Production (MSP) of High Quality Timber Products section of the California Forest Practice Rules. It is assumed in the baseline model that MSP is achieved pursuant to 14 CCR 933.11(c)(2) and (3), paraphrased below:

2) For uneven-aged management, complying with the seed tree retention standards, meeting minimum stocking and basal area standards for the selected silvicultural methods as contained in

the Forest Practice Rules only with group A species, and protecting the soil, air, fish and wildlife, water resources and other public trust resources through the application of these rules.

3) For intermediate treatments and special prescriptions, complying with the stocking requirements of the individual treatment or prescription.

This overall constraint is emulated in the baseline by requiring that selection and transition harvest retain at least 15 square feet of conifer basal area in trees 18" DBH or larger for site class III areas, and 12 square feet of conifer basal area in trees 18" DBH or larger for site class IV areas.

In other words, treatment types, or silviculture systems, were applied to forest stands in the baseline model such that they followed the silvicultural method objectives in Article 3 of the Forest Practice Rules and as additionally described in this section. Specifically, these treatments included selection and transition harvesting. Treatments were selected and scheduled in the baseline based on legal constraint(s) and stocking.

A 'selection harvest' was defined as a single tree selection harvest (i.e. uneven-age). All selection harvests were designed using a Q-factor of 1.2 and a maximum diameter class of 24 inches. The target residual basal area varied based on site class, NSO habitat type, and WLPZ type. Conifer regeneration was established immediately following the harvest and hardwood sprouts, if any, were controlled.

For stands in Class I Outer and Class II-S Inner WLPZs, the selection harvests maintained a minimum 50 percent canopy cover of which at least 25 percent of the overstory was conifer. For stands in Class I Inner and Class II-L Inner WLPZs, selection harvests maintained a minimum 70 percent canopy of which at least 25 percent of the overstory was conifer. No harvesting occurred in the baseline model for stands within 1000 feet of an NSO activity center. These constraints are pursuant to 14 CCR 936.9, described in the "Harvesting WLPZ Areas" section of the constraints analysis.

Stands undergoing Selection harvests that are in non-NSO designated habitat and outside any WLPZs maintain 75 square feet of total conifer basal area per acre and 15 square feet conifer basal area per acre in trees over 18 inches dbh for Site III or 12 square feet for Site IV and Site V. These constraints are pursuant to 14 CCR 933.2(a)(2)(A),

described in the "Timber Site" section of the constraints analysis, and 14 CCR 933.1(c)(1), shown below:

14 CCR 933.1(c): Standards for Seed Tree Step:

c) Seed Tree The seed tree regeneration method involves the removal of a stand in one harvest except for well distributed seed trees of desired species which are left singly or in groups to restock the harvested area. The seed step is utilized to promote natural reproduction from seed and to initiate the establishment of an evenaged stand. The removal step may be utilized to remove the seed trees after a fully stocked stand of reproduction has become established.

1) Seed Tree Seed Step: The seed tree seed step is the regeneration step and shall meet the following requirements:

A. Retention of at least the following basal area of seed trees per acre which are 18 inches dbh or greater:

1. Fifteen square feet basal area on site I, II and III lands and

2. Twelve square feet basal area on site IV and V lands.

Hardwood Harvest:

The Brushy Mountain Project's hardwood reduction program calls for the manipulation of hardwood stocking levels through commercial harvest, manual or mechanical treatments, or basal herbicide treatments as appropriate. Understocked portions of the Project Area were modeled as a rehabilitation harvest per 14 CCR 933.4(b).

Non-Commercial Treatments:

Portions of the Brushy Mountain Project's timberlands exist in a condition that does not permit current commercial timber harvest. These stands are composed of advanced conifer regeneration with varying levels of hardwood competition. The stands with the heaviest hardwood component are targeted for a "Release" treatment during the first decade of the planning period. For stands with lesser amounts of hardwood competition, or those stands where the hardwood component is too small to treat economically, no treatment is modeled in the baseline growth and yield analysis; however, the Brushy

Mountain Project may at its discretion undertake stand improvement treatments in these non-commercial stands. Non-commercial treatments may include hardwood reduction treatments and pre-commercial thinning of conifers.

The arrangement of these treatments over time and space create timber product value in both yields and appreciation and provide NSO habitat that is in line with the baseline scenario characterization and legal constraints. By the end of the baseline model, 511.26 acres remain un-treated as a result of being protected NSO habitat or restricted WLPZ areas. The application of the silvicultural regimes described below at the landscape level, yield an acceptable return on investment for the forest owner while maintaining compliance with the California Forest Practice Rules and NSO Take Avoidance protection measures. Overall, the baseline regime reflects maximum sustained productivity and a harvest and growth pattern that indefinitely serves multiple management objectives.

Standing Dead:

The standing dead carbon pool represents approximately 2.4% of the total carbon found on the Project Area, and exceeds the one metric ton or 1% of live carbon test in the structural elements evaluation criteria under section 3.8.2 (Table 3.2) of the protocol. The standing dead carbon pool is treated as a static pool as a part of the baseline analysis. The level of the standing dead carbon pool on the Brushy Mountain Project meets the minimum standards for Standing Dead per the Natural Forest Management requirements of the protocol; furthermore, as the baseline analysis involves ongoing forest management and maintenance of young and vigorous stands, standing dead levels are expected to be maintained at the current levels. It could be argued that the baseline harvesting scenario would remove poorly formed and suppressed trees, thus capturing mortality that would have otherwise occurred under a harvest scenario that removed fewer trees and less volume over time.

Silvicultural Prescriptions

Assignment of Silvicultural Treatment Schedules:

With the exception of regimes designed to retain NSO habitat, or meet Forest Practice Rule requirements for WLPZ, the majority of the Project Area was treated using the R1 regime. The R1 regime includes silvicultural treatment schedules that were selected on a plot-by-plot basis, where each plot was representative of a micro-stand within its larger strata. Site Class, regeneration point count, and conifer and hardwood basal area values were calculated for each plot at the end of the first 5-year period to determine which silvicultural treatment should be applied. Treatments for the first period were No-Cut, Transition, Release, Rehabilitation, Commercial Thinning, or Selection. The No-Cut, Transition, Release, Commercial Thin, and Rehabilitation treatments are meant to grow plots to an appropriate state to the point where Selection can be employed.

Table 4b contains the parameters used to assign first period (decade) silviculture. Harvests in following decades is guided by the minimum retention values shown in table 4c.

Specialized treatments were applied for designated northern spotted owl (NSO) habitat and WLPZ areas via regimes R2, R9, R10, R11, and R12. The relative acreage of designated northern spotted owl (NSO) habitat vs. areas undergoing the average effects of the plot-level silvicultural treatments of regime R1 described above vs. no harvest/WLPZ areas within each stand were used to calculate the overall effects of all treatments at the stand level. Constraints guiding the application of each silvicultural regime are described in the sections above.

Table 4a: Silvicultural Prescriptions used by the Various Regimes:

Regime	Prescription	Description
R1	Selection	The goal of this prescription is to create and maintain, multistoried, uneven-aged stands with varied diameter classes. Trees are harvested individually, or in small groups up to 2.5 acres in size.
	Transition	The goal of this prescription is to develop uneven-aged stands from stands that have an even-aged or irregular stand structure. Trees are harvested individually, or in small groups up to 2.5 acres in size.
	Rehabilitation	The goal of this prescription is to regenerate stands that are primarily experiencing excessive hardwood competition, and that also do not meet minimum stocking standards. Successive harvests will utilize intermediate prescriptions leading to uneven-aged silviculture.
	Hardwood Release	The goal of this prescription is to improve growth in stands that are primarily experiencing excessive hardwood competition, and that are also well stocked with conifer seedlings. Successive harvests will utilize intermediate prescriptions leading to uneven-aged silviculture.
	Commercial Thinning	To promote timber growth and improve forest health through the harvest of trees in a manner that results in a stand capable of being managed using single tree or group selection.
R9	No Harvest	This prescription is used to account for those portions of the Project Area where harvesting is prohibited.
R3	Single Tree Selection (WLPZ)	The goal of this prescription is to create and maintain dense, multistoried, uneven-aged stands with varied diameter classes.
R10	Single Tree Selection (NSO Nest Roost Habitat)	The goal of this prescription is to create and maintain dense, multistoried, uneven-aged stands with varied diameter classes while meeting the retention standards for NSO Nesting/Roosting Habitat.
R11	Single Tree Selection (NSO High Quality Nest Roost Habitat)	The goal of this prescription is to create and maintain dense, multistoried, uneven-aged stands with varied diameter classes while meeting the retention standards for NSO High Quality Nesting/Roosting Habitat.
R12	Single Tree Selection (NSO Foraging Habitat)	The goal of this prescription is to create and maintain dense, multistoried, uneven-aged stands with varied diameter classes while meeting the retention standards for NSO Foraging Habitat.
R2	Single Tree Selection (NSO Low Quality Foraging Habitat)	The goal of this prescription is to create and maintain dense, multistoried, uneven-aged stands with varied diameter classes while meeting the retention standards for NSO Low Quality Foraging Habitat.

Table 4b: Pre-harvest Stand Conditions by Regime

Regime	Prescription	Pre-Harvest Conifer Basal Area (Square Feet per Acre)		Other Pre-Harvest Considerations
		Lower Limit	Upper Limit	
R1	Selection Site Class III	125	None	Retain at least 15 square feet of basal area in trees 18" or larger.
	Selection Site Class IV or V	70	None	Retain at least 12 square feet of basal area in trees 18" or larger.
	Transition Site Class III	70	125	Retain at least 15 square feet of basal area in trees 18" or larger.
	Rehabilitation Site Class III	0	<50	Less than 300 point count, at least 35 square feet of hardwood basal area.
	Rehabilitation Site Class IV or V	0	<50	Less than 150 point count, at least 35 square feet of hardwood basal area.
	Hardwood Release	0	70	At least 150 or 300 point count, at least 35 square feet of hardwood basal area.
	Commercial Thinning Site Class III	35	None	
	Commercial Thinning Site Class IV or V	35	None	
R9	No Harvest	None	None	No Harvest
R3	Single Tree Selection (WLPZ)	None	None	Retain at least 12 or 15 square feet of basal area in trees 18" or larger.
R10	Single Tree Selection (WLPZ/NSO Nest Roost Habitat)	None	None	Retain 8 TPA 26" DBH or greater, ≥15" QMD
R11	Single Tree Selection (NSO High Quality Nest Roost Habitat)	None	None	Retain 8 TPA 26" DBH or greater, ≥ 15" QMD
R12	Single Tree Selection (NSO Foraging Habitat)	None	None	Retain 5 TPA 26" DBH or greater, ≥13" QMD
R2	Single Tree Selection (NSO Low Quality Foraging Habitat)	None	None	≥ 11" QMD

Table 4c: Post-harvest Stocking by Regime

Regime	Prescription	Stocking Considerations	Conifer Basal Area Retention (sq. ft. per ac)	Hardwood Basal Area Retention (sq. ft. per ac)	Regeneration Assumptions	Time to Next Treatment
R1	Selection Site Class III	Less than 20% of stand in group openings, at least 15 sq. ft. >18" DBH	≥75	7	300 Point Count, Sprout 20%	At Least 10 Years
	Selection Site Class IV or V	Less than 20% of stand in group openings, at least 12 sq. ft. >18" DBH	≥50	7	150 Point Count, Sprout 20%	At Least 10 Years
	Transition Site Class III	Less than 20% of stand in group openings, at least 15 sq. ft. >18" DBH	≥50	7	300 Point Count, Sprout 20%	Selection within 10-20 Years
	Rehabilitation Site Class III		≥10 where conifer≥10 pre-harvest	7	300 Point Count, Sprout 20%	Selection within 30-40 Years
	Rehabilitation Site Class IV or V		≥10 where conifer≥10 pre-harvest	7	150 Point Count, Sprout 20%	Selection within 30-40 Years
	Hardwood Release	No Commercial Conifer Harvest	No Commercial Conifer Harvest	7	None	Selection within 20-40 Years
	Commercial Thinning Site Class III	≥ average stand diameter than pre-harvest stand	>75 if QMD >14" and 100 4"+ trees if QMD <14"	7	300 Point Count, Sprout 20%	Selection within 10-20 Years
	Commercial Thinning Site Class IV or V	≥ average stand diameter than pre-harvest stand	>50 if QMD >14" and 75 4"+ trees if QMD <14"	7	150 Point Count, Sprout 20%	Selection within 10-20 Years
R9	No Harvest	None	No Harvest	No Harvest	None	None
R3	Single Tree Selection (WLPZ)	None	130	20	150-300 Point Count, Sprout 20%	At Least 10 Years
R10	Single Tree Selection (NSO Nest Roost Habitat)	Retain 8 TPA 26" DBH or greater, ≥15" QMD	143	7	150-300 Point Count, Sprout 20%	At Least 10 Years
R11	Single Tree Selection (NSO High Quality Nest Roost Habitat)	Retain 8 TPA 26" DBH or greater, ≥15" QMD	203	7	150-300 Point Count, Sprout 20%	At Least 10 Years
R12	Single Tree Selection (NSO Foraging Habitat)	Retain 5 TPA 26" DBH or greater, ≥13" QMD	113	7	150-300 Point Count, Sprout 20%	At Least 10 Years
R2	Single Tree Selection (NSO Low Quality Foraging Habitat)	≥ 11" QMD	75	7	150-300 Point Count, Sprout 20%	At Least 10 Years

Growth and Yield Analysis:

The baseline growth and yield analysis was modeled using the FORSEE model utilizing the above described harvest strategy. Table 5a shows the results of the growth and yield analysis in terms of conifer yields, while table 5b shows the results in terms of tonnes of live carbon for all species. Table 6 shows the results in terms of average basal area per acre over the 100 year planning horizon.

Table 5a: Average per Acre Conifer Growth and Yield through the Planning Horizon (Scribner Board Feet per Acre)

Elapsed Time (years)	Beginning Inventory (board feet)	Average Decadal Growth (board feet)	Average Decadal Harvest (board feet)	Ending Inventory (board feet)
10	9,657	377	621	7,211
20	7,211	336	278	7,793
30	7,793	305	249	8,349
40	8,349	323	224	9,332
50	9,332	361	235	10,591
60	10,591	382	281	11,606
70	11,606	378	283	12,549
80	12,549	364	286	13,324
90	13,324	349	320	13,612
100	13,612	337	308	13,902

Table 5b: Average per Acre Total Live Carbon Growth and Yield through the Planning Horizon (Mg C per Acre)

Elapsed Time (year)	Beginning Inventory (Mg Carbon)	Average Decadal Growth (Mg Carbon)	Average Decadal Harvest (Mg Carbon)	Ending Inventory (Mg Carbon)
10	52.02	1.34	4.25	22.87
20	22.87	1.12	0.96	24.48
30	24.48	0.92	0.72	26.48
40	26.48	0.93	0.99	25.93
50	25.93	0.89	0.64	28.43
60	28.43	0.88	0.72	30.01
70	30.01	0.83	0.73	30.98
80	30.98	0.78	0.69	31.85
90	31.85	0.74	0.72	32.07
100	32.07	0.72	0.68	32.44

Table 6: Average Basal Area per Acre through the Planning Horizon

Elapsed Time (years)	0	10	20	30	40	50	60	70	80	90	100
Conifer	86	61	56	57	61	67	69	68	68	66	66
Hardwood	72	12	15	18	11	11	11	10	10	11	11
Total	157	73	71	75	72	78	80	79	78	77	77

Table 7a below presents the percentage of each silvicultural regime applied to the various timber stratum for the entire baseline modeling analysis. Table 7b presents the number of plots treated as group selection for each of the first eight decades of the baseline analysis period. Plots with CCTrtPrd 1 are group selected in the first 10 year period, then again in the ninth 10 year period.

Table 7a: Application of Silvicultural Regimes through the 100-year Planning Horizon

Stand	R1	R2	R9	R10	R11	R12	R3	Total
High Stocked DF	62.2%	9.7%	5.8%	12.3%	0.4%	6.9%	2.8%	100%
Low Stocked Hwd/DF	93.1%	0.0%	1.4%	0.0%	0.0%	0.0%	5.5%	100%
Low Stocked Mixed	70.7%	5.1%	1.6%	6.9%	0.7%	12.3%	2.8%	100%
Mod Stocked DF	83.8%	1.2%	3.2%	4.2%	0.3%	2.9%	4.4%	100%
Mod Stocked DF/PP	62.5%	10.4%	0.9%	2.2%	2.9%	19.4%	1.7%	100%

Table 7b: Distribution of Group Selection Silviculture through the 100-year Planning Horizon

Distribution of Group Selection by Decade

CCTrtPrd	Count	Percent
1	57	16.3%
2	50	14.3%
3	46	13.1%
4	40	11.4%
5	40	11.4%
6	38	10.9%
7	42	12.0%
8	37	10.6%
Grand Total	**350**	

Table 8 below shows the modeled standing live carbon stocks over the 100-year baseline analysis period, the projected standing dead carbon pool, and the resulting average baseline carbon stocks on a per acre basis. These figures are plotted in Figure 1 as well.

Baseline Carbon Stocks

The baseline modeling scenario defined in this document follows the guidelines presented in section 6.2 of the Compliance Offset Protocol U.S. Forest Projects, October 20, 2011.

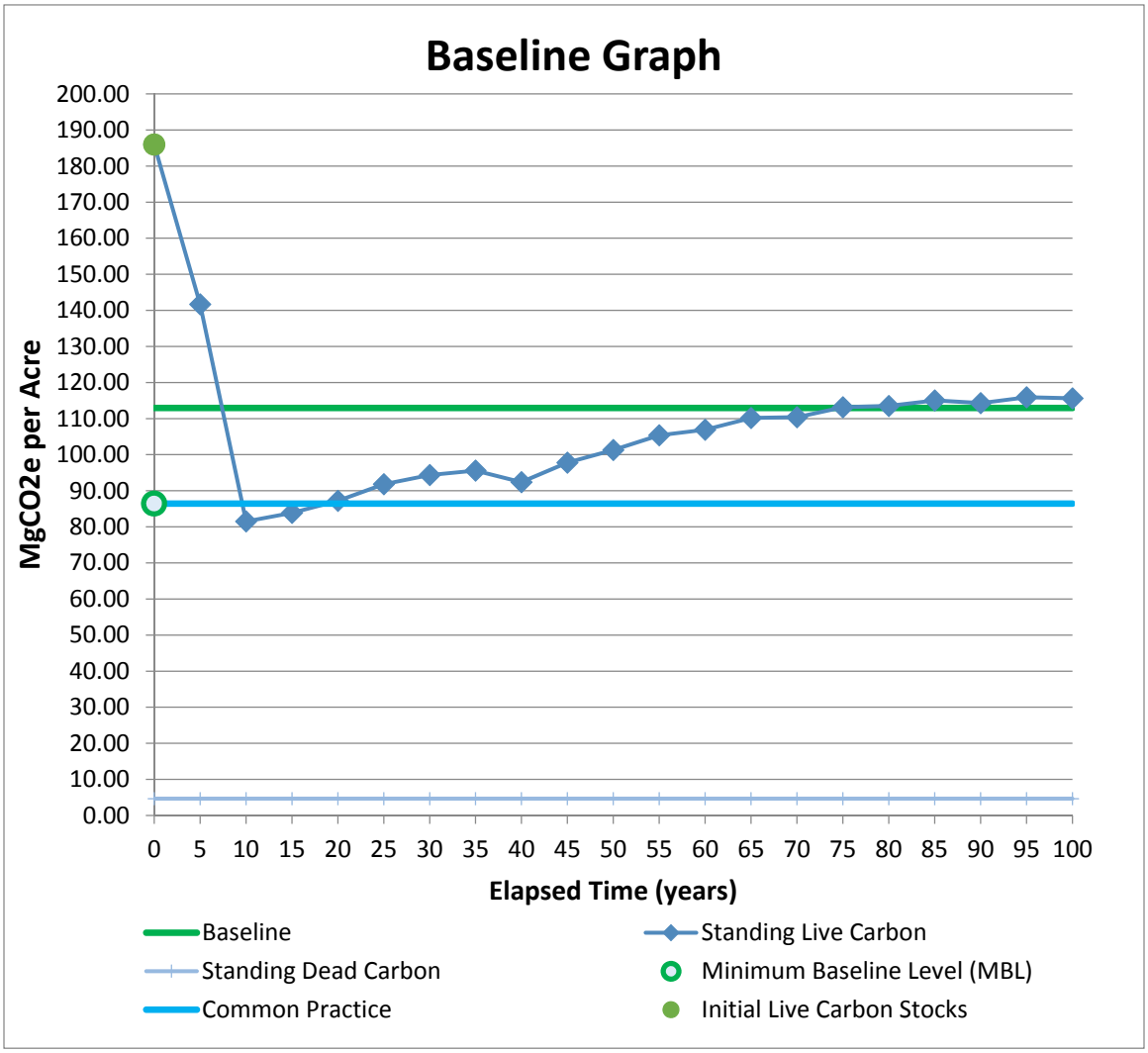
Key components of the calculated baseline are as follows:

1. Initial Project live carbon stocks are above Common Practice.
2. The Project is not subject to the High Stocking Reference calculation.
3. Initial live carbon stocks have been modeled subject to all legal and financial constraints for a 100-year period.
4. The average carbon stocks of the 100-year baseline growth and yield modeling scenario have been calculated.
5. The average stocks of standing dead carbon over the 100-year period have been calculated.
6. The average production of In-Use carbon, landfill carbon, and harvested carbon prior to delivery to a mill have been calculated from the 100-year baseline growth and yield scenario.

Table 8: Average Baseline Carbon Stocks per acre Generated by the Baseline Harvest Scenario (Mg CO2e per Acre).

Elapsed Time	Standing Live Carbon Pool IFM-1	Standing Live Above Ground	Standing Live Below Ground	Standing Dead Carbon Pool IFM-3	Baseline
0	185.94	149.26	36.68	4.66	112.93
5	141.67	113.48	28.19	4.66	112.93
10	81.50	64.40	17.10	4.66	112.93
15	83.86	66.50	17.37	4.66	112.93
20	87.23	69.19	18.04	4.66	112.93
25	91.80	72.99	18.81	4.66	112.93
30	94.34	75.10	19.24	4.66	112.93
35	95.61	76.20	19.41	4.66	112.93
40	92.40	73.61	18.80	4.66	112.93
45	97.79	77.98	19.81	4.66	112.93
50	101.29	80.82	20.47	4.66	112.93
55	105.37	84.15	21.22	4.66	112.93
60	106.92	85.42	21.50	4.66	112.93
65	110.14	88.07	22.07	4.66	112.93
70	110.40	88.29	22.10	4.66	112.93
75	113.16	90.56	22.61	4.66	112.93
80	113.49	90.82	22.66	4.66	112.93
85	115.03	92.13	22.91	4.66	112.93
90	114.27	91.53	22.74	4.66	112.93
95	115.93	92.90	23.03	4.66	112.93
100	115.58	92.63	22.96	4.66	112.93
Average	108.27	86.48	21.80	4.66	112.93

Figure 1: Baseline Carbon Stocks



Wood Products

The baseline growth and yield modeling produces a flow of wood products over the 100-year planning period. Table 9 below shows the average wood products generated over the 100-year period. Three average wood products numbers are presented: average wood products In-use, average wood products stored in landfills, and the average amount of carbon in standing live carbon stocks prior to delivery to a mill.

Table 9: Average Wood Products Carbon per acre Generated by the Baseline Harvest Scenario.

Woods Products	Mg C/ acre	Mg CO2e/acre	Total Mg CO2e
Average Annual Carbon 100-year In-Use	0.110	0.403	6,626.46
Average Annual Carbon 100-year Landfill	0.071	0.259	4,249.99
Average Annual Carbon in Harvested Trees Prior to Delivery to the Mill	0.644	2.361	38,812.64

ATTACHMENT L

BRUSHY MOUNTAIN CARBON PROJECT INVENTORY METHODOLGY (CONFIDENTIAL)

This document contains specifications for the collection of data in the field for the Brushy Mountain Inventory, as well as the data to be collected and the standards for data collection and processing. The Brushy Mountain Carbon Project includes approximately 16,300 acres of timberland characterized by Douglas-fir, Black Oak, Interior live oak, Ponderosa Pine, Pacific Madrone, and associated conifer and hardwood species. The Project Boundary includes the following GHG emission sources, GHG sinks, and GHG reservoirs (SSRs or Carbon Pools) as defined in table 5.2 of the Compliance Offset Protocol U.S. Forest Projects, October 20. 2011:

IFM-1 Standing live carbon (carbon in all portions of living trees)
IFM-3 Standing dead carbon (carbon in all portions of standing dead trees)
IFM-7 Carbon in in-use forest products
IFM-8 Forest product carbon in landfills
IFM-14 Biological emissions/removals from changes in harvesting on forestlands outside the Project Area
IFM-17 Biological emissions from decomposition of forest products

This Forest Carbon Inventory at its core consists of a systematic sampling of the timber stands found on the Brushy Mountain Forest. Sampling was conducted through the installation of sampling points on a square systematic plot grid 20 chains on a side utilizing a random starting location. A map of the sampling grid is attached. The standard procedures for collecting field measurements are detailed below and are generally aimed at the collection of tree data pertaining to the quantification of the IFM-1 and IFM-3 carbon pools. Carbon in carbon pools IFM7, IFM-8, IFM-14, and IFM-17 are calculated as described in the calculation methodologies section below.

Inventory Methodologies

A description of the inventory methodology for each of the carbon pools listed above is included in the initial OPDR under section VII (A) and is included herein by reference. The data collection procedures for IFM-1 and IFM-3 SSRs are described in detail in the attached Brushy Mountain Carbon Project Inventory Specification included as Appendix B.

Calculation Methodologies

A description of the calculation methodologies used to determine metric tons per acre of each of the carbon pools listed above is included in the initial OPDR under section VII (B) and is included herein by reference. Included are the analytic methods and biomass equation references used to translate field measurements into volume and biomass carbon estimates.

Data Management Systems and Data Processing

The inventory data gathered by this inventory methodology is entered into an Access database as described in the attached Brushy Mountain Ranch Inventory Plot Data Entry Procedures (Appendix C). Plot data within the database is extensively sorted and queried to look for data entry errors. This process results in a final data set for cruise processing. The Access database serves as the repository for inventory data and is accessed by the growth and yield model during growth and yield simulations and during future inventory updates.

The inventory database is utilized to process the inventory data through the growth and yield model FORSEE, and analyze the modeling outputs. The calculation of volume, biomass and the ultimate conversion to carbon utilizes the inventory data and growth and yield output data and applies the volume formulas and biomass conversion factors described in section VII (B) of the initial OPDR as referenced above.

Management of inventory data over the life of the Project will include archiving of retired inventory data as the data exceeds the maximum plot life requirements prescribed by the Protocol. Archived inventory data will also include a copy of each inventory database used to develop those carbon stock estimates reported in each OPDR submitted for the Project. This series of archived inventory database files will serve as the repository of inventory data as it existed for each reporting period.

Stratification Methodology

The Brushy Mountain Project Area was stratified based on species composition and relative stocking. The Project Area is dominated by Douglas-fir with varying levels of hardwood species, and other conifer species with Ponderosa pine being the most prevalent other conifer. Stratification was performed post sampling utilizing aerial photos with GIS system polygon overlays. Vegetation strata were verified utilizing historic and current field verification. Boundaries were established utilizing GIS overlays with sample stratification based on plot location within identified vegetation strata polygons. The strata boundaries were digitized into the Brushy Mountain Geographical Information System utilizing orthophoto imagery as a guide. A map of the timber stand boundaries and inventory plot locations is included as Appendix D.

The stratification resulted in the following project acreages:

Table 1: Strata and Plot Summary

Stratum	Acres	Plots
High Stocked DF	4,183.53	98
Mod Stocked DF/PP	1,952.85	36
Mod Stocked DF	6,387.52	134
Low Stocked Mixed	1,598.08	32
Low Stocked Hwd/DF	2,290.86	50
Total	16,412.83	350

The total acreage of each timber stratum was summed and input into the _Stands table in FORSEE for each timber stratum.

Quality Assurance/Quality Control (QA/QC)

Procedures for ensuring quality control are explained in the attached Brushy Mountain Carbon Project Inventory Specifications document under the "Check Cruising" heading. Procedures in verifying the integrity of inventory data are described above.

Inventory Monitoring

Updating the Inventory

As timber management activities take place on the Brushy Mountain Project Area or disturbance such as fire or mortality resulting from pathogens or other factors occurs, cruise plots installed in 2014 will be relocated and remeasured within areas that have been harvested, treated for hardwood reduction, or subject to disturbance. By 2026, all of the plots installed in 2014 will have been remeasured regardless of whether or not the plot had been harvested, treated for hardwood reduction, or subject to disturbance. On this basis, Brushy Mountain will maintain a forest inventory system that will meet the inventory specifications and requirements contained in Appendix A of the Compliance Offset Protocol U.S. Forest Projects, with plots which are no more than 12 years old.

Updating the Project's carbon stocks from the end of the last reporting period to the end of the current reporting period will involve the following steps:

1. Any newly installed inventory plots will be incorporated into the inventory estimate. Newly installed plots will be grown forward to the end of the reporting period utilizing FORSEE as described in the modeling plan.
2. Existing inventory plots that are less than 12 years old will be updated using FORSEE as described in the modeling plan. This update process will involve adjusting the plot data one year forward either by using FORSEE's "Inventory Update" tool, or through the application of average annual increment based on diameter and height increment predicted by FORSEE over the next-five year period.
3. Plots older than 12-years will be replaced in the database by new plot data collected at the same plot location. Retired plot data will be archived as described in the Data Management Systems section above.
4. Updating the forest inventory for harvests or disturbances will involve either the installation of new plots, or adjustments to previous plot data.
    a. If new inventory plots are installed, they will be installed at randomly selected plot locations taken from a 5x5 chain grid tied to the initial 20x20 chain inventory plot grid within the harvested or disturbed portion of the Project Area. The number of randomly selected plots will be determined based on the size of the area harvested or disturbed, and estimated carbon stock variability within the harvested or disturbed area.

i. Existing inventory plot data within the harvested or disturbed area will be removed from the inventory database.
ii. Harvested or disturbed areas will be stratified based on the current inventory stratification, or may be placed into a new stratum representing the harvested or disturbed area.

b. At the discretion of the OPO, inventory updates may involve adjustments to existing plot data (depletions) that will involve the following steps:
   i. The carbon in harvested wood products delivered to the mill will be calculated using the "Harvested Wood Products Worksheet" provided by CAR, and included as Appendix E herein.
   ii. Using the ratio of harvested wood carbon to harvested tree carbon calculated in Table 8 of the CAR worksheet. The carbon in harvested wood products will be multiplied by this ratio to determine the total amount of carbon subject to harvest. This carbon will be subtracted from the carbon stock estimate derived through the inventory stock estimate generated by updating the existing inventory data as described above.

5. Disturbances related to fire, insect or disease, and unauthorized harvest will be monitored through annual inspections of the Project Area by the OPO. Portions of the Project Area affected by fire, insect or disease, or unauthorized harvest will be mapped and reported in the OPDR. If the mapped disturbed portion of the Project Area is less than 5 acres in cumulative size, no adjustment to the carbon stock inventory will be performed. For mapped disturbances between 5 and 40 acres of cumulative size, a depletion of the inventory based on the average stocking and acreage of each stratum disturbed will be calculated, or at the discretion of the OPO, new inventory plots may be installed following the procedures described in step 4(a) above. For mapped disturbances larger than 40 acres in cumulative size, new inventory plots will be installed following the procedures described in step 4(a) above.
6. The field collection of updated inventory data following harvest, hardwood reduction or disturbance will be conducted prior to the next field verification, and at a minimum within 36 months of the harvest or disturbance.
7. A revised inventory confidence deduction will be calculated following the update process in years when a field verification will be conducted, otherwise the last verified inventory confidence deduction shall be applied.

Appendices:

A. Inventory Change Log
B. Brushy Mountain Carbon Project Inventory Specification
C. Brushy Mountain Ranch Inventory Plot Data Entry Procedures
D. Plot and Strata Map
E. CAR Harvested Wood Products Worksheet

Appendix A

Brushy Mountain Carbon Project Inventory Change Log

Date of Change	Note (changes made)
7/6/2015	Updated wood density for Unknown Hardwood to 31.82.
7/6/2015	Corrected error in carbon stock calculation where equation 20 was used for California Buckeye bark biomass estimates.
7/6/2015	Revised the SMALL_TARIF adjustment code for conifer species using equations 3, 5, 16, 18, 19, 20, and 23.

Appendix B

Brushy Mountain Carbon Project
Inventory Specification

Brushy Mountain Carbon Project
Inventory Specification

The cruise shall include the CFL Brushy Mountain Tract and Summer Camp Ranch for a total of approximately 16,000 acres. The emphasis of the cruise is to develop timber stand and stock tables at the ownership level, calculate live carbon and standing dead carbon pools, and allow for growth and yield projections to be performed.

The cruise is based on a systematic sample of the ownership, and will include post-cruising stratification. The cruise design will install approximately 400-440 plots on a square systematic plot grid 20 chains on a side.

Plot Documentation and Location: Cruiser will be supplied with maps that show the locations of the plots and plot numbers, air photo maps, and an electronic list of coordinates for plot centers (UTM).

It is the cruiser's responsibility to accurately locate plots within the accuracy tolerances specified (one chain). Plots will be located via a systematic list of GPS coordinates as supplied by CFL and if necessary, due to lack of adequate GPS satellite reception, take-off points established by CFL, and field measurement (hip chain, or electronic device). Handheld GPS equipment will be used to establish plot centers. As needed, plot take-off points will be monumented with black and red striped flagging hung with glo-orange, and a metal tag listing the plot number, and the distance and direction to the plot. The timber cruiser will navigate from the closest and easiest access point to the plot in question using the handheld GPS units. As needed and where it is not possible or practical to establish a road take-off point for a given plot, the plot shall be located based on the last plot cruised on the cruise line.

When navigating to a given plot with the handheld GPS unit, the cruiser will set a "proximity" alarm on the GPS unit. The first time that the GPS unit triggers the proximity alarm, the cruiser shall stop and note the best achievable distance and direction to the plot as indicated by the GPS unit. The cruiser shall then measure the distance to the plot center using a hand compass and steel tape, hip chain or electronic device.

Plots shall be measured where they fall on the systematic grid regardless of roads, watercourses, or unmapped non-timbered areas. The cruise will be based on all acres within the timbered strata including roads and small non-timbered areas. Where plots are located adjacent to mapped non-timber areas, cruise plot locations should be relocated such that the plot is entirely within the timbered type. The plot center shall be moved in the cardinal direction most close to perpendicular to the type boundary.

Plot centers will be documented with a gutter spike (provided by CFL) and flagging (tied to the spike) with the plot number written in rain proof ink. A second long vinyl flag (at

least 24" in length) with the plot number, date, and cruiser initials written in rain proof ink shall be hung on trees stems or branches over, or nearly over the plot center. The plot number shall be painted on the nearest tree to plot center of sufficient size with orange spray paint. Flagging to establish plot center shall be glow lime green and provided by CFL. A GPS coordinate of the actual plot center shall be recorded.

At each plot center, two plot reference trees will be established for the purpose of relocating the plot center. A reference tree tag shall be placed on each reference tree within 1' of the ground line on the face of the tree which is facing plot center. The plot number shall be scribed on each reference tree tag. Species, azimuth and slope distance from the reference tree to the plot center shall be recorded with the plot data. Reference trees shall be at least 3.5" in diameter and should be located as close as possible at right angles to plot center. A ring shall be painted around the circumference of the reference trees at DBH to identify these trees and the plot in the future. Paint color shall be glo-orange.

Plot Card Format: Paper field data forms will follow the format of the attached sample cruise card (to be provided by CFL on Rite-In-The-Rain paper). Cruiser shall fill out all appropriate information on cruise cards while in the field; including plot number, date, cruiser initials. All cruise cards produced within any day shall be completed and "proofed" by the cruiser the same day. Cruiser will be responsible for providing copies of the field data cards to CFL within 1 day of cruising, and providing the cruise data in a digital format within 30 days of cruise completion.

Sampling Method: All plots will be circular fixed plots; plot radius distances will be horizontal distances.

The cruise will consist of three nested circular plots:

1. $1/5^{th}$ acre (52.7') – Conifers and hardwoods 10.6" DBH and larger.
2. $1/50^{th}$ acre (16.7') – Conifers and hardwoods 3.6" DBH to 10.5" DBH.
3. $1/100^{th}$ acre (11.8') – Conifers and hardwoods 1.0" DBH to 3.5" DBH.

Data to be collected:

1. Tree number shall be recorded clockwise from north and painted on the tree above DBH with orange paint (only paint tree numbers on trees in two largest plots as trees smaller than 3.6" DBH are difficult to paint). Record all the trees in the largest plot first then the middle plot and finally the smallest plot. Species Code
2. DBH to the nearest $1/10^{th}$ inch (paint a horizontal line at DBH location on the uphill side of the tree)..
3. Live crown ratio (LCR) to the nearest 10%
4. Visible defect will be recorded by log position for all conifers which contain at least one 16.5' x 6" dib log

5. Total height to the nearest foot
6. Merchantable Height – Number of Logs (measured to a 6" DIB top). (WTS Note: Log heights start at the top of the stump height. [Merch. Ht. data can be noted for each tree on the cruise card.] To be consistent and help check cruisers, logs should be identified within a range per log height, please see table below):

Log Ht.	Height (ft.)	Min (ft.)	Max (ft.)
Log 1	16.5	16	24
Log 2	33.0	25	41
Log 3	49.5	42	57
Log 4	66.0	58	74
Log 5	82.5	75	90
Log 6	99.0	91	107
Log 7	115.5	108	123
Log 8	132.0	124	140
Log 9	148.5	141	156
Log 10	165.0	157	173
Log 11	181.5	174	189
Log 12	198.0	190	206

7. Status Code
8. Conifer and hardwood snag trees if they are at least 5" DBH and 15.0' in height prior to rounding. Above 15' height will be recorded to the nearest foot (height to the break, if snag is broken), including decay class.
9. Missing volume by 1/3rd segment of the tree as described below.

Blank Plots

If there are no trees located on any of nested plots, the plot is considered a Blank Plot. Blank Plots are noted on the plot card by including "XX" in the Species column.

Species Codes:

DF	Douglas-fir	TO	Tanoak
SP	Sugar pine	PM	Madrone
PP	Ponderosa pine	BO	Black oak
WF	White fir	WO	Oregon white oak
IC	Incense cedar	LO	Interior live oak
WH	Western hemlock	CLO	Coast live oak
CX	Other conifer	BM	Bigleaf maple
NM	California nutmeg	CL	California laurel
GP	Gray pine	RA	Red alder
SS	Seargent cypress	CB	California buckeye
XX	Blank Plot	GC	Golden chinkapin
		HX	Other hardwood*

*Include the species of each "Other hardwood" in the note field.

Diameter at Breast Height:

Measure DBH at 4.5 feet above ground on the uphill side of tree perpendicular to angle of the tree. On leaning or pistol butt trees, measure 4.5 feet along the stem, not vertical distance. For trees where there is no good ground level to measure from, figure where a faller would cut the tree, and measure DBH 3.5 feet above that stump height.

Diameter is recorded to the nearest 0.1". If the diameter reading is not exactly on a tenth, record the DBH to the next lower one-tenth inch. Paint a horizontal line at the DBH location on the uphill side of the tree.

Live Crown Ratio:

Estimate live crown ratio, in percent, on all trees on the plot. Visually estimate the percentage of the total length of the tree bole that is covered by live crown, to the nearest 10 percent. In trees with uneven crown length, average the two most different sides of the tree.

Visible Defect:

Estimate defect for all merchantable conifer trees by 16-foot log segment. A merchantable conifer tree is any tree that will make at least one 16.5' x 6" dib log.

Missing Volume:

Record missing gross volume for each 1/3rd portion of the tree, bottom, middle, and top. For trees with broken tops, estimate the total height including the missing top section before estimating the height of each 1/3rd segment of the tree. If the broken top is the only missing portion of the tree, record nothing for missing volume as the cruise compiler will estimate the missing portions based on a regressed total tree height. Record missing volume to the nearest 10 percent by segment for any tree with missing volume. If any portion of the tree is missing, record the missing volume for each 1/3rd segment of the tree. For example if 20% of the bottom 1/3rd, and 100% of the middle 1/3rd is missing, record 20-100-0 for the tree.

Total Height:

Total height to the nearest foot will be measured for all trees on each plot (Measure total height from the ground (uphill side of the tree) to the highest point on top of the tree (highest branch) unless it is broken then measure to the break in the stem, unless a new leader has developed then measure to the height of the new leader).
Trees with broken tops will have the condition of the top noted in the Status Code column (broken [BT], broken and recovered [RL], dead [DT]). Height to the nearest foot will be recorded for each tree that has a broken top.

Status Codes:

BT	Broken top
FT	Forked top
RL	Recovered leader
DT	Dead top
SN	Snag

Snag Decay Class:

Each snag recorded on a given plot shall have its decay class recorded. These decay classes are generally described as follows:

Class 0	Tree has recently died with leaves intact.
Class 1	Leaves mostly still attached, intact bark, fine twigs, and branches.
Class 2	Leaves mostly gone, fine branches mostly gone, bark loose and starting to fall off.
Class 3	A few large branches or stubs remain, bark falling off in large patches, softwood sloughing is evident.
Class 4	Highly decomposed, no branches, little bark, broken off top.
Class 5	Mostly decomposed, no branches, very little bark, broken off close to the ground.

Check Cruising: A minimum of five percent of plots will be check cruised. Each plot check cruised will receive either a pass or fail grade. The basis for pass or fail will be individual plot measurements for a given plot as compared to the check cruiser. Plot data shall be proofed daily and provided to CFL for check cruising within 3 days of cruising. CFL will randomly select plots to be checked as plot data is received from cruiser. All check cruise reports should be provided to cruiser in a timely manner and no later than 3 days from receipt of plot data from cruiser.

The following tolerances will be used to determine if a cruiser passes or fails the quality control check on any one plot:

Measurement	Tolerance, + / - of check measurement
Tree count on 1/5th , and 1/50th acre plot only including snags	None.
Species	None.
Total height	±10% or 10' whichever is less, on each tree.
DBH 1/5th acre plot	±0.3" for trees less than 24" DBH ±0.5" for conifer trees and ±1" for hardwood trees 24" DBH or greater
DBH 1/50th and 1/100th acre plots	±0.3" for all trees
Live crown ratio	20%.
Plot location	Within one chain of mapped location
Tree count on 1/100th – acre plot	±20% within each species class

The cruiser's work will be considered acceptable if the following is met:

1. The cruise design was followed.
2. The plot card is correctly filled out
3. A minimum score of 86% is achieved using the Check Cruise Worksheet (the worksheet generates a score by evaluating all data on a plot and considers data that misses the cruise tolerances)

If 2 or more plots measured by the same cruiser on the same day fail the check cruising criteria, then in addition to the failed plots, all plots measured on the day of measurement of the last failed plot by the same cruiser will have to be remeasured in their entirety.

Remarks:

Record descriptive information for a particular tree, notes about measurements, or other observations.

Special Circumstances:

DBH: Trees with irregularities at DBH shall be measured just above the irregularity. For trees with a fork near DBH, the tree shall be treated as two trees if the fork occurs below DBH, and as a single tree if the fork occurs above DBH. If it is not possible to measure DBH on forked trees due to an irregularity associated with the fork, it can be estimated by the cruiser and noted in the remarks section that the tree (use the tree "line number on the cruise card," to identify the tree) was estimated. Estimation should be based on a "straight tape" measurement of DBH by projecting a normalized bole at the point of DBH measurement, and reading the estimated DBH from a tape measure or Spencers's tape held tangent to the bole of the tree at the point of DBH measurement.

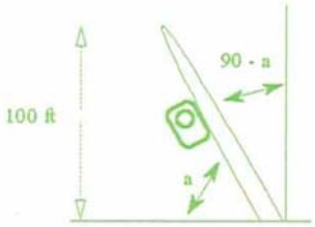
For independent trees that have grown together, and that are fused at or above DBH, treat them as separate trees and use the "half-DBH" method to estimate DBH. Take a half tree diameter by estimating two point opposite each other on the stem at the DBH point. Measure the distance between the two marks and double the measurement to determine DBH. Either paint the location of the two marks, or set an aluminum nail at each point. Make a note that the DBH was measured using the "half-DBH" method.

As the plots are fixed area plots, trees are considered on the plot if the center of the tree at ground level is within the fixed plot radius. The reference for determining if a tree is off or on the plot is the point where the tree meets the ground. Trees leaning away from plot center are on the plot in question if the center of the base of the tree, and not the tree's DBH is within the plot radius.

Leaning Trees: Total height on slightly leaning trees (less than 15 degrees) shall be measured perpendicular to the lean of the tree. Severely leaning trees (15 degrees or more) shall be measured perpendicular to the lean with the vertical distance from the ground to the tip of the tree, and the angle of the tree lean to the nearest 5 degrees recorded in the "Remarks" column. Measure the lean from the base of the tree to the center of the crown of the leaning tree. The cruiser may additionally estimate the trees height using the heights of similar diameter trees that are standing upright. Severely leaning tree heights are not subject to penalties by check cruisers.

A) Slope Correction Factor Method:

1. Measure vertical height to tree tip from a point perpendicular to tree lean.
2. Measure angle of tree lean, reading from the side of clinometer (in Degrees).
3. Subtract the degree reading from 90 °
4. Find slope correction factor for step 3 angle.
5. Multiply vertical height by slope correction factor.



EXAMPLE:

Vertical height = 100 ft. Clinometer reading = 61° (a = 61)
90° - 61° = 29° Slope Correction Factor for 29°= 1.14
Corrected height = 100 * 1.14 = **114 ft**

Measurement Tools:

Tree heights shall be measured using laser hypsometers, DBH shall be measured with steel diameter tapes, plot diameters shall be determined utilizing steel tapes while correcting for slope. Slope shall be determined with a Relaskop or clinometer.

Appendix C

Brushy Mountain Ranch Inventory
Plot Data Entry Procedures

Brushy Mountain Ranch Inventory
Plot Data Entry Procedures

The following data entry procedures indicate the steps taken for the current Project inventory, as well as the steps that will be taken as additional inventory data is collected across the Project Area.

1. Cruise cards are ordered as they are received from the cruisers. A page number is added to the lower left corner of each card. A copy of the cards with this page number is made and used for the basis of data entry. Data entry cards are stored in a binder with a copy of the completed data entry form.
2. Open the "Select Plot to View" form in the "Brushy_Carbon_2014.mdb" Access database found at L:\CFL\Brushy Mountain\Inventory.
3. Type the plot number ("Plot" on the field card) in the StandId field and hit the enter key to move through the other data in the plot header.
4. Irregularities in the header data should be noted in the Data Entry Note field.
5. To begin entering the tree data, click in the upper left most cell in the TREE DATA portion of the form and type the Tree No.s from 1 to the total number of trees on the plot in the Tree# column. Then enter the remaining data by column from left to right. It is more efficient to enter data by moving up and down the columns, rather than across columns for each tree.
6. Snags are recorded with "SN" in the status column followed by the decay class. SN1 is a snag with decay class 1. Record SN in the Status column, and 1 in the DC (Decay Class) column. Record zero for LCR for all snags.
7. Enter Log Ht and defect by log position data as recorded on the field card. This data is not used for the carbon inventory, but must be entered properly. WTS cruisers include a line through log position columns if the data is the same as the cell to the left of the line. Record the value in the cell to the left of the line for all columns through which the line passes up to the recorded log Ht.
8. Leaning trees have the lean in degrees recorded in the Remarks column. Enter the lean from the Remarks column to the nearest 5 degrees in the Lean column.
9. Missing volume is recorded in the Remarks column on the field card, and in the B1/3, M1/3, and T1/3 columns in the database. Missing volume is recorded to the nearest 10 percent by segment for any tree with missing volume. If any portion of the tree is missing, the missing volume for each 1/3rd segment of the tree is recorded. For example if 20% of the bottom 1/3rd, and 100% of the middle 1/3rd is missing, 20-100-0

is recorded for the tree. The B1/3, M1/3, and T1/3 columns default to zero, separate the recorded data into the respective columns.

10. Record all of the data in the Remarks column of the card into the Note column in the form, even if the data is recorded elsewhere on the form with the exception of 0-0-0 data included for trees without missing volume.
11. If there is a problem reading the data for a tree, or if the data entered differs from the data on the cruise card, describe the issue in the Entry Note column for the tree in question.
12. When data entry is complete, the person entering the card shall write the word "Entered", the date entered, and their initials in the upper right corner of the card in the box where the word "Remarks" is found.

Data Review

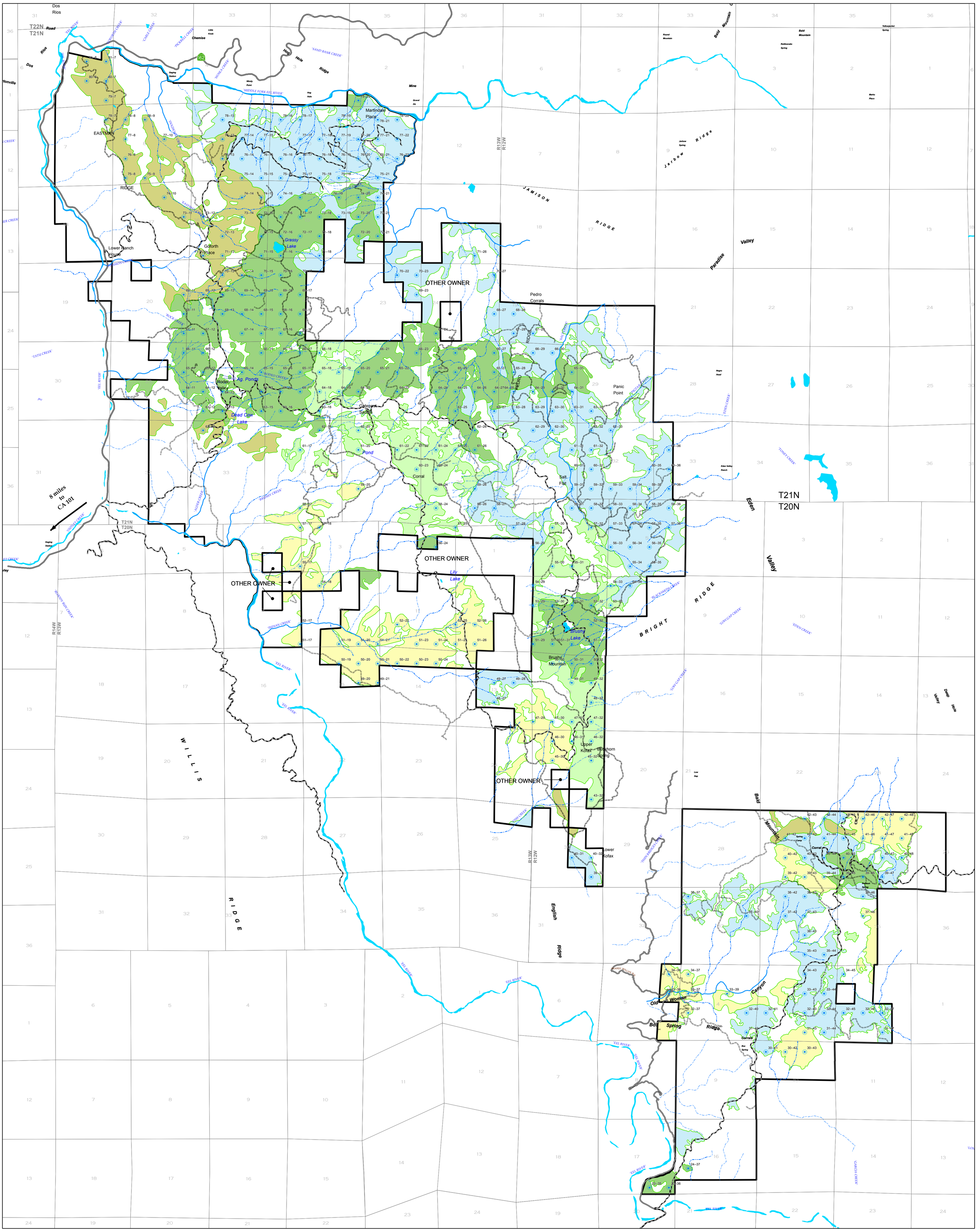
1. Data review begins with a visual review of the plot card and the data entered. Check that data is entered in the appropriate column, and in the appropriate order.
2. Save a PDF of the completed plot card with the StandId as the file name into the following directory on the server:
   L:\CFL\Brushy Mountain\Inventory\Plotcards\Final_Plot_Cards
3. Print a hard copy of the PDF and place it in the Data Entry binder opposite the field card.
4. Review the printed card against the field card. Make any corrections, then reprint the completed card.

Appendix D

Plot and Strata Map

Brushy Mountain Project Inventory Plot and Strata Map

May 27, 2015
Version 2.0D



Property Boundary
Project Area
Inventory Plot

Strata

High Stocked DF
Mod Stocked DF
Mod Stocked DF/PP
Low Stocked Mixed
Low Stocked Hwd/DF

Roads

Public
Mainline
Seasonal

NCRM Inc.

0 0.5 1 2 Miles

N
W E
S

ATTACHMENT M

Volume estimation for the PNW-FIA Integrated Database

Cubic and board foot volumes (in Scribner and International 1/4" log rules) are calculated for softwood and hardwood trees measured on forest land. A variety of volumes are estimated including gross and net volume of the merchantable stem, gross and net volume of both the sawlog portion and the upper stem portion of the bole, gross total stem volume of the entire bole from gound to tip, current annual growth volume, and annual mortality volume. These volumes are calculated on different sized trees (in terms of diameter at breast height (DBH), depending on the specific type of volume.

All total stem volumes are calculated on all trees in the inventory that are larger than seedlings (>= 1" (2.5cm) DBH).

All other volumes (gross and net growing stock and sawtimber volumes) are calculated on the merchantable stem, originally for the purpose of providing timber information. This is the most common volume most users will see in published reports. Gross volume is generally the first output from volume equations and has not been adjusted for the presence of cull (rot and defect). Net volume is gross volume minus an estimate of volume lost due to rot, physical defect, and/or other damage.

Cubic volume is referred to as growing-stock volume, which is the volume of a tree, from a 1-foot stump to a 4" top, calculated on all trees >= 5" (12.5cm) DBH.
Board foot volume is referred to as sawtimber volume; for softwoods it is the volume of a tree from a 1-foot stump to a 6" top, calculated for softwood species >= 9" (22.5cm) DBH; and for hardwoods, it is the volume of a tree from a 1-foot stump to an 8" top, calculated for hardwood species >= 11" (27.5cm) DBH.

Note, that the sawlog and upper stem volumes are the cubic volume of sawtimber-sized trees, not to be confused with sawtimber (boardfoot) volume.

The log length for the log rule used in sawtimber (board-foot) calculations differs by species group and location, as follows:

On the west side of Oregon and Washington--
Scribner volume uses a 32-foot log rule for softwoods, and
a 16-foot log rule for hardwoods;
International 1/4" volume uses a 16-foot log rule for softwoods, and
an 8-foot log rule for hardwoods.

On the east side of Oregon and Washington, and all of California--
Scribner volume uses a 16-foot log rule for softwoods, and
a 16-foot log rule for hardwoods;
International 1/4" volume uses a 16-foot log rule for softwoods, and
an 8-foot log rule for hardwoods.

Board foot equations estimate volume of the fractional log up to the specified top diameter. The fractional log is the last log of the tree, which is less than the log rule specification.

The following volume names are used throughout the equations and are defined below:

CUBIC VOLUME (in cubic feet)

Type of Volume	Calculated on trees with a DBH of:	Volume name in equations
All softwoods and hardwoods:		
Volume of the total stem, ground to tip	>= 1” (2.5cm)	CVTS
Volume from a 1-foot stump to the tip	>= 1” (2.5cm)	CVT
Volume from a 1-foot stump to a 4-inch top	>= 5” (12.5cm)	CV4
Softwood sawlog volume:		
Volume from a 1-foot stump to a 6-inch top	>= 9” (22.5cm)	CV6
Hardwood sawlog volume:		
Volume from a 1-foot stump to an 8-inch top	>= 11” (27.5cm)	CV8

BOARD FOOT VOLUME (square feet)

Type of Volume	Calculated on trees with a DBH of:	Volume name in equations
Softwoods:		
Scribner volume, 16-foot log rule, 1-foot stump to a 6-inch top (Eastern OR; Eastern WA; CA)	>= 9” (22.5cm)	SV616
Scribner volume, 32-foot log rule, 1-foot stump to a 6-inch top (Western OR; Western WA)	>= 9” (22.5cm)	SV632
International 1/4" volume, 16-foot log rule, 1-foot stump to a 6-inch top (all states)	>= 9” (22.5cm)	XINT6
Hardwoods:		
Scribner volume, 16-foot log rule 1-foot stump to an 8-inch top (all states)	>=11” (27.5cm)	SV816
International 1/4" volume, 8-foot log rule, 1-foot stump to an 8-inch top (all states)	>= 11” (27.5cm)	XINT8

PROCEDURES

The general procedure used to calculate volume is as follows:

a.) estimate cubic volume first to produce CVTS, CVT, CV4, and the TARIF number;
b.) estimate RATIO's from equations that use DBH and TARIF as inputs;
c.) use the RATIO's to convert cubic volume to Scribner and International 1/4" board-foot volumes;
d.) use the RATIO's to convert the Scribner 16-foot log rule to the Scribner 32-foot log rule.

There are three methods to calculate cubic volume, depending on the equation. Each method produces an estimate for CVTS, CVT, CV4, and TARIF. In cases where volume equations do not exist for a given species, a suitable equation has been chosen and assigned to each species.

After cubic volume is calculated, all species use the same set of equations to develop the RATIO's needed to produce the remaining volumes.

CUBIC VOLUME Method 1: The TARIF number is based on CVTS.
Softwood Eqns. 1,2,4,6-15,17,21,22,24
Hardwood Eqns. 1-7

1. Calculate CVTS from published or documented volume equations for the species.
2. Calculate the TARIF number from CVTS, using the equation in DNR note #27.
3. Calculate CV4 from the TARIF number and tree basal area.
4. Calculate CVT from the TARIF number and DBH.

CUBIC VOLUME Method 2: The TARIF number is based on CV4.
Softwood Eqns. 3,5,16,18-20,23

5. Calculate CV4 directly from published equations, using DBH and height.
6. Calculate the TARIF number from CV4 and tree basal area.
7. If the tree >= 6" DBH then Calculate CVTS from CV4.
8. If the tree < 6" DBH then adjust the TARIF before calculating CVTS.
9. Calculate CVT from the TARIF number and DBH.

CUBIC VOLUME Method 3: The TARIF number is based on CV8.
Hardwood Eqns. 8-20

10. Calculate CVTS, CV4, and CV8 directly from published equations;
11. Calculate TARIF from CV8.
12. Calculate CVT from CV8.

For all trees:

13. CALCULATE CONVERSION RATIOS: After CVTS and CV4 have been estimated, use equations to calculate the ratios. These ratios are used to convert cubic to board foot volume, and 16 to 32-foot log rules as follows:

RATIO	Used to convert:
RC6	CV4 to CV6
RC8	CV4 to CV8 (if needed)
RS616	CV6 to SV616
RS816	SV616 to SV816
RS632	SV616 to SV632
RI6	CV6 to XINT6
RI8	XINT6 to XINT8

SOFTWOOD CUBIC VOLUME EQUATIONS
Volume equation numbers

Species Code	Species	Halfstate				
		WOR	WWA	EOR	EWA	CA
11	Pacific silver fir	11	11	10	10	--
14	Bristlecone fir	--	--	--	--	18
15	White fir	23	--	10	--	23
17	Grand fir	11	11	10	10	23
19	Subalpine fir	11	11	10	10	18
20	California red fir	--	--	--	--	18
21	Shasta red fir	18	18	18	18	18
22	Noble fir	11	11	10	10	18
41	Port-Orford-cedar	19	19	19	19	8
42	Alaska-cedar	9	9	8	8	8
50	Cypress	--	--	--	--	19
51	Arizona cypress	--	--	--	--	19
56	Mcnabb cypress	--	--	--	--	19
62	California juniper	--	--	--	--	21
64	Western juniper	21	21	21	21	21
65	Utah juniper	--	--	--	--	21
72	Subalpine larch	--	22	--	22	--
73	Western larch	--	22	22	22	--
81	Incense cedar	19	19	19	19	19
92	Brewer spruce	13	--	13	--	12
93	Engelmann spruce	13	13	12	12	12
98	Sitka spruce	13	13	--	--	12
101	Whitebark pine	15	15	15	15	20
102	Bristlecone pine	--	--	--	--	16
103	Knobcone pine	15	--	15	--	16
104	Foxtail pine	--	--	--	--	16
108	Lodgepole pine	15	15	15	15	16
109	Coulter pine	--	--	--	--	5
113	Limber pine	15	--	15	--	16
116	Jeffrey pine	5	--	4	--	5
117	Sugar pine	20	20	20	20	20
119	Western white pine	15	15	15	15	20
120	Bishop pine	--	--	--	--	16
122	Ponderosa pine	5	4*	4*	4*	5
124	Monterey pine	--	--	--	--	16
127	Gray pine	--	--	--	--	5
130	Scotch pine	17	17	17	17	17
133	Singleleaf pinyon	--	--	--	--	21
137	Washoe pine	--	--	--	--	5
201	Bigcone Douglas-fir	--	--	--	--	3
202	Douglas-fir	1	1	2	2	3
211	Redwood	24	--	--	--	24
212	Giant Sequoia	24	--	--	--	24
231	Pacific yew	9	9	8	8	8
242	Western redcedar	9	9	8	8	8
251	California nutmeg	--	--	--	--	8
263	Western hemlock	6	6	6	6	6
264	Mountain hemlock	17	17	17	17	17
298	Unknown Conifer	17	17	17	17	17

* Equation 5 was used for all trees < 5” dbh, in all states

There are 24 equations used to estimate softwood cubic-foot volume. Each equation below has been crosswalked to a particular tree species in the table above. A brief reference for each equation is listed below—the full citation is at the end of this document.
Click on an equation number to view the actual equation and procedure used to estimate volume.

EQUATION 1 DOUGLAS-FIR	(WEYERHAUSER-DNR RPT#24,1977)
EQUATION 2 DOUGLAS-FIR	(DNR MEMO--SUMMERFIELD,11/7/80)
EQUATION 3 DOUGLAS-FIR	(USDA-FS RES NOTE PNW-266)
EQUATION 4 PONDEROSA PINE	(DNR MEMO--SUMMERFIELD,11/7/80)
EQUATION 5 PONDEROSA PINE	(USDA-FS RES NOTE PNW-266)
EQUATION 5 PONDEROSA PINE	Used for all trees <5” dbh, in all states
EQUATION 6 W.HEMLOCK	(DNR NOTE 27,4/79)
EQUATION 7 W.HEMLOCK	(BROWN (1962) BC FOREST SERV,P33)
EQUATION 8 REDCEDAR	(REDCEDAR INTERIOR--DNR RPT#24,1977)
EQUATION 9 REDCEDAR	(REDCEDAR COAST--DNR RPT#24,1977)
EQUATION10 TRUE FIRS	(INTERIOR BALSAM--DNR RPT#24,1977)
EQUATION11 TRUE FIRS	(COAST BALSAM--DNR RPT#24,1977)
EQUATION12 SPRUCE	(SITKA SPRUCE INTERIOR--DNR RPT#24,1977)
EQUATION13 SPRUCE	(SITKA SPRUCE MATURE--DNR RPT#24,1977)
EQUATION15 LODGEPOLE PINE	(LODGEPOLE PINE--DNR RPT#24,1977)
EQUATION16 LODGEPOLE PINE	(USDA-FS RES NOTE PNW-266)
EQUATION17 MTN.HEMLOCK	(BELL, OSU RES.BULL 35)
EQUATION18 SHASTA RED FIR	(USDA-FS RES NOTE PNW-266)
EQUATION19 INCENSE CEDAR	(USDA-FS RES NOTE PNW-266)
EQUATION20 SUGAR PINE	(USDA-FS RES NOTE PNW-266)
EQUATION21 W.JUNIPER	(CHITTESTER,1984)
EQUATION22 W.LARCH	(LARCH--DNR RPT#24,1977)
EQUATION23 WHITE FIR	(USDA-FS RES NOTE PNW-266)
EQUATION24 REDWOOD	(Krumland, B.E. and L.E. Wensel. 1975.)

Softwood cubic volume equations

Equation 1

$$\mathbf{CVTSL} = -3.21809 + 0.04948 \times \log(HT) \times \log(DBH) - 0.15664 \times (\log(DBH))^2 + 2.02132 \times \log(DBH) + 1.63408 \times \log(HT) - 0.16185 \times (\log(HT))^2 \quad (1)$$

CVTS=10**CVTSL (2)

$$\mathbf{TARIF} = \frac{(CVTS \times 0.912733)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)} \quad (3)$$

$$\mathbf{CV4} = \frac{TARIF \times (BA - 0.087266)}{0.912733} \quad (4)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 2

$$\mathbf{CVTSL} = -6.110493 + 1.81306 \times ln(DBH) + 1.083884 \times ln(HT) \quad (1)$$

$$\mathbf{CVTS} = exp(CVTSL) \quad (2)$$

$$\mathbf{TARIF} = \frac{(CVTS \times 0.912733)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)} \quad (3)$$

$$\mathbf{CV4} = \frac{TARIF \times (BA - 0.087266)}{0.912733} \quad (4)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 3

TMP_DBH = *DBH*

If DBH < 6.0 **inches then TMP_DBH** = **6.0 inches and BA** = $6^2 \times 0.005454154$

$$\textbf{CF4} = 0.248569 + 0.0253524 \times \frac{HT}{TMP\_DBH} - 0.0000560175 \times \left(\frac{HT^2}{TMP\_DBH} \right) \quad (1)$$

IF CF4 < 0.3 THEN CF4 = 0.3
IF CF4 > 0.4 THEN CF4 = 0.4

$$\textbf{CV4} = 0.005454154 \times TMP\_DBH^2 \times HT \times CF4 \quad (2)$$

$$\textbf{TARIF} = \frac{CV4 \times 0.912733}{BA - 0.087266} \quad (3)$$

IF TMP_DBH > 6.0 THEN

$$\textbf{CVTS} = CV4 \times \frac{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right)}{\left(BA - 0.087266 \right)} \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5} \right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right)}{0.912733} \quad (5)$$

IF TMP_DBH = 6.0 THEN

$$\textbf{SMALL\_TARIF} = 0.5 \times \left(6.0 - DBH \right)^2 + \left(1.0 + 0.063 \times \left(6.0 - DBH \right)^2 \times TARIF \right) \quad (3)$$

IF SMALL_TARIF <= 0.0 THEN SMALL_TARIF = 0.01

$$\textbf{CVTS} = SMALL\_TARIF \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right) \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5} \right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 4

$$\mathbf{CVTSL} = -8.521558 + 1.977243 \times \ln(DBH) - 0.105288 \times (\ln(HT))^2 + \frac{136.0489}{HT} + 1.99546 \times \ln(HT) \quad (1)$$

$$\mathbf{CVTS} = exp(CVTSL) \quad (2)$$

$$\mathbf{TARIF} = \frac{(CVTS \times 0.912733)}{((1.033 \times (1.0 + 1.382937 \times exp(-4.015292 \times DBH))) \times (BA + 0.087266) - 0.174533)} \quad (3)$$

$$\mathbf{CV4} = \frac{TARIF \times (BA - 0.087266)}{0.912733} \quad (4)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 5

TMP_DBH = *DBH*

If DBH < 6.0 **inches then TMP_DBH** = **6.0 inches and BA** = $6^2 \times 0.005454154$

$$\textbf{CF4} = 0.402060 - 0.899914 \times \left(\frac{1}{TMP\_DBH} \right) \quad (1)$$

IF CF4 < 0.3 THEN CF4 = 0.3
IF CF4 > 0.4 THEN CF4 = 0.4

$$\textbf{CV4} = 0.005454154 \times TMP\_DBH^2 \times HT \times CF4 \quad (2)$$

$$\textbf{TARIF} = \frac{CV4 \times 0.912733}{BA - 0.087266} \quad (3)$$

IF TMP_DBH > 6.0 THEN

$$\textbf{CVTS} = CV4 \times \frac{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right)}{\left(BA - 0.087266 \right)} \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5} \right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right)}{0.912733} \quad (5)$$

IF TMP_DBH = 6.0 THEN

$$\textbf{SMALL\_TARIF} = 0.5 \times \left(6.0 - DBH \right)^2 + \left(1.0 + 0.063 \times \left(6.0 - DBH \right)^2 \times TARIF \right) \quad (3)$$

IF SMALL_TARIF <= 0.0 THEN SMALL_TARIF = 0.01

$$\textbf{CVTS} = SMALL\_TARIF \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right) \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5} \right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 6

$$\mathrm{CVTSL} = -2.72170 + 2.00857 \times \log\left(DBH\right) + 1.08620 \times \log\left(HT\right) - 0.00568 \times \left(DBH\right) \quad (1)$$

CVTS=10**CVTSL

(2)

$$\mathbf{TARIF} = \frac{\left(CVTS \times 0.912733\right)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)} \quad (3)$$

$$\mathbf{CV4} = \frac{TARIF \times \left(BA - 0.087266\right)}{0.912733} \quad (4)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 7

$$\mathbf{CVTSL} = -2.663834 + 1.79023 \times log(DBH) + 1.124873 \times log(HT) \quad (1)$$

CVTS=10**CVTSL

(2)

$$\mathbf{TARIF} = \frac{(CVTS \times 0.912733)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)} \quad (3)$$

$$\mathbf{CV4} = \frac{TARIF \times (BA - 0.087266)}{0.912733} \quad (4)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 8

$$\mathrm{CVTSL} = -2.464614 + 1.701993 \times \log\left(DBH\right) + 1.067038 \times \log\left(HT\right) \quad (1)$$

CVTS=10**CVTSL

(2)

$$\mathbf{TARIF} = \frac{\left(CVTS \times 0.912733\right)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)} \quad (3)$$

$$\mathbf{CV4} = \frac{TARIF \times \left(BA - 0.087266\right)}{0.912733} \quad (4)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 9

$$\mathbf{CVTSL} = -2.379642 + 1.682300 \times log(DBH) + 1.039712 \times log(HT) \quad (1)$$

(2)

CVTS=10**CVTSL

$$\mathbf{TARIF} = \frac{(CVTS \times 0.912733)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)} \quad (3)$$

$$\mathbf{CV4} = \frac{TARIF \times (BA - 0.087266)}{0.912733} \quad (4)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 10

$$\mathbf{CVTSL} = -2.502332 + 1.864963 \times log(DBH) + 1.004903 \times log(HT) \quad (1)$$

CVTS=10**CVTSL

(2)

$$\mathbf{TARIF} = \frac{(CVTS \times 0.912733)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)} \quad (3)$$

$$\mathbf{CV4} = \frac{TARIF \times (BA - 0.087266)}{0.912733} \quad (4)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 11

$$\mathbf{CVTSL} = -2.575642 + 1.806775 \times log(DBH) + 1.094665 \times log(HT) \quad (1)$$

CVTS=10**CVTSL

(2)

$$\mathbf{TARIF} = \frac{(CVTS \times 0.912733)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)} \quad (3)$$

$$\mathbf{CV4} = \frac{TARIF \times (BA - 0.087266)}{0.912733} \quad (4)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 12

$$\text{CVTSL} = -2.539944 + 1.841226 \times \log(DBH) + 1.034051 \times \log(HT) \quad (1)$$

CVTS=10**CVTSL

$$\textbf{TARIF} = \frac{(CVTS \times 0.912733)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)} \quad (3)$$

$$\textbf{CV4} = \frac{TARIF \times (BA - 0.087266)}{0.912733} \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 13

$$\mathbf{CVTSL} = -2.700574 + 1.754171 \times log(DBH) + 1.164531 \times log(HT) \quad (1)$$

CVTS=10**CVTSL

(2)

$$\mathbf{TARIF} = \frac{(CVTS \times 0.912733)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)} \quad (3)$$

$$\mathbf{CV4} = \frac{TARIF \times (BA - 0.087266)}{0.912733} \quad (4)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 14

NOT USED

Equation 15

$$\mathbf{CVTSL} = -2.615591 + 1.847504 \times log(DBH) + 1.085772 \times log(HT) \quad (1)$$

CVTS=10**CVTSL

$$\mathbf{TARIF} = \frac{(CVTS \times 0.912733)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)} \quad (3)$$

$$\mathbf{CV4} = \frac{TARIF \times (BA - 0.087266)}{0.912733} \quad (4)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 16

TMP_DBH = *DBH*

If DBH < 6.0 **inches then TMP_DBH** = **6.0 inches and BA** = $6^2 \times 0.005454154$

$$\textbf{CF4} = 0.422709 - 0.0000612236 \times \left(\frac{HT^2}{TMP\_DBH} \right) \quad (1)$$

IF CF4 < 0.3 THEN CF4 = 0.3
IF CF4 > 0.4 THEN CF4 = 0.4

$$\textbf{CV4} = 0.005454154 \times TMP\_DBH^2 \times HT \times CF4 \quad (2)$$

$$\textbf{TARIF} = \frac{CV4 \times 0.912733}{BA - 0.087266} \quad (3)$$

IF TMP_DBH > 6.0 THEN

$$\textbf{CVTS} = CV4 \times \frac{\left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right) \right)}{\left(BA - 0.087266 \right)} \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5} \right) \times \left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right) \right)}{0.912733} \quad (5)$$

IF TMP_DBH = 6.0 THEN

$$\textbf{SMALL\_TARIF} = 0.5 \times \left(6.0 - DBH \right)^2 + \left(1.0 + 0.063 \times \left(6.0 - DBH \right)^2 \times TARIF \right) \quad (3)$$

IF SMALL_TARIF <= 0.0 THEN SMALL_TARIF = 0.01

$$\textbf{CVTS} = SMALL\_TARIF \times \left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right) \right) \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5} \right) \times \left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right) \right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 17

$$\mathbf{CVTS} = 0.001106485 \times (DBH)^{1.8140497} \times (HT)^{1.2744923} \tag{1}$$

$$\mathbf{TARIF} = \frac{(CVTS \times 0.912733)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)} \tag{2}$$

$$\mathbf{CV4} = \frac{TARIF \times (BA - 0.087266)}{0.912733} \tag{3}$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \tag{5}$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 18

TMP_DBH = *DBH*

If DBH < 6.0 **inches then TMP_DBH** = **6.0 inches and BA** = $6^2 \times 0.005454154$

$$\textbf{CF4} = 0.231237 + 0.028176 \times \left(\frac{HT}{TMP\_DBH} \right) \quad (1)$$

IF CF4 < 0.3 THEN CF4 = 0.3
IF CF4 > 0.4 THEN CF4 = 0.4

$$\textbf{CV4} = 0.005454154 \times TMP\_DBH^2 \times HT \times CF4 \quad (2)$$

$$\textbf{TARIF} = \frac{CV4 \times 0.912733}{BA - 0.087266} \quad (3)$$

IF TMP_DBH > 6.0 THEN

$$\textbf{CVTS} = CV4 \times \frac{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times (BA + 0.087266) - 0.174533 \right)}{(BA - 0.087266)} \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5} \right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times (BA + 0.087266) - 0.174533 \right)}{0.912733} \quad (5)$$

IF TMP_DBH = 6.0 THEN

$$\textbf{SMALL\_TARIF} = 0.5 \times (6.0 - DBH)^2 + \left(1.0 + 0.063 \times (6.0 - DBH)^2 \times TARIF \right) \quad (3)$$

IF SMALL_TARIF <= 0.0 THEN SMALL_TARIF = 0.01

$$\textbf{CVTS} = SMALL\_TARIF \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times \exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right) \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5} \right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times (BA + 0.087266) - 0.174533 \right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 19

TMP_DBH = *DBH*

If DBH < 6.0 **inches then TMP_DBH** = **6.0 inches and BA** = $6^2 \times 0.005454154$

$$\textbf{CF4} = 0.225786 + 4.44236 \times \left(\frac{1}{HT}\right) \quad (1)$$

IF CF4 < 0.27 THEN CF4 = 0.27

$$\textbf{CV4} = 0.005454154 \times TMP\_DBH^2 \times HT \times CF4 \quad (2)$$

$$\textbf{TARIF} = \frac{CV4 \times 0.912733}{BA - 0.087266} \quad (3)$$

IF TMP_DBH > 6.0 THEN

$$\textbf{CVTS} = CV4 \times \frac{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{(BA - 0.087266)} \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

IF TMP_DBH = 6.0 THEN

$$\textbf{SMALL\_TARIF} = 0.5 \times (6.0 - DBH)^2 + \left(1.0 + 0.063 \times (6.0 - DBH)^2 \times TARIF\right) \quad (3)$$

IF SMALL_TARIF <= 0.0 THEN SMALL_TARIF = 0.01

$$\textbf{CVTS} = SMALL\_TARIF \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right) \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP
DBH = DIAMETER BREAST HEIGHT IN CENTIMETERS
HT = HEIGHT IN METERS

Equation 20

TMP_DBH = *DBH*

If DBH < 6.0 **inches then TMP_DBH** = **6.0 inches and BA** = $6^2 \times 0.005454154$

$$\textbf{CF4} = 0.358550 - 0.488134 \times \left(\frac{1}{TMP\_DBH} \right) \quad (1)$$

IF CF4 < 0.3 THEN CF4 = 0.3
IF CF4 > 0.4 THEN CF4 = 0.4

$$\textbf{CV4} = 0.005454154 \times TMP\_DBH^2 \times HT \times CF4 \quad (2)$$

$$\textbf{TARIF} = \frac{CV4 \times 0.912733}{BA - 0.087266} \quad (3)$$

IF TMP_DBH > 6.0 THEN

$$\textbf{CVTS} = CV4 \times \frac{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times (BA + 0.087266) - 0.174533 \right)}{(BA - 0.087266)} \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5} \right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times (BA + 0.087266) - 0.174533 \right)}{0.912733} \quad (5)$$

IF TMP_DBH = 6.0 THEN

$$\textbf{SMALL\_TARIF} = 0.5 \times (6.0 - DBH)^2 + \left(1.0 + 0.063 \times (6.0 - DBH)^2 \times TARIF \right) \quad (3)$$

IF SMALL_TARIF <= 0.0 THEN SMALL_TARIF = 0.01

$$\textbf{CVTS} = SMALL\_TARIF \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times (BA + 0.087266) - 0.174533 \right) \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5} \right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times (BA + 0.087266) - 0.174533 \right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 21

$$\mathbf{CVTS} = 0.005454154 \times \left[0.30708901 + 0.00086157622 \times HT - 0.0037255243 \times DBH \times \frac{HT}{HT - 4.5} \right] \times DBH^2 \times HT \times \left(\frac{HT}{HT - 4.5} \right)^2 \quad (1)$$

$$\mathbf{TARIF} = \frac{\left(CVTS \times 0.912733 \right)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right)} \quad (2)$$

$$\mathbf{CV4} = \frac{\left(CVTS + 3.48 \right)}{\left(1.18052 + 0.32736 \times exp\left(-0.1 \times DBH \right) \right)} - 2.948 \quad (3)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5} \right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0} \right) \right) \right) \right) \times \left(BA + 0.087266 \right) - 0.174533 \right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.005454154 \times DBH^2$
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 22

$$\mathbf{CVTSL} = -2.624325 + 1.847123 \times log(DBH) + 1.044007 \times log(HT) \quad (1)$$

$$\mathbf{CVTS} = 10.0^{CVTSL} \quad (2)$$

$$\mathbf{TARIF} = \frac{(CVTS \times 0.912733)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)} \quad (3)$$

$$\mathbf{CV4} = \frac{TARIF \times (BA - 0.087266)}{0.912733} \quad (4)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.05454154 \times DBH^2$
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 23

TMP_DBH = *DBH*

If DBH < 6.0 **inches then TMP_DBH** = **6.0 inches and BA** = $6^2 \times 0.005454154$

$$\textbf{CF4} = 0.299039 + 1.91272 \times \left(\frac{1}{HT}\right) + 0.0000367217 \times \frac{\left(HT^2\right)}{TMP\_DBH} \quad (1)$$

IF CF4 < 0.3 THEN CF4 = 0.3
IF CF4 > 0.4 THEN CF4 = 0.4

$$\textbf{CV4} = 0.005454154 \times TMP\_DBH^2 \times HT \times CF4 \quad (2)$$

$$\textbf{TARIF} = \frac{CV4 \times 0.912733}{BA - 0.087266} \quad (3)$$

IF TMP_DBH > 6.0 THEN

$$\textbf{CVTS} = CV4 \times \frac{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{(BA - 0.087266)} \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

IF TMP_DBH = 6.0 THEN

$$\textbf{SMALL\_TARIF} = 0.5 \times (6.0 - DBH)^2 + \left(1.0 + 0.063 \times (6.0 - DBH)^2 \times TARIF\right) \quad (3)$$

IF SMALL_TARIF <= 0.0 THEN SMALL_TARIF = 0.01

$$\textbf{CVTS} = SMALL\_TARIF \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right) \quad (4)$$

$$\textbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \quad (5)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.05454154 \times DBH^2$
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

Equation 24

$$\mathbf{CVTS} = exp\left(-6.2597 + 1.9967 \times ln\left(DBH\right) + 0.9642 \times ln\left(HT\right)\right) \quad (1)$$

$$\mathbf{TARIF} = \frac{\left(CVTS \times 0.912733\right)}{\left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)\right)} \quad (2)$$

$$\mathbf{CV4} = \frac{\left(CVTS + 3.48\right)}{\left(1.18052 + 0.32736 \times exp\left(-0.1 \times DBH\right)\right)} - 2.948 \quad (3)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)\right)}{0.912733} \quad (4)$$

WHERE:

DBH (inches) = DBH (CM) CONVERTED TO INCHES (DBH/2.54)
HT (feet) = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA/ACRE (DBH IN INCHES) $BA = 0.05454154 \times DBH^2$
CVTS = CUBIC FOOT VOLUME, INCLUDING TOP AND STUMP
TARIF = TARIF NUMBER EQUATION (REF. DNR NOTE NO.27, P.2)
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME ABOVE STUMP, 4-INCH TOP

SOFTWOOD BOARDFOOT VOLUME EQUATIONS

$$\textbf{RC6} = 0.993\text{-}\left(0.993 \times 0.62^{(DBH-6.0)}\right)$$

$$\textbf{CV6} = RC6 \times CV4$$

IF CV6 > CV4 THEN CV6 =CV4

$$\textbf{CUBUS} = CV4 - CV6$$

$$\textbf{B4} = \frac{TARIF}{0.912733}$$

$$\textbf{RS616L} = 0.174439 + 0.117594 \times log(DBH) \times log(B4) - \frac{8.210585}{DBH^2} + 0.236693 \times log(B4) - 0.00001345 \times (B4)^2 - 0.00001937 \times DBH^2$$

$$\textbf{RS616} = 10.0^{RS616L}$$

$$\textbf{RS632} = 1.001491 - \frac{6.924097}{TARIF} + 0.00001351 \times DBH^2$$

$$\textbf{SV616} = RS616 \times CV6$$

$$\textbf{SV632} = RS632 \times SV616$$

$$\textbf{SCRIB} = SV632$$

note: West-side Scribner conifer volumes are based on 32 foot logs, for areas other than western Oregon and western Washington SCRIB = sv616

$$\textbf{RI6} = -2.904154 + 3.466328 \times log(DBH \times TARIF) - 0.02765985 \times DBH - 0.00008205 \times TARIF^2 + \frac{11.29598}{DBH^2}$$

$$\textbf{XINT6} = RI6 \times CV6$$

Where:

B4 = BINGO FACTOR
CUBUS = CUBIC FOOT VOLUME, UPPER-STEM PORTION
RC6 = RATIO TO CONVERT CUBIC 4-INCH TOP TO CUBIC 6-INCH TOP
CV6 = CUBIC FOOT VOLUME, 6-INCH TOP (SAWLOG)
RS616 = RATIO TO CONVERT CUBIC 6-INCH TOP TO SCRIB 6-INCH TOP IN 16-FT LOGS
RS632 = RATIO TO CONVERT SCRIB 6-INCH TOP IN 16-FT LOGS TO SCRIB 6-INCH TOP IN 32-FT LOGS (WEST-SIDE ONLY)
SV632 = SCRIBNER VOLUME--6-INCH TOP (IN 32-FT LOGS) (WEST-SIDE ONLY)
SV616 = SCRIBNER VOLUME--6-INCH TOP (IN 16-FT LOGS)
RI6 = RATIO TO CONVERT CUBIC 6-INCH TOP TO INTERNATIONAL ¼ INCH 6-INCH TOP
XINT6 =INTERNATIONAL ¼ INCH VOLUME--6-INCH TOP (IN 16-FT LOGS)

SOFTWOOD VOLUME EQUATION SOURCES

Brackett, Michael. 1977. Notes on TARIF tree-volume computation. DNR report #24. State of Washington, Department of Natural Resources, Olympia, WA. 132p. (see Weyerhaeuser Eqn. #4, page 6)

Summerfield, Edward. 1980. In-house memo describing equations for Douglas-fir and ponderosa pine. State of Washington, Department of Natural Resources. On file with the PNW Research Station.

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Chambers, Charles and Bruce Foltz. 1979. The TARIF system--revisions and additions. DNR Note #27. State of Washington, Department of Natural Resources. (see page 2)

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Chittester, Judith and Colin MacLean. 1984. Cubic-foot tree-volume equations and tables for western juniper. Research Note, PNW_420. Pacific Northwest Forest and Range Experiment Station. Portland, Oregon. 8p. (see page 4)

Krumland, B.E. and L.E. Wensel. 1975. Preliminary young growth volume tables for coastal California conifers. Research Note #1. In-house memo. Co-op Redwood Yield Research Project. Department of Forestry and Conservation, College of Natural Resources, U of Cal, Berkeley. On file with the PNW Research Station. (see Table 1, page 4)

HARDWOOD CUBIC VOLUME EQUATIONS

Species Code	Species	Halfstate				
		WOR	WWA	EOR	EWA	CA
312	Bigleaf maple	37	26	37	26	37
313	Boxelder	--	--	--	--	38
321	Rocky Mountain maple	--	--	--	--	--
322	Bigtooth maple	--	--	--	--	--
330	California buckeye	--	--	--	--	43
341	Tree of heaven	--	--	--	--	26
351	Red alder	26	25	26	25	26
352	White alder	26	--	26	--	26
361	Pacific madrone	40	26	40	26	40
374	Water birch	--	--	--	--	26
375	Paper birch	--	--	--	--	--
376	Western paper birch	--	26	--	26	--
431	Golden chinkapin	32	26	--	26	32
475	Curlleaf mountain-mahogany	--	--	45	--	45
492	Pacific dogwood	--	26	--	26	26
500	Hawthorn	--	--	--	--	--
510	Eucalyptus	26	--	--	--	31
542	Oregon ash	38	26	38	26	38
590	Holly	26	26	26	26	26
600	Walnut	26	26	26	--	38
631	Tanoak	34	--	--	--	34
660	Apple	26	26	26	26	42
730	California sycamore	26	26	26	26	42
740	Cottonwood and poplar	--	--	--	--	--
741	Balsam poplar	--	--	--	--	--
742	Eastern cottonwood	--	--	--	--	--
745	Plains cottonwood	--	--	--	--	--
746	Quaking aspen	26	26	26	26	28
747	Black cottonwood	26	26	26	26	27
748	Fremont poplar	--	--	--	--	27
755	Mesquite	--	--	--	--	--
760	Cherry	26	26	26	26	26
800	Oak-deciduous	--	--	--	--	43
801	California live oak	--	--	--	--	43
805	Canyon live oak	42	--	--	--	42
807	Blue oak	--	--	--	--	39
810	Emory oak	--	--	--	--	--
811	Englemann oak	--	--	--	--	36
815	Oregon white oak	41	26	41	26	41
818	California black oak	41	--	41	26	41
821	California white oak	--	--	--	--	35
839	Interior live oak	--	--	--	--	44
901	Black locust	--	--	--	--	41
920	Willow	26	26	26	26	40
981	California-laurel	33	--	--	--	33
998	Unknown hardwood	26	26	26	26	41
999	Unknown Tree	26	26	26	26	41

HARDWOOD VOLUME EQUATION SOURCE

EQUATION 25	ALDER	(CURTIS/BRUCE, PNW-56)
EQUATION 26	ALDER	(BC-ALDER--DNR RPT#24,1977)
EQUATION 27	COTTONWOOD	(BC-COTTONWOOD--DNR RPT#24,1977)
EQUATION 28	ASPEN	(BC-ASPEN--DNR RPT#24,1977)
EQUATION 29	BIRCH	(BC-BIRCH--DNR RPT#24,1977)
EQUATION 30	BIGLEAF MAPLE	(BC-MAPLE--DNR RPT#24,1977)
EQUATION 31	EUCALYPTUS	(MEMO,COLIN D. MacLEAN 1/27/83,(REVISED 2/7/83))
EQUATION 32	G.CHINQUAPIN	(PILLSBURY (H,D), CHARLES BOLSINGER 1/3/83)
EQUATION 33	C.LAUREL	(PILLSBURY (H,D), CHARLES BOLSINGER 1/3/83)
EQUATION34	TANOAK	(PILLSBURY (H,D), CHARLES BOLSINGER 1/3/83)
EQUATION35	CALIF WHITE OAK	(PILLSBURY (H,D), CHARLES BOLSINGER 1/3/83)
EQUATION36	ENGELMANN OAK	(PILLSBURY (H,D), CHARLES BOLSINGER 1/3/83)
EQUATION37	BIGLEAF MAPLE	(PILLSBURY (H,D,FC), CHARLES BOLSINGER 1/3/83)
EQUATION38	CALIF BLACK OAK	(PILLSBURY (H,D,FC), CHARLES BOLSINGER 1/3/83)
EQUATION39	BLUE OAK	(PILLSBURY (H,D,FC), CHARLES BOLSINGER 1/3/83)
EQUATION40	PACIFIC MADRONE	(PILLSBURY (H,D,FC), CHARLES BOLSINGER 1/3/83)
EQUATION41	ORE WHITE OAK	(PILLSBURY (H,D,FC), CHARLES BOLSINGER 1/3/83)
EQUATION42	CANYON LIVE OAK	(PILLSBURY (H,D,FC), CHARLES BOLSINGER 1/3/83)
EQUATION43	COAST LIVE OAK	(PILLSBURY (H,D,FC), CHARLES BOLSINGER 1/3/83)
EQUATION44	INT LIVE OAK	(PILLSBURY (H,D,FC), CHARLES BOLSINGER 1/3/83)
EQUATION45	MTN. MAHOGANY	(Chojnacky, 1985)

HARDWOOD CUBIC VOLUME EQUATIONS

EQUATION 25

$$\mathbf{F} = 0.3651 \times Z^{2.5} - 7.9032 \times Z^{2.5} \frac{DBH}{1000.0} + 3.295 \times Z^{2.5} \times \frac{HT}{1000.0}$$
$$- 1.9856 \times Z^{2.5} \times HT \times \frac{DBH}{100000.0} - 2.9668 \times Z^{2.5} \times \frac{HT^2}{1000000.0}$$
$$+ 1.5092 \times Z^{2.5} \times \frac{HT^{0.5}}{1000.0} + 4.9395 \times Z^4 \times \frac{DBH}{1000.0}$$
$$- 2.05937 \times Z^4 \times \frac{HT}{1000.0} + 1.5042 \times Z^{33} \times HT \times \frac{DBH}{1000000.0}$$
$$- 1.1433 \times Z^{33} \times \frac{HT^{0.5}}{10000.0} + 1.809 \times Z^{41} \times \frac{HT^2}{10000000.0} \quad (1)$$

Where: $$Z = \frac{\left(HT - 0.5 - \frac{DBH}{24.0}\right)}{HT - 4.5}$$

$$\mathbf{CVT} = 0.00545415 \times \left(DBH\right)^2 \times \left(HT - 4.5\right) \times F \quad (2)$$

$$\text{TARIF} = \frac{\left(CVT \times 0.912733\right)}{\left(\left(0.9679 - 0.1051 \times 0.5523^{\left(DBH - 1.5\right)}\right) \times \left(\left(\left(1.0330 \times \left(1.0 + 1.382937 \times \exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)\right)} \quad (3)$$

$$\mathbf{CVTS} = TARIF \times \frac{\left(\left(\left(1.0330 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)\right)}{0.912733} \quad (4)$$

$$\mathbf{CV4} = \frac{TARIF \times \left(BA - 0.087266\right)}{0.912733} \quad (5)$$

$$\mathbf{RC8} = 0.983\text{-}\left(0.983 \times 0.65^{\left(DBH - 8.6\right)}\right)$$

$$\mathbf{CV8} = RC8 \times CV4 \quad (6)$$

$$\mathbf{CV4X} = CV4$$

WHERE:
DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
CVTS = CUBIC FOOT VOLUME, TOTAL STEM, WITH TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 26

$$\mathbf{CVTSL} = -2.672775 + 1.920617 \times log(DBH) + 1.074024 \times log(HT) \quad (1)$$

CVTS=10**CVTSL

(2)

$$\mathbf{TARIF} = \frac{\left(CVTS \times 0.912733\right)}{\left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)\right)} \quad (3)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)\right)}{0.912733} \quad (4)$$

$$\mathbf{CV4} = \frac{TARIF \times \left(BA - 0.087266\right)}{0.912733} \quad (5)$$

$$\mathbf{RC8} = 0.983\text{-}\left(0.983 \times 0.65^{(DBH - 8.6)}\right)$$

$$\mathbf{CV8} = RC8 \times CV4 \quad (6)$$

$$\mathbf{CV4X} = CV4$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, TOTAL STEM, WITH TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 27

$$\mathbf{CVTSL} = -2.945047 + 1.803973 \times log(DBH) + 1.238853 \times log(HT) \quad (1)$$

CVTS=10**CVTSL

(2)

$$\mathbf{TARIF} = \frac{\left(CVTS \times 0.912733\right)}{\left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)\right)} \quad (3)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)\right)}{0.912733} \quad (4)$$

$$\mathbf{CV4} = \frac{TARIF \times \left(BA - 0.087266\right)}{0.912733} \quad (5)$$

$$\mathbf{RC8} = 0.983\text{-}\left(0.983 \times 0.65^{(DBH - 8.6)}\right)$$

$$\mathbf{CV8} = RC8 \times CV4 \quad (6)$$

$$\mathbf{CV4X} = CV4$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, TOTAL STEM, WITH TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 28

$$\mathbf{CVTSL} = -2.635360 + 1.946034 \times log(DBH) + 1.024793 \times log(HT) \quad (1)$$

CVTS=10**CVTSL

(2)

$$\mathbf{TARIF} = \frac{\left(CVTS \times 0.912733\right)}{\left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)\right)} \quad (3)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH\,-\,1.5}\right) \times \left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)\right)}{0.912733} \quad (4)$$

$$\mathbf{CV4} = \frac{TARIF \times \left(BA - 0.087266\right)}{0.912733} \quad (5)$$

$$\mathbf{RC8} = 0.983\text{-}\left(0.983 \times 0.65^{(DBH-8.6)}\right)$$

$$\mathbf{CV8} = RC8 \times CV4 \quad (6)$$

$$\mathbf{CV4X} = CV4$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, TOTAL STEM, WITH TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 29

$$\mathbf{CVTSL} = -2.757813 + 1.911681 \times log(DBH) + 1.105403 \times log(HT) \quad (1)$$

CVTS=10**CVTSL

(2)

$$\mathbf{TARIF} = \frac{\left(CVTS \times 0.912733\right)}{\left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)\right)} \quad (3)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)\right)}{0.912733} \quad (4)$$

$$\mathbf{CV4} = \frac{TARIF \times \left(BA - 0.087266\right)}{0.912733} \quad (5)$$

$$\mathbf{RC8} = 0.983\text{-}\left(0.983 \times 0.65^{(DBH - 8.6)}\right)$$

$$\mathbf{CV8} = RC8 \times CV4 \quad (6)$$

$$\mathbf{CV4X} = CV4$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, TOTAL STEM, WITH TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 30

$$\mathbf{CVTSL} = -2.770324 + 1.885813 \times log(DBH) + 1.119043 \times log(HT) \quad (1)$$

CVTS=10**CVTSL

(2)

$$\mathbf{TARIF} = \frac{\left(CVTS \times 0.912733\right)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)} \quad (3)$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times \left(BA + 0.087266\right) - 0.174533\right)}{0.912733} \quad (4)$$

$$\mathbf{CV4} = \frac{TARIF \times \left(BA - 0.087266\right)}{0.912733} \quad (5)$$

$$\mathbf{RC8} = 0.983\text{-}\left(0.983 \times 0.65^{(DBH - 8.6)}\right)$$

$$\mathbf{CV8} = RC8 \times CV4 \quad (6)$$

$$\mathbf{CV4X} = CV4$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
CVTSL = LOG BASE 10, CUBIC FOOT VOLUME, TOP AND STUMP
CVTS = CUBIC FOOT VOLUME, TOTAL STEM, WITH TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 31

$$\mathbf{CVTS} = 0.0016144 \times DBH^2 \times HT \tag{1}$$

$$\mathbf{TARIF} = \frac{(CVTS \times 0.912733)}{\left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)} \tag{2}$$

$$\mathbf{CVT} = \frac{TARIF \times \left(0.9679 - 0.1051 \times 0.5523^{DBH - 1.5}\right) \times \left(\left(1.033 \times \left(1.0 + 1.382937 \times exp\left(-4.015292 \times \left(\frac{DBH}{10.0}\right)\right)\right)\right) \times (BA + 0.087266) - 0.174533\right)}{0.912733} \tag{3}$$

$$\mathbf{CV4} = \frac{TARIF \times \left(BA - 0.087266\right)}{0.912733} \tag{4}$$

$$\mathbf{RC8} = 0.983\text{-}\left(0.983 \times 0.65^{(DBH - 8.6)}\right)$$

$$\mathbf{CV8} = RC8 \times CV4 \tag{5}$$

$$\mathbf{CV4X} = CV4$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
CVTS = CUBIC FOOT VOLUME, TOTAL STEM, WITH TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 32

$$\mathrm{CVTS} = 0.0120372263 \times DBH^{2.02232} \times HT^{0.68638} \quad (1)$$

$$\mathbf{CV4} = 0.0055212937 \times DBH^{2.07202} \times HT^{0.77467} \quad (2)$$

$$\mathbf{CV8} = 0.0018985111 \times DBH^{2.38285} \times HT^{0.77105} \quad (3)$$

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$
$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)}$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
CVTS = CUBIC FOOT VOLUME, TOTAL STEM, WITH TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 33

$$\mathbf{CVTS} = 0.0057821322 \times DBH^{1.94553} \times HT^{0.88389} \quad (1)$$

$$\mathbf{CV4} = 0.0016380753 \times DBH^{2.05910} \times HT^{1.05293} \quad (2)$$

$$\mathbf{CV8} = 0.0007741517 \times DBH^{2.23009} \times HT^{1.03700} \quad (3)$$

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$
$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)}$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
CVTS = CUBIC FOOT VOLUME, TOTAL STEM, WITH TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 34

$$\mathbf{CVTS} = 0.0058870024 \times DBH^{1.94165} \times HT^{0.86562} \quad (1)$$

$$\mathbf{CV4} = 0.0005774970 \times DBH^{2.19576} \times HT^{1.14078} \quad (2)$$

$$\mathbf{CV8} = 0.0002526443 \times DBH^{2.30949} \times HT^{1.21069} \quad (3)$$

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$
$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)}$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
CVTS = CUBIC FOOT VOLUME, TOTAL STEM, WITH TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 35

$$\mathbf{CVTS} = 0.0042870077 \times DBH^{2.33631} \times HT^{0.74872} \quad (1)$$

$$\mathbf{CV4} = 0.0009684363 \times DBH^{2.39565} \times HT^{0.98878} \quad (2)$$

$$\mathrm{CV8} = 0.0001880044 \times DBH^{1.87346} \times HT^{1.62443} \quad (3)$$

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$

$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)} \quad (4)$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
CVTS = CUBIC FOOT VOLUME, TOTAL STEM, WITH TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 36

$$\mathbf{CVTS} = 0.0191453191 \times DBH^{2.40248} \times HT^{0.28060} \quad (1)$$

$$\mathbf{CV4} = 0.0053866353 \times DBH^{2.61268} \times HT^{0.31103} \quad (2)$$

CV8=CV4 (3)

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$

$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)} \quad (4)$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
CVTS = CUBIC FOOT VOLUME, TOTAL STEM, WITH TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 37

$$\mathbf{CVTS} = 0.0101786350 \times DBH^{2.22462} \times HT^{0.57561} \quad (1)$$

$$\mathrm{CV4} = 0.0034214162 \times DBH^{2.35347} \times HT^{0.69586} \quad (2)$$

$$\mathbf{CV8} = 0.0004236332 \times DBH^{2.10316} \times HT^{1.08584} \times FC^{0.40017} \quad (3)$$

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$

$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)} \quad (4)$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
FC =HARDWOOD FORM CLASS
CVTS = CUBIC FOOT VOLUME, TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 38

$$\mathbf{CVTS} = 0.0070538108 \times DBH^{1.97437} \times HT^{0.85034} \quad (1)$$

$$\mathbf{CV4} = 0.0036795695 \times DBH^{2.12635} \times HT^{0.83339} \quad (2)$$

$$\mathbf{CV8} = 0.0012478663 \times DBH^{2.68099} \times HT^{0.42441} \times FC^{0.28385} \quad (3)$$

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$

$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)} \quad (4)$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
FC =HARDWOOD FORM CLASS
CVTS = CUBIC FOOT VOLUME, TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 39

$$\mathbf{CVTS} = 0.0125103008 \times DBH^{2.33089} \times HT^{0.46100} \quad (1)$$

$$\mathbf{CV4} = 0.0042324071 \times DBH^{2.53987} \times HT^{0.50591} \quad (2)$$

$$\mathbf{CV8} = 0.0036912408 \times DBH^{1.79732} \times HT^{0.83884} \times FC^{0.15958} \quad (3)$$

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$

$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)} \quad (4)$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
FC =HARDWOOD FORM CLASS
CVTS = CUBIC FOOT VOLUME, TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 40

$$\mathbf{CVTS} = 0.0067322665 \times DBH^{1.96628} \times HT^{0.83458} \quad (1)$$

$$\mathbf{CV4} = 0.0025616425 \times DBH^{1.99295} \times HT^{1.01532} \quad (2)$$

$$\mathrm{CV8} = 0.0006181530 \times DBH^{1.72635} \times HT^{1.26462} \times FC^{0.37868} \quad (3)$$

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$

$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)} \quad (4)$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
FC =HARDWOOD FORM CLASS
CVTS = CUBIC FOOT VOLUME, TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 41

$$\mathbf{CVTS} = 0.0072695058 \times DBH^{2.14321} \times HT^{0.74220} \quad (1)$$

$$\mathbf{CV4} = 0.0024277027 \times DBH^{2.25575} \times HT^{0.87108} \quad (2)$$

$$\mathbf{CV8} = 0.0008281647 \times DBH^{2.10651} \times HT^{0.91215} \times FC^{0.32652} \quad (3)$$

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$

$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)} \quad (4)$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
FC =HARDWOOD FORM CLASS
CVTS = CUBIC FOOT VOLUME, TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 42

$$\mathbf{CVTS} = 0.0097438611 \times DBH^{2.20527} \times HT^{0.61190} \quad (1)$$

$$\mathbf{CV4} = 0.0031670596 \times DBH^{2.32519} \times HT^{0.74348} \quad (2)$$

$$\mathbf{CV8} = 0.0006540144 \times DBH^{2.24437} \times HT^{0.81358} \times FC^{0.43381} \quad (3)$$

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$

$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)} \quad (4)$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
FC =HARDWOOD FORM CLASS
CVTS = CUBIC FOOT VOLUME, TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 43

$$\mathbf{CVTS} = 0.0065261029 \times DBH^{2.31958} \times HT^{0.62528} \quad (1)$$

$$\mathbf{CV4} = 0.0024574847 \times DBH^{2.53284} \times HT^{0.60764} \quad (2)$$

$$\mathbf{CV8} = 0.0006540144 \times DBH^{2.24437} \times HT^{0.81358} \times FC^{0.43381} \quad (3)$$

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$

$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)} \quad (4)$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
FC =HARDWOOD FORM CLASS
CVTS = CUBIC FOOT VOLUME, TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 44

$$\mathbf{CVTS} = 0.0136818837 \times DBH^{2.02989} \times HT^{0.63257} \quad (1)$$

$$\mathbf{CV4} = 0.0041192264 \times DBH^{2.14915} \times HT^{0.77843} \quad (2)$$

$$\mathbf{CV8} = 0.0006540144 \times DBH^{2.24437} \times HT^{0.81358} \times FC^{0.43381} \quad (3)$$

$$\mathrm{CVT} = CVTS * RTS \quad (4)$$

$$RTS = 0.9679 - 0.1051 \times 0.5523^{(DBH-1.5)} \quad (4)$$

$$\mathbf{CV4X} = CVT \times \left(0.99875 - \frac{43.336}{DBH^3} - \frac{124.717}{DBH^4} + \frac{(0.193437 \times HT)}{DBH^3} + \frac{479.83}{(DBH^3 \times HT)} \right) \quad (5)$$

$$\mathbf{TARIF} = \frac{(CV8 \times 0.912733)}{\left(\left(0.983 - o.983 \times 0.65^{(DBH-8.6)} \right) \times (BA - 0.087266) \right)} \quad (6)$$

WHERE

DBH = DBH(CM) CONVERTED TO INCHES (DBH/2.54)
HT = HT (M) CONVERTED TO FEET (HT/0.3048)
BA = BASAL AREA
FC =HARDWOOD FORM CLASS
CVTS = CUBIC FOOT VOLUME, TOP AND STUMP
TARIF = TARIF NUMBER EQUATION
CVT = CUBIC FOOT VOLUME ABOVE STUMP
CV4 = CUBIC FOOT VOLUME, 4-IN TOP
CV8 = CUBIC FOOT VOLUME, SAWLOG (8-IN TOP)

EQUATION 45

CVTS = $(A + B \times DSXH^{.3333} + C \times D)^3$

WHERE

A = -0.13363
B = 0.128222
C = 0 .080208
D = 1
DSXH = $DRC \times DRC \div THT$ DRC is diameter at root collar and THT is total height

Mountain mahogany
Cubic foot volume of all wood and bark to a 1.5 inch branch diameter
From INT-339, Chojnacky, 1985
Pinyon-Juniper Volume Equations for the Central Rocky Mountain States

HARDWOOD BOARDFOOT VOLUME EQUATIONS

$$\textbf{CUBUS} = CV4 - CV8 \quad (1)$$

$$\textbf{RC6} = 0.993 - 0.993 \times 0.62^{(DBH-6.0)} \quad (2)$$

IF EQN < 8 THEN CV4X =CVT

TARIFX = TARIF

$$\text{CV4X} = \text{CVT} \times 0.99875 - \frac{43.336}{\text{DBH}^3} - \frac{124.717}{\text{DBH}^4} + \frac{0.193437 \times \text{HT}}{\text{DBH}^3} + \frac{479.83}{\text{DBH}^3 \times \text{HT}}$$

$$\text{TARIFX} = \frac{\text{CV8} \times 0.912733}{0.983 - 0.983 \times 0.65^{\text{DBH}-8.6} \times \text{BA} - 0.087266}$$

$$\textbf{CV6} = RC6 \times CV4X \quad (3)$$

$$\textbf{B4} = \frac{TARIF}{0.912733}$$

$$\text{RS616L} = 0.174439 + 0.117594 \times \log(DBH) \times \log(B4) - \frac{8.210585}{DBH^2} + 0.236693 \times \log(B4) - 0.00001345 \times (B4)^2 - 0.00001937 \times DBH^2 \quad (4)$$

$$\textbf{RS616} = 10.0^{RS616L} \quad (5)$$

$$\textbf{SV616} = RS616 \times CV6$$

$$\textbf{RI6} = -2.904154 + 3.466328 \times log(DBH \times TARIF) - 0.02765985 \times DBH - 0.00008205 \times TARIF^2 + \frac{11.29598}{DBH^2} \quad (6)$$

$$\textbf{XINT6} = RI6 \times CV6 \quad (7)$$

$$RS616 = 0.990 - 0.58 \times \left(0.484^{DBH-9.5}\right) \quad (8)$$

$$SV816 = RS816 \times SV616 \quad (9)$$

$$RI8 = 0.990 - 0.55 \times \left(0.485^{DBH-9.5}\right) \quad (10)$$

$$XINT8 = XINT6 \times RI8 \quad (11)$$

WHERE

B4 = BINGO FACTOR
CUBUS = CUBIC FOOT VOLUME, UPPER-STEM PORTION
RC6 = RATIO TO CONVERT CUBIC 4-INCH TOP TO CUBIC 6-INCH TOP
CV6 = CUBIC FOOT VOLUME, 6-INCH TOP (SAWLOG)
RS616 = RATIO TO CONVERT CUBIC 6-INCH TOP TO SCRIB 6-INCH TOP IN 16-FT LOGS
SV616 = SCRIBNER VOLUME--6-INCH TOP (IN 16-FT LOGS)
RS816 = RATIO TO CONVERT CUBIC 6-INCH TOP TO SCRIB 8-INCH TOP IN 16-FT LOGS
SV816 = SCRIBNER VOLUME--8-INCH TOP (IN 16-FT LOGS)
XINT6 = INTERNATIONAL ¼ INCH VOLUME--6-INCH TOP (IN 8-FT LOGS)
RI8 =RATIO TO CONVERT INTERNATIONAL ¼ INCH 6-INCH TOP TO INTERNATIONAL ¼ INCH 8-INCH TOP
XINT8 = INTERNATIONAL ¼ INCH VOLUME--8-INCH TOP (IN 8-FT LOGS)

HARDWOOD VOLUME EQUATION SOURCES

Curtis, Robert O., Bruce, David, and Caryanne VanCoevering. 1968. Volume and taper tables for red alder. US Forest Serv. Res. Pap. PNW-56. PNW Forest & Range Exp. Sta., Portland, Oregon. 35p.

Brackett, Michael. 1977. Notes on TARIF tree-volume computation. DNR report #24. State of Washington, Department of Natural Resources, Olympia, WA. 132p. (see page 5)

Colin MacLean and Tom Farrenkopf. 1983. Eucalyptus volume equation. In-house memo describing the volume equation for CVTS, to be used for all species of Eucalyptus. The equation was developed from 111 trees. On file at the PNW Research Station,Portland,OR

Pillsbury, Norman H. and Michael L. Kirkley. 1984. Equations for Total, Wood, and Saw-log Volume for Thirteen California Hardwoods. PNW Research Note, PNW-414. Pacific Northwest Research Station, Portland Oregon. 52p.

REGIONAL BIOMASS EQUATIONS USED BY FIA TO ESTIMATE BOLE, BARK, AND BRANCHES

BIOMASS OF THE TREE STEM

Tree stem biomass, regardless of whether it is merchantable bole or total stem, is calculated from cubic volume estimates and the wood density factor (in tables below) as follows:

Cubic volume = green cubic volume in cubic feet (ft3)
Wood density = (Specific gravity of a tree species) * (62.4 lbs/ft3)

Weight of water = 62.4 pounds/cubic foot

Biomass of the tree stem (in tons**) =** (cubic foot volume * wood density) / 2000

The tables below contain specific gravity and wood density values for many species.

Softwoods

Code	Species	Specific gravity	Wood density
11	Pacific silver fir	0.4	24.96
14	Bristlecone fir	0.36	22.46
15	White fir	0.37	23.09
17	Grand fir	0.35	21.84
19	Subalpine fir	0.31	19.34
20	California red fir	0.36	22.46
21	Shasta red fir	0.36	22.46
22	Noble fir	0.37	23.09
41	Port-Orford-cedar	0.39	24.34
42	Alaska-cedar	0.42	26.21
50	Cypress	0.67	41.81
56	McNabb cypress	.67	41.81
62	California juniper	0.54	33.7
64	Western juniper	0.54	33.7
65	Utah juniper	0.54	33.7
72	Subablpine larch	0.48	29.95
73	Western larch	0.48	29.95
81	Incense cedar	0.35	21.84
92	Brewer spruce	0.35	21.84
93	Engelmann spruce	0.33	20.59
98	Sitka spruce	0.37	23.09
101	Whitebark pine	0.37	23.09
102	Bristlecone pine	0.37	23.09
103	Knobcone pine	0.37	23.09
104	Foxtail pine	0.37	23.09
108	Lodgepole pine	0.38	23.71
109	Coulter pine	0.43	26.83
113	Limber pine	0.37	23.09
116	Jeffrey pine	0.38	23.71
117	Sugar pine	0.34	21.22
119	Western white pine	0.35	21.84
120	Bishop pine	0.43	26.83
122	Ponderosa pine	0.38	23.71
124	Monterey pine	0.35	21.84
127	Gray pine	0.43	26.83
133	Singleleaf pinyon	0.37	23.09
137	Washoe pine	.37	23.09
201	Bigcone Douglas-fir	0.46	28.7
202	Douglas-fir	0.46	28.7
211	Redwood	0.34	21.22
212	Giant Sequoia	0.38	23.71
231	Pacific yew	0.67	41.81
242	Western redcedar	0.31	19.34
251	California nutmeg	0.51	31.82
263	Western hemlock	0.42	26.21
264	Mountain hemlock	0.42	26.21
298	Unknown softwood	0.41	25.58

Hardwoods

Code	Species	Specific gravity	Wood density
312	Bigleaf maple	0.44	27.46
313	Boxelder		19.34
330	California buckeye	0.38	23.71
341	Tree of heaven	0.3	18.72
351	Red alder	0.37	23.09
352	White alder	0.37	23.09
361	Pacific madrone	0.69	43.06
374	Water birch	0.3	18.72
376	Western paper birch	0.3	18.72
431	Golden chinkapin	0.48	29.95
475	Curlleaf mountain-mahogany		
492	Pacific dogwood	0.7	43.68
510	Eucalyptus	0.8	49.92
542	Oregon ash	0.5	31.2
590	Holly		37.44
600	Walnut	0.51	31.82
631	Tanoak	0.58	36.19
660	Apple	0.58	36.19
730	California sycamore	0.46	28.7
740	Cottonwood and poplar		
746	Quaking aspen	0.35	21.84
747	Black cottonwood	0.31	19.34
748	Fremont poplar	0.31	19.34
760	Cherry		29.32
801	California live oak	0.8	49.92
805	Canyon live oak	0.8	49.92
807	Blue oak	0.6	37.44
811	Englemann oak	0.6	37.44
815	Oregon white oak	0.6	37.44
818	California black oak	0.56	34.94
821	California white oak	0.6	37.44
839	Interior live oak	0.8	49.92
920	Willow	0.36	22.46
981	California-laurel	0.59	36.82
998	Unknown hardwood	0.51	31.82
999	Unknown tree	0.45	28.08

SOFTWOOD BIOMASS EQUATION ASSIGNMENTS

BIOMASS OF BARK

Code	Species	Halfstate				
		WOR	WWA	EOR	EWA	CA
11	Pacific silver fir	22	22	22	22	--
14	Bristlecone fir	--	--	--	--	2
15	White fir	1	1	1	1	1
17	Grand fir	2	2	2	2	2
18	Corkbark fir	--	--	--	--	0
19	Subalpine fir	3	3	3	3	3
20	California red fir	--	--	--	--	4
21	Shasta red fir	4	4	4	4	4
22	Noble fir	5	5	5	5	5
41	Port-Orford-cedar	13	13	13	13	13
42	Alaska-cedar	23	23	23	23	13
50	Cypress	--	--	--	--	13
51	Arizona cypress	--	--	--	--	0
56	Mcnabb cypress	--	--	--	--	13
58	Pinchot juniper	--	--	--	--	0
59	Redberry juniper	--	--	--	--	0
62	California juniper	--	--	--	--	16
63	Alligator juniper	--	--	--	--	0
64	Western juniper	16	16	16	16	16
65	Utah juniper	--	--	--	--	16
66	Rocky Mountain juniper	--	--	--	--	0
69	Oneseed juniper	--	--	--	--	0
72	Subablpine larch	24	24	24	24	--
73	Western larch	24	24	24	24	--
81	Incense cedar	12	12	12	12	12
92	Brewer spruce	7	7	7	7	7
93	Engelmann spruce	7	7	7	7	7
94	White spruce	--	--	--	--	0
96	Blue spruce	--	--	--	--	0
98	Sitka spruce	6	6	6	6	6
101	Whitebark pine	11	11	11	11	14
102	Bristlecone pine	--	--	--	--	14
103	Knobcone pine	14	14	14	14	14
104	Foxtail pine	--	--	--	--	14
106	Twoneedle pinyon	--	--	--	--	0
108	Lodgepole pine	14	14	14	14	14
109	Coulter pine	--	--	--	--	9
112	Apache pine	--	--	--	--	0
113	Limber pine	--	--	--	--	14
114	Southwestern white pine	--	--	--	--	0
116	Jeffrey pine	9	9	9	9	9

SOFTWOOD BIOMASS EQUATION ASSIGNMENTS
--continued--
BIOMASS OF BARK

		Halfstate				
Code	Species	WOR	WWA	EOR	EWA	CA
117	Sugar pine	10	10	10	10	10
118	Chihuahuan pine	--	--	--	--	0
119	Western white pine	11	11	11	11	11
120	Bishop pine	--	--	--	--	14
122	Ponderosa pine	9	9	9	9	9
124	Monterey pine	--	--	--	--	14
127	Gray pine	--	--	--	--	9
130	Scotch pine	0	0	0	0	0
133	Singleleaf pinyon	--	--	--	--	14
134	Border pinyon	--	--	--	--	0
135	Arizona pine	--	--	--	--	0
137	Washoe pine	--	--	--	--	9
201	Bigcone Douglas-fir	--	--	--	--	8
202	Douglas-fir	8	8	25	25	8
211	Redwood	17	17	17	17	17
212	Giant Sequoia	17	17	17	17	17
231	Pacific yew	13	13	13	13	13
242	Western redcedar	13	13	13	13	13
251	California nutmeg	--	--	--	--	13
263	Western hemlock	26	26	26	26	15
264	Mountain hemlock	21	21	21	21	21
298	Unknown Conifer	21	21	21	21	21

SOFTWOOD BIOMASS EQUATION ASSIGNMENTS

BIOMASS OF LIVE BRANCHES

Code	Species	Halfstate				
		WOR	WWA	EOR	EWA	CA
11	Pacific silver fir	18	18	18	18	--
14	Bristlecone fir	--	--	--	--	1
15	White fir	1	1	1	1	1
17	Grand fir	1	1	1	1	1
18	Corkbark fir	--	--	--	--	0
19	Subalpine fir	2	2	2	2	2
20	California red fir	--	--	--	--	3
21	Shasta red fir	3	3	3	3	3
22	Noble fir	3	3	3	3	3
41	Port-Orford-cedar	10	10	10	10	10
42	Alaska-cedar	19	19	19	19	10
50	Cypress	--	--	--	--	10
51	Arizona cypress	--	--	--	--	0
56	Mcnabb cypress	--	--	--	--	10
58	Pinchot juniper	--	--	--	--	0
59	Redberry juniper	--	--	--	--	0
62	California juniper	--	--	--	--	13
63	Alligator juniper	--	--	--	--	0
64	Western juniper	13	13	13	13	13
65	Utah juniper	--	--	--	--	13
66	Rocky Mountain juniper	--	--	--	--	0
69	Oneseed juniper	--	--	--	--	0
72	Subablpine larch	20	20	20	20	--
73	Western larch	20	20	20	20	--
81	Incense cedar	10	10	10	10	10
92	Brewer spruce	4	4	4	4	4
93	Engelmann spruce	4	4	4	4	4
94	White spruce	--	--	--	--	0
96	Blue spruce	--	--	--	--	0
98	Sitka spruce	5	5	5	5	5
101	Whitebark pine	9	9	9	9	11
102	Bristlecone pine	--	--	--	--	11
103	Knobcone pine	11	11	11	11	11
104	Foxtail pine	--	--	--	--	11
106	Twoneedle pinyon	--	--	--	--	0
108	Lodgepole pine	11	11	11	11	11
109	Coulter pine	--	--	--	--	7
112	Apache pine	--	--	--	--	0
113	Limber pine	--	--	--	--	11
114	Southwestern white pine	--	--	--	--	0
116	Jeffrey pine	7	7	7	7	7
117	Sugar pine	8	8	8	8	8
118	Chihuahuan pine	--	--	--	--	0

SOFTWOOD BIOMASS EQUATION ASSIGNMENTS
--continued--
BIOMASS OF LIVE BRANCHES

Code	Species	Halfstate				
		WOR	WWA	EOR	EWA	CA
119	Western white pine	9	9	9	9	9
120	Bishop pine	--	--	--	--	11
122	Ponderosa pine	7	7	7	7	7
124	Monterey pine	--	--	--	--	11
127	Gray pine	--	--	--	--	7
130	Scotch pine	--	--	--	--	0
133	Singleleaf pinyon	--	--	--	--	11
134	Border pinyon	--	--	--	--	0
135	Arizona pine	--	--	--	--	0
137	Washoe pine	--	--	--	--	7
201	Bigcone Douglas-fir	--	--	--	--	6
202	Douglas-fir	6	6	22	22	6
211	Redwood	10	10	10	10	10
212	Giant Sequoia	10	10	10	10	10
231	Pacific yew	10	10	10	10	10
242	Western redcedar	10	10	10	10	10
251	California nutmeg	--	--	--	--	10
263	Western hemlock	23	23	23	23	12
264	Mountain hemlock	24	24	24	24	17
298	Unknown Conifer	24	24	24	24	17

HARDWOOD BIOMASS EQUATION ASSIGNMENTS

BIOMASS OF BARK

Code	Species	Halfstate				
		WOR	WWA	EOR	EWA	CA
300	Acacia	--	--	--	--	0
312	Bigleaf maple	29	29	29	29	--
313	Boxelder	--	--	--	--	--
321	Rocky Mountain maple	--	--	--	--	0
322	Bigtooth maple	--	--	--	--	0
330	California buckeye	--	--	--	--	0
341	Tree of heaven	20	20	20	20	20
351	Red alder	20	20	20	20	20
352	White alder	20	20	20	20	20
361	Pacific madrone	34	34	34	34	--
374	Water birch	20	20	20	20	20
375	Paper birch	--	--	--	--	0
376	Western paper birch	--	--	--	--	0
431	Golden chinkapin	32	32	32	32	--
475	Curlleaf mountain-mahogany	--	--	--	--	0
476	True mountain-mahogany	--	--	--	--	0
477	Hairy mountain-mahogany	--	--	--	--	0
478	Birchleaf mountain-mahogany	--	--	--	--	0
479	Littleleaf mountain-mahogany	--	--	--	--	0
492	Pacific dogwood	29	--	29	29	--
500	Hawthorn	--	--	--	--	0
510	Eucalyptus	--	--	--	--	0
542	Oregon ash	20	20	20	20	--
590	Holly	27	27	27	27	--
600	Walnut	30	30	30	30	--
631	Tanoak	36	36	36	36	--
660	Apple	31	31	31	31	--
730	California sycamore	--	--	--	--	0
740	Cottonwood and poplar	--	--	--	--	0
741	Balsam poplar	--	--	--	--	0
742	Eastern cottonwood	--	--	--	--	0
745	Plains cottonwood	--	--	--	--	0
746	Quaking aspen	18	18	18	18	18
747	Black cottonwood	28	28	28	28	18
748	Fremont poplar	18	18	18	18	18
755	Mesquite	--	--	--	--	0
760	Cherry	27	27	27	27	--
800	Oak-deciduous	--	--	--	--	0
801	California live oak	--	--	--	--	0
805	Canyon live oak	31	31	31	31	31

Code	Species	Halfstate				
		WOR	WWA	EOR	EWA	CA
807	Blue oak	--	--	--	--	0
810	Emory oak	--	--	--	--	0
811	Englemann oak	--	--	--	--	0
814	Gambel oak	--	--	--	--	0
815	Oregon white oak	35	35	35	35	--
818	California black oak	30	30	30	30	--
821	California white oak	--	--	--	--	0
829	Mexican blue oak	--	--	--	--	0
839	Interior live oak	--	--	--	--	0
843	Silverleaf oak	--	--	--	--	0
850	Oak-evergreen	--	--	--	--	0
901	Black locust	--	--	--	--	0
902	New Mexico locust	--	--	--	--	0
920	Willow	34	34	34	34	--
981	California-laurel	33	33	33	33	--
990	Tesota (Arizona ironwood)	--	--	--	--	0
998	Unknown hardwood	20	20	20	20	20
999	Unknown Tree	35	35	35	35	0

HARDWOOD BIOMASS EQUATION ASSIGNMENTS

BIOMASS OF LIVE BRANCHES

Code	Species	Halfstate				
		WOR	WWA	EOR	EWA	CA
300	Acacia	--	--	--	--	0
312	Bigleaf maple	--	--	--	--	--
313	Boxelder	--	--	--	--	0
321	Rocky Mountain maple	--	--	--	--	0
322	Bigtooth maple	--	--	--	--	0
330	California buckeye	--	--	--	--	0
341	Tree of heaven	14	14	14	14	14
351	Red alder	16	16	16	16	16
352	White alder	16	16	16	16	16
361	Pacific madrone	--	--	--	--	--
374	Water birch	14	14	14	14	14
375	Paper birch	--	--	--	--	0
376	Western paper birch	25	25	25	25	3
431	Golden chinkapin	--	--	--	--	--
475	Curlleaf mountain-mahogany	--	--	--	--	0
476	True mountain-mahogany	--	--	--	--	0
477	Hairy mountain-mahogany	--	--	--	--	0
478	Birchleaf mountain-mahogany	--	--	--	--	0
479	Littleleaf mountain-mahogany	--	--	--	--	0
492	Pacific dogwood	--	--	--	--	--
500	Hawthorn	--	--	--	--	0
510	Eucalyptus	--	--	--	--	0
542	Oregon ash	--	--	--	--	--
590	Holly	25	25	25	25	0
600	Walnut	--	--	--	--	--
631	Tanoak	--	--	--	--	--
660	Apple	--	--	--	--	0
730	California sycamore	--	--	--	--	0
740	Cottonwood and poplar	--	--	--	--	0
741	Balsam poplar	--	--	--	--	0
742	Eastern cottonwood	--	--	--	--	0
745	Plains cottonwood	--	--	--	--	0
746	Quaking aspen	14	14	14	14	14
747	Black cottonwood	15	15	15	15	15
748	Fremont poplar	5	5	5	5	5
755	Mesquite	--	--	--	--	0
760	Cherry	25	25	25	25	0
800	Oak-deciduous	--	--	--	--	0
801	California live oak	--	--	--	--	--
805	Canyon live oak	--	--	--	--	--
807	Blue oak	--	--	--	--	--
810	Emory oak	0	0	0	0	0
811	Englemann oak	0	0	0	0	0

Code	Species	WOR	WWA	Halfstate EOR	EWA	CA
814	Gambel oak	--	--	--	--	0
815	Oregon white oak	--	--	--	--	--
818	California black oak	--	--	--	--	--
821	California white oak	--	--	--	--	--
829	Mexican blue oak	--	--	--	--	0
839	Interior live oak	--	--	--	--	--
843	Silverleaf oak	--	--	--	--	0
850	Oak-evergreen	--	--	--	--	0
901	Black locust	--	--	--	--	0
902	New Mexico locust	--	--	--	--	0
920	Willow	--	--	--	--	--
981	California-laurel	--	--	--	--	--
990	Tesota (Arizona ironwood)	--	--	--	--	--
998	Unknown hardwood	16	16	16	16	16
999	Unknown Tree	16	16	16	16	16

SPECIES 312, 330, 361, 431, 492, 600, 631, 801, 805, 807, 811, 815, 818, 821, 839, 920, and 981 hardwood volumes are calculated with Pillsbury equations; this means that total stem volume includes branches and bark, thus bark biomass and live branch biomass are not available as separate components of biomass.

BIOMASS OF BARK

All equations produce Biomass of Bark in Kilograms --- to convert to tons multiply by 0.0011023

Log in the equations is = NATURAL LOG

EQUATION 1 BIOPAK EQUATION 379

$$\mathrm{BB} = \frac{\exp(2.1069 + 2.7271 \times \log(DBH))}{1000}$$

EQUATION 2 BIOPAK EQUATION 887

$$\mathrm{BB} = 0.6 + 16.4 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 3 BIOPAK EQUATION 917

$$\mathrm{BB} = 1.0 + 17.2 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 4 BIOPAK EQUATION 382

$$\mathrm{BB} = \frac{\exp(1.47146 + 2.8421 \times \log(DBH))}{1000}$$

EQUATION 5 BIOPAK EQUATION 251

$$\mathrm{BB} = \frac{\exp(2.79189 + 2.4313 \times \log(DBH))}{1000}$$

EQUATION 6 BIOPAK EQUATION 845

$$\mathrm{BB} = 1.3 + 12.6 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 7 BIOPAK EQUATION 875

$$\mathrm{BB} = 4.5 + 9.3 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 8 BIOPAK EQUATION 5

$$\mathrm{BB} = \exp(-4.3103 + 2.4300 \times \log(DBH))$$

EQUATION 9 BIOPAK EQUATION 705

$$\mathrm{BB} = \exp(-3.6263 + 1.34077 \times \log(DBH) + 0.8567 \times \log(HT))$$

EQUATION 10 BIOPAK EQUATION 391

$$\mathrm{BB} = \frac{\exp(2.183174 + 2.6610 \times \log(DBH))}{1000}$$

EQUATION 11 BIOPAK EQUATION 899

$$\mathrm{BB} = 1.2 + 11.2 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 12 (updated) BIOPAK EQUATION 385

$$\mathrm{BB} = \frac{\exp(-13.3146 + 2.8594 \times \log(DBH)) * 1000}{}$$

EQUATION 13 BIOPAK EQUATION 461

$$\mathrm{BB} = 0.336 + 0.00058 \times DBH^2 \times HT$$

EQUATION 14 BIOPAK EQUATION 904

$$\mathrm{BB} = 3.2 + 9.1 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 15

$$\mathrm{BB} = \exp(-4.371 + 2.259 \times \log(DBH))$$

EQUATION 16 BIOPAK EQUATION 54

$$\mathrm{BB} = \exp(-10.175 + 2.6333 \times \log(DBH \times \pi))$$

EQUATION 17 BIOPAK EQUATION 394

$$\mathrm{BB} = \frac{\exp(7.189689 + 1.5837 \times \log(DBH))}{1000}$$

EQUATION 18 BIOPAK EQUATION 942

$$\mathrm{BB} = 1.3 + 27.6 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 19

$$\mathrm{BB} = 0.0$$

EQUATION 20 BIOPAK EQUATION 275

$$\mathrm{BB} = \exp(-4.6424 + 2.4617 \times \log(DBH))$$

EQUATION 21 BIOPAK EQUATION 911

$$\mathrm{BB} = 0.9 + 27.4 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 22 BIOPAK EQUATION 881

$$\mathrm{BB} = 1.0 + 15.6 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 23 BIOPAK EQUATION 923

$$\mathrm{BB} = 1.8 + 9.6 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 24 BIOPAK EQUATION 893

$$\mathrm{BB} = 2.4 + 15.0 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 25 BIOPAK EQUATION 857

$$\mathrm{BB} = 3.6 + 18.2 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 26 Weyerhaeuser Co Equation

$$\mathrm{BB} = -0.025 + 0.00134 \times DBH^2 \times HT$$

EQUATION 27

$$\mathrm{BB} = -1.2 + 29.1 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 28 BIOPAK EQUATION 930

$$\mathrm{BB} = 1.2 + 15.5 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 29 (Bigleaf maple)

$$ADBH = \frac{(DBH - 0.21235)}{0.94782} \quad (1)$$

$$OUTERVOL = 0.0000246916 \times \left(ADBH^{2.354347}\left(HT^{0.69586}\right)\right) \quad (2)$$

$$INNERVOL = 0.0000246916 \times \left(DBH^{2.354347}\left(HT^{0.69586}\right)\right) \quad (3)$$

$$BB = (OUTERVOL - INNERVOL) \times 35.30 \times DENSFAC / 2.2046 \quad (4)$$

EQUATION 30 (California Black Oak)

$$ADBH = \frac{(DBH + 0.68133)}{0.95767} \quad 1$$

$$OUTERVOL = 0.0000386403 \times \left(ADBH^{2.12635}\left(HT^{0.83339}\right)\right) \quad 2$$

$$INNERVOL = 0.0000386403 \times \left(DBH^{2.12635}\left(HT^{0.83339}\right)\right) \quad 3$$

$$BB = (OUTERVOL - INNERVOL) \times 35.30 \times DENSFAC / 2.2046 \quad 4$$

EQUATION 31 (Canyon Live Oak)

$$ADBH = \frac{(DBH + 0.48584)}{0.96147} \quad 1$$

$$OUTERVOL = 0.0000248325 \times \left(ADBH^{2.32519}\left(HT^{0.74348}\right)\right) \quad 2$$

$$INNERVOL = 0.0000248325 \times \left(DBH^{2.32519}\left(HT^{0.74348}\right)\right) \quad 3$$

$$BB = (OUTERVOL - INNERVOL) \times 35.30 \times DENSFAC / 2.2046 \quad 4$$

EQUATION 32 (Golden Chinkapin)

$$ADBH = \frac{(DBH - 0.39534)}{0.90182} \quad 1$$

$$OUTERVOL = 0.000056884 \times \left(ADBH^{2.07202}\left(HT^{0.77467}\right)\right) \quad 2$$

$$INNERVOL = 0.000056884 \times \left(DBH^{2.07202}\left(HT^{0.77467}\right)\right) \quad 3$$

$$BB = (OUTERVOL - INNERVOL) \times 35.30 \times DENSFAC / 2.2046 \quad 4$$

EQUATION 33 (California Laurel)

$$ADBH = \frac{(DBH + 0.32491)}{0.96579} \quad 1$$

$$OUTERVOL = 0.0000237733 \times \left(ADBH^{2.05910}\left(HT^{1.05293}\right)\right) \quad 2$$

$$INNERVOL = 0.0000237733 \times \left(DBH^{2.05910}\left(HT^{1.05293}\right)\right) \quad 3$$

$$BB = (OUTERVOL - INNERVOL) \times 35.30 \times DENSFAC / 2.2046 \quad 4$$

EQUATION 34 (Pacific Madrone)

$$ADBH = \frac{(DBH + 0.03425)}{0.98155} \quad 1$$

$$OUTERVOL = 0.0000378129 \times (ADBH^{1.99295}(HT^{1.01532})) \quad 2$$

$$INNERVOL = 0.0000378129 \times (DBH^{1.99295}(HT^{1.01532})) \quad 3$$

$$BB = (OUTERVOL - INNERVOL) \times 35.30 \times DENSFAC / 2.2046 \quad 4$$

EQUATION 35 (Oregon White Oak)

$$ADBH = \frac{(DBH + 0.78034)}{0.95956} \quad 1$$

$$OUTERVOL = 0.0000236325 \times (ADBH^{2.25575}(HT^{0.87108})) \quad 2$$

$$INNERVOL = 0.0000236325 \times (DBH^{2.25575}(HT^{0.87108})) \quad 3$$

$$BB = (OUTERVOL - INNERVOL) \times 35.30 \times DENSFAC / 2.2046 \quad 4$$

EQUATION 36 (Tanoak)

$$ADBH = \frac{(DBH + 4.1177)}{0.95354} \quad 1$$

$$OUTERVOL = 0.0000081905 \times (ADBH^{2.19576}(HT^{1.14078})) \quad 2$$

$$INNERVOL = 0.0000081905 \times (DBH^{2.19576}(HT^{1.14078})) \quad 3$$

$$BB = (OUTERVOL - INNERVOL) \times 35.30 \times DENSFAC / 2.2046 \quad 4$$

WHERE

Log	= NATURAL LOG
DBH	= DIAMETER OF TREE IN CENTIMETERS
HT	= HEIGHT OF TREE IN METERS
DENSFAC	= DENSITY FACTOR FOR SPECIES
BB	= BIOMASS OF BARK, WEIGHT IN KILOGRAMS, OF THE BARK ON THE TREE BOLE
π	= 3.141593

BIOMASS OF LIVE BRANCHES

All equations produce Biomass of Live Branches in Kilograms --- to convert to tons multiply by 0.0011023

Log in the equations is = NATURAL LOG

Log = natural log

EQUATION 1 BIOPAK EQUATION 889

$$\mathrm{BLB} = 13.0 + 12.4 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 2 BIOPAK EQUATION 919

$$\mathrm{BLB} = 3.6 + 44.2 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 3 BIOPAK EQUATION 28

$$\mathrm{BLB} = \exp\left(-4.1817 + 2.3324 \times \log\left(DBH\right)\right)$$

EQUATION 4 BIOPAK EQUATION 877

$$\mathrm{BLB} = 16.8 + 14.4 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 5 BIOPAK EQUATION 847

$$\mathrm{BLB} = 9.7 + 22.0 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 6 BIOPAK EQUATION 2

$$\mathrm{BLB} = \exp\left(-3.6941 + 2.1382 \times \log\left(DBH\right)\right)$$

EQUATION 7 BIOPAK EQUATION 702

$$\mathrm{BLB} = \exp\left(-4.1068 + 1.5177 \times \log\left(DBH\right) + 1.0424 \times \log\left(HT\right)\right)$$

EQUATION 8

$$\mathrm{BLB} = \exp\left(-7.637 + 3.3648 \times \log\left(DBH\right)\right)$$

EQUATION 9 BIOPAK EQUATION 901

$$\mathrm{BLB} = 9.5 + 16.8 \times \left(\frac{DBH}{100}\right)^2 \times HT$$

EQUATION 10 BIOPAK EQUATION 459

$$\mathrm{BLB} = 0.199 + 0.00381 \times DBH^{2} \times HT$$

EQUATION 11 BIOPAK EQUATION 907

$$\mathrm{BLB} = 7.8 + 12.3 \times \left(\frac{DBH}{100}\right)^{2} \times HT$$

EQUATION 12

$$\mathrm{BLB} = \exp\left(-4.570 + 2.271 \times \log\left(DBH\right)\right)$$

EQUATION 13 BIOPAK EQUATION 51

$$\mathrm{BLB} = \exp\left(-7.2775 + 2.3337 \times \log\left(DBH \times \pi\right)\right)$$

EQUATION 14 BIOPAK EQUATION 944

$$\mathrm{BLB} = 1.7 + 26.2 \times \left(\frac{DBH}{100}\right)^{2} \times HT$$

EQUATION 15 BIOPAK EQUATION 932

$$\mathrm{BLB} = 2.5 + 36.8 \times \left(\frac{DBH}{100}\right)^{2} \times HT$$

EQUATION 16

$$\mathrm{BLB} = \exp\left(-4.5648 + 2.6232 \times \log\left(DBH\right)\right) - BF$$

where: $$\mathrm{BF} = \left(\exp\left(-4.5648 + 2.6232 \times \log\left(DBH\right)\right)\right) \times \frac{1}{(2.7638 + 0.062 \times DBH^{1.3364}}$$

EQUATION 17

$$\mathrm{BLB} = \exp\left(-5.2581 + 2.6045 \times \log\left(DBH\right)\right)$$

EQUATION 18 BIOPAK EQUATION 883

$$\mathrm{BLB} = 4.5 + 22.7 \times \left(\frac{DBH}{100}\right)^{2} \times HT$$

EQUATION 19 BIOPAK EQUATION 925

$$\mathrm{BLB} = 5.3 + 9.7 \times \left(\frac{DBH}{100} \right)^2 \times HT$$

EQUATION 20 BIOPAK EQUATION 895

$$\mathrm{BLB} = 20.4 + 7.7 \times \left(\frac{DBH}{100} \right)^2 \times HT$$

EQUATION 21 BIOPAK EQUATION 446

$$\mathrm{BLB} = 0.626 + 0.00079 \times DBH^2 \times HT$$

EQUATION 22 BIOPAK EQUATION 859

$$\mathrm{BLB} = 12.6 + 23.5 \times \left(\frac{DBH}{100} \right)^2 \times HT$$

EQUATION 23 Weyerhaeuser Co Equation

$$\mathrm{BLB} = 0.047 + 0.00413 \times DBH^2 \times HT$$

EQUATION 24 BIOPAK EQUATION 913

$$\mathrm{BLB} = 4.2 + 17.4 \times \left(\frac{DBH}{100} \right)^2 \times HT$$

EQUATION 25 BIOPAK EQUATION 950

$$\mathrm{BLB} = -0.6 + 45.1 \times \left(\frac{DBH}{100} \right)^2 \times HT$$

WHERE

Log = NATURAL LOG
DBH = DIAMETER OF TREE IN CENTIMETERS
HT = HEIGHT OF TREE IN METERS
BLB = BIOMASS OF LIVE BRANCHES,
WEIGHT IN KILOGRAMS, OF THE WOOD AND BARK OF LIVE BRANCHES IN THE CROWN
π = 3.141593

ATTACHMENT N

Brushy Mountain Improved Forest Management Project

Financial Analysis of Baseline Scenario

This analysis is provided per section 6.2.1.3(1) of Compliance Offset Protocol U.S. Forest Projects, October 20, 2011, and is designed to demonstrate that the baseline growth and harvest regime is financially feasible. This analysis is overly conservative given that the test is simply finalcial feasibility. If herbicide treatments, tree planting and logging costs were significantly increased, the analysis would still demonstrate that the baseline growth and harvest is finalcially feasible. Delivered log values are derived from a conservative analysis of recent delivered log values.

Model Inputs:

Discount Rate	8.0%	
Inflation	0.0%	
Real price appreciation for delivered log values	0.0%	
Yield Tax	2.9%	MBF

Production Costs:

Item	**Cost per acre**	**Quantity**	**Total Cost**	**Cost per MBF**
THP Preparation	$125	16,413	$ 2,051,604	$20.45
Logging Supervision				$7.00
Property Management				$7.00
Logging and Hauling				$215.00
Total				**$249.45**

Herbicide Treatment of Hardwoods and Pre-Commercial Thinning:

Period	**Cost per acre**	**% of Acres Treated**	**Total Cost**	**Cost per MBF**
1	$ 160.00	100%	$2,626,053	$26.17
2	$ 160.00	33%	$866,598	$19.04
3	$ 160.00	33%	$866,598	$21.06
4	$ 160.00	33%	$866,598	$23.39
5	$ 160.00	33%	$866,598	$22.19
6	$ 160.00	33%	$866,598	$18.64
7	$ 160.00	33%	$866,598	$18.55
8	$ 160.00	33%	$866,598	$17.72
9	$ 160.00	33%	$866,598	$17.78
10	$ 160.00	33%	$866,598	$17.09

Tree Planting: ($1 per tree cost)

Period	**Cost per acre**	**% of Acres Treated**	**Total Cost**	**Cost per MBF**
1	$ 150.00	100%	$2,461,925	$24.54
2	$ 150.00	25%	$615,481	$13.52
3	$ 150.00	25%	$615,481	$14.95
4	$ 150.00	25%	$615,481	$16.61
5	$ 150.00	25%	$615,481	$15.76
6	$ 150.00	25%	$615,481	$13.24
7	$ 150.00	25%	$615,481	$13.17
8	$ 150.00	25%	$615,481	$12.58
9	$ 150.00	25%	$615,481	$12.63
10	$ 150.00	25%	$615,481	$12.14

Brushy Mountain Carbon Project

Financial Analysis of Baseline Scenario

Calculation of Net Present Value of Harvest Stream

Assumptions: Harvest levels are based on Brushy Mountain Baseline Harvest Scenario

Logging sytem mix estimated as 85% tractor, 15% cable.

Production costs per MBF are estimates based upon logging system mix.

0% Real price appreciation applied to delivered log values.

All calculations in constant dollars without inflation.

Discount Rate 8% Real.

	Annual Harvest Volume				Delivered Log Values per MBF				Production	Herbicide	Tree	Yield	Net	Total	Present
	DF	PP	OC	Totals	DF	PP	OC	Camprun	Costs	Treatment	Planting	Taxes	Value	Net	Net
Year	MBF	MBF	MBF	MBF	$ / MBF	$ / MBF	$ / MBF	$ / MBF	$ / MBF	$ / MBF	$ / MBF	$ / MBF	$ / MBF	Value	Value
2014	7,052	2,523	507	10,083	500.00	500.00	400.00	494.97	249.35	26.05	24.42	14.35	180.80	1,822,981	1,687,945
2015	7,052	2,523	507	10,083	500.00	500.00	400.00	494.97	249.35	26.05	24.42	14.35	180.80	1,822,981	1,562,912
2016	7,052	2,523	507	10,083	500.00	500.00	400.00	494.97	249.35	26.05	24.42	14.35	180.80	1,822,981	1,447,141
2017	7,052	2,523	507	10,083	500.00	500.00	400.00	494.97	249.35	26.05	24.42	14.35	180.80	1,822,981	1,339,945
2018	7,052	2,523	507	10,083	500.00	500.00	400.00	494.97	249.35	26.05	24.42	14.35	180.80	1,822,981	1,240,690
2019	7,052	2,523	507	10,083	500.00	500.00	400.00	494.97	249.35	26.05	24.42	14.35	180.80	1,822,981	1,148,787
2020	7,052	2,523	507	10,083	500.00	500.00	400.00	494.97	249.35	26.05	24.42	14.35	180.80	1,822,981	1,063,692
2021	7,052	2,523	507	10,083	500.00	500.00	400.00	494.97	249.35	26.05	24.42	14.35	180.80	1,822,981	984,900
2022	7,052	2,523	507	10,083	500.00	500.00	400.00	494.97	249.35	26.05	24.42	14.35	180.80	1,822,981	911,944
2023	7,052	2,523	507	10,083	500.00	500.00	400.00	494.97	249.35	26.05	24.42	14.35	180.80	1,822,981	844,393
2024	3,105	1,341	112	4,557	500.00	500.00	400.00	497.55	249.35	19.02	13.51	14.43	201.25	917,090	393,324
2025	3,105	1,341	112	4,557	500.00	500.00	400.00	497.55	249.35	19.02	13.51	14.43	201.25	917,090	364,189
2026	3,105	1,341	112	4,557	500.00	500.00	400.00	497.55	249.35	19.02	13.51	14.43	201.25	917,090	337,212
2027	3,105	1,341	112	4,557	500.00	500.00	400.00	497.55	249.35	19.02	13.51	14.43	201.25	917,090	312,234
2028	3,105	1,341	112	4,557	500.00	500.00	400.00	497.55	249.35	19.02	13.51	14.43	201.25	917,090	289,105
2029	3,105	1,341	112	4,557	500.00	500.00	400.00	497.55	249.35	19.02	13.51	14.43	201.25	917,090	267,690
2030	3,105	1,341	112	4,557	500.00	500.00	400.00	497.55	249.35	19.02	13.51	14.43	201.25	917,090	247,861
2031	3,105	1,341	112	4,557	500.00	500.00	400.00	497.55	249.35	19.02	13.51	14.43	201.25	917,090	229,501
2032	3,105	1,341	112	4,557	500.00	500.00	400.00	497.55	249.35	19.02	13.51	14.43	201.25	917,090	212,501
2033	3,105	1,341	112	4,557	500.00	500.00	400.00	497.55	249.35	19.02	13.51	14.43	201.25	917,090	196,760
2034	3,029	970	95	4,094	500.00	500.00	400.00	497.68	249.35	21.17	15.03	14.43	197.70	809,444	160,801
2035	3,029	970	95	4,094	500.00	500.00	400.00	497.68	249.35	21.17	15.03	14.43	197.70	809,444	148,890
2036	3,029	970	95	4,094	500.00	500.00	400.00	497.68	249.35	21.17	15.03	14.43	197.70	809,444	137,861
2037	3,029	970	95	4,094	500.00	500.00	400.00	497.68	249.35	21.17	15.03	14.43	197.70	809,444	127,649
2038	3,029	970	95	4,094	500.00	500.00	400.00	497.68	249.35	21.17	15.03	14.43	197.70	809,444	118,193
2039	3,029	970	95	4,094	500.00	500.00	400.00	497.68	249.35	21.17	15.03	14.43	197.70	809,444	109,438
2040	3,029	970	95	4,094	500.00	500.00	400.00	497.68	249.35	21.17	15.03	14.43	197.70	809,444	101,332
2041	3,029	970	95	4,094	500.00	500.00	400.00	497.68	249.35	21.17	15.03	14.43	197.70	809,444	93,826
2042	3,029	970	95	4,094	500.00	500.00	400.00	497.68	249.35	21.17	15.03	14.43	197.70	809,444	86,876
2043	3,029	970	95	4,094	500.00	500.00	400.00	497.68	249.35	21.17	15.03	14.43	197.70	809,444	80,440
2044	2,792	764	123	3,679	500.00	500.00	400.00	496.64	249.35	23.55	16.73	14.40	192.61	708,675	65,209
2045	2,792	764	123	3,679	500.00	500.00	400.00	496.64	249.35	23.55	16.73	14.40	192.61	708,675	60,379
2046	2,792	764	123	3,679	500.00	500.00	400.00	496.64	249.35	23.55	16.73	14.40	192.61	708,675	55,907
2047	2,792	764	123	3,679	500.00	500.00	400.00	496.64	249.35	23.55	16.73	14.40	192.61	708,675	51,765
2048	2,792	764	123	3,679	500.00	500.00	400.00	496.64	249.35	23.55	16.73	14.40	192.61	708,675	47,931
2049	2,792	764	123	3,679	500.00	500.00	400.00	496.64	249.35	23.55	16.73	14.40	192.61	708,675	44,380
2050	2,792	764	123	3,679	500.00	500.00	400.00	496.64	249.35	23.55	16.73	14.40	192.61	708,675	41,093
2051	2,792	764	123	3,679	500.00	500.00	400.00	496.64	249.35	23.55	16.73	14.40	192.61	708,675	38,049
2052	2,792	764	123	3,679	500.00	500.00	400.00	496.64	249.35	23.55	16.73	14.40	192.61	708,675	35,231
2053	2,792	764	123	3,679	500.00	500.00	400.00	496.64	249.35	23.55	16.73	14.40	192.61	708,675	32,621
2054	2,952	779	128	3,859	500.00	500.00	400.00	496.69	249.35	22.46	15.95	14.40	194.53	750,742	31,998
2055	2,952	779	128	3,859	500.00	500.00	400.00	496.69	249.35	22.46	15.95	14.40	194.53	750,742	29,627
2056	2,952	779	128	3,859	500.00	500.00	400.00	496.69	249.35	22.46	15.95	14.40	194.53	750,742	27,433
2057	2,952	779	128	3,859	500.00	500.00	400.00	496.69	249.35	22.46	15.95	14.40	194.53	750,742	25,401
2058	2,952	779	128	3,859	500.00	500.00	400.00	496.69	249.35	22.46	15.95	14.40	194.53	750,742	23,519
2059	2,952	779	128	3,859	500.00	500.00	400.00	496.69	249.35	22.46	15.95	14.40	194.53	750,742	21,777
2060	2,952	779	128	3,859	500.00	500.00	400.00	496.69	249.35	22.46	15.95	14.40	194.53	750,742	20,164
2061	2,952	779	128	3,859	500.00	500.00	400.00	496.69	249.35	22.46	15.95	14.40	194.53	750,742	18,670
2062	2,952	779	128	3,859	500.00	500.00	400.00	496.69	249.35	22.46	15.95	14.40	194.53	750,742	17,287
2063	2,952	779	128	3,859	500.00	500.00	400.00	496.69	249.35	22.46	15.95	14.40	194.53	750,742	16,007
2064-2114															247,157
														Total	17,199,639

ATTACHMENT O

Agreement between
Richard L. Padula and Coastal Forestlands LTD

THIS AGREEMENT for Offset Project Operation Services (herein the "Agreement"), is made by and between Richard L. Padula (herein the "Landowner") who owns approximately 7,000 acres of real property commonly known as the "Summer Camp Ranch" and COASTAL FORESTLANDS, Ltd, a California Limited Partnership, (herein "CFL") and is entered into effective as of September 15, 2014.

CFL intends to become an Offset Project Operator ("OPO") under the California Air Resource Board's ("ARB") Cap-and-Trade regulations of an Offset Project know as Brushy Mountain.

Landowner agrees to participate in an Offset Project in which forested portions of both CFL's lands and Summer Camp are combined, and CFL will act as the OPO for the Brushy Mountain Offset Project.

Landowner hereby acknowledges that CFL has the legal authority to implement the Brushy Mountain Offset Project.

Read and agreed to:

Coastal Forestlands, Ltd, A
California Limited Partnership

By Richard L. Padula, President of
Coastal Forestlands, Inc.
Its General Partner

Richard L. Padula, Landowner