
APPENDIX R

Project Carbon Accounting: Inventory, Growth, and Harvest

This worksheet addresses the sequestration and emissions associated with the project area's balance of harvest, inventory, and growth plus any emissions associated with site preparation. Complete the input for Steps 0- 8 on this worksheet.

Forest Type				Harvest Periods		Inventory		Growth Rates		Harvest Volume	
Multipliers to Estimate Carbon Tonnes per MBF (Sampson, 2002)				Time of Harvest (years from project approval)		Conifer Live Tree Volume (MBF/Acre) - Prior to Harvest	Hardwood Live Tree Volume (BA square feet/Acre) - Prior to Harvest	Conifer Growth Rate (BF/Acre/Year)	Hardwood Growth Rate (BA/Acre/Year)	Conifer Harvest Volume (MBF/acre)	Hardwood Harvested / Treated Basal Area (BA/Acre)
Forest Type	Step 0. Identify the approximate percentage of conifers by volume within the harvest plan. Must sum to 100%	Multiplier from Cubic Feet (merchantable) to Total Biomass	Pounds Carbon per Cubic Foot	Step 1. Enter the anticipated future harvest entries. The re-entry cycles should be supported by management plan, if available.	Step 2. Enter the estimated conifer inventory (mbf/acre) present in project area prior to harvest.	Step 3. Enter the estimated hardwood inventory (basal area per acre) present in project area prior to harvest.	Step 4. Enter the average annual periodic growth of conifers between harvests based on estimated growth in management plan, if available. Must be entered for each harvest cycle identified in Step 1.	Step 5. Insert average annual periodic growth of hardwoods between harvests based on estimated growth in management plan, if available.	Step 6. Enter the estimated conifer harvested per acre at current and future entries. The estimate should be based on projections from the management plan, if available.	Step 7. Enter estimated hardwood basal area harvested/treated per acre	
Douglas-fir	50%	1.675	14.38	User must enter harvest cycles to 100 years and/or at least three entry cycles.	0	25	75	500	1	9	15
Redwood	50%	1.675	13.42		20	26	80	650	1	13	15
Pines	0%	2.254	12.14		40	26	85	700	0.75	13	15
True firs	0%	2.254	11.18		60	28	80	750	0.5	14	15
Hardwoods	0%	2.214	11.76		80	28	80	800	0.5	14	15
Conversion of Board Feet to Cubic Feet	0.165	Pounds per Metric Tonne	2.204		100	30	75	800	0.5	14	15
Multipliers to Estimate Total Carbon Tonnes per MBF	Conifer	1.74			0	0	0	0	0	0	0
	Hardwoods	1.95			0	0	0	0	0	0	0
Multipliers to Estimate Merchantable Carbon Tonnes per MBF	Conifer	1.04			0	0	0	0	0	0	0
	Hardwoods	0.88			0	0	0	0	0	0	0
Harvest Periods	Inventory Conversion to Carbon (prior to harvest)	Inventory Conversion to Carbon Dioxide Equivalent (prior to harvest)		Site Preparation							
	Conifer Live Tree Tonnes (C/acre)	Hardwood Live Trees Tonnes (C/acre)	Conifer Live Tree Tonnes (CO ₂ equivalent/acre)	Hardwood Live Tree Tonnes (CO ₂ equivalent/acre)	Step 8. Enter the value (in bold) for each harvest cycle that best reflects the site preparation activities, as averaged across the project area.						
from above (Time of Harvest as years from project approval)	Computed: MBF * Conifer Multiplier from Step 0.	Computed: BA*Volume*Basal Area Ratio (to convert to MBF) * Hardwood Multiplier from Step 0.	Computed: Conversion of carbon to CO ₂ (3.67 tonnes CO ₂ per 1 tonne Carbon)	Computed: Conversion of carbon to CO ₂ (3.67 tonnes CO ₂ per 1 tonne Carbon)	<p>Heavy- 50% or more of the project area is covered with brush and removed as part of site preparation or stumps are removed (mobile emissions estimated at .429 metric tonnes CO₂e per acre, biological emissions estimated at 2 metric tonnes CO₂e per acre)</p> <p>Medium - >25% <50% of the project area is covered with brush and removed as part of site preparation (mobile emissions estimated at .202 metric tonnes CO₂e per acre, biological emissions estimated at 1 metric tonne per acre).</p> <p>Light - 25% or less of the project area is covered with brush and is removed as part of site preparation (mobile emissions estimated at .09 metric tonnes CO₂e per acre, biological emissions estimated at .5 metric tonnes per acre).</p> <p>None - No site preparation is conducted.</p>						
0	44	11	160	40	light						
20	45	12	166	43	None						
40	45	12	166	46	light						
60	47	12	173	46	None						
80	49	12	179	43	light						
100	52	11	192	40	None						
0	0	0	0	0	None						
0	0	0	0	0	None						
0	0	0	0	0	None						
0	0	0	0	0	None						
Difference between ending stocks and beginning stocks			32	0.00	Sum of emissions (Metric Tonnes CO ₂ e) per acre						
					-1.77						

Project Carbon Accounting: Harvesting Emissions

This worksheet addresses the non-biological emissions associated with the project area's harvesting activities. Complete the input for Steps 9- 14 on this worksheet.

Harvest Periods	Falling Operations	Production per Day	Emissions Associated with Yarders and Loaders			Emissions Associated with Tractors and Skidders			Emissions Associated with Helicopters			Landing Saws	Trucking Emissions	
from Inventory, Growth, and Harvest Page (Time of Harvest as years from project approval)	Assumption: ((.25 gallons gasoline per MBF harvested * 5.33 (pounds carbon per gallon))/2205(conversion to metric tonnes)* mbf per acre harvested)	MBF (all species) Yarded Delivered to Landing Step 9. Enter the estimated volume delivered to the landing in a day.	Assumption: ((35 gallons diesel per day per piece of equipment * 6.12 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day			Assumption: (((55 gallons diesel per day per piece of equipment * 6.12 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day			Assumption: (((200 gallons jet fuel per day per piece of equipment * 5 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day			Assumption: (((.16 gallons gasoline per MBF * 5.33 (pounds carbon per gallon))/2205(conversion to metric tonnes)* 3.67 to convert to metric tonnes CO2 equivalent)/mbf per acre harvested. Applies to all species whether harvested or not.	Assumption: Round Trip Hours/Load average (from below, to compute the mbf/hour) /(6 gallons diesel/hour * 6.12 pounds carbon/gallon)/2205 (conversion to metric tonnes carbon))*3.67 (conversion to metric tonnes carbon dioxide equivalent)	
	Computed. Metric Tonnes CO2 equivalent per mbf harvested Applies to all species whether harvested or treated		Step 10. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Yarders and Loaders CO2 equivalent/mbf (metric tonnes)	Computed. Yarders and Loaders CO2 equivalent per Acre Harvested (metric tonnes)	Step 11. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Tractor and skidder CO2 equivalent/mbf (metric tonnes)	Computed. Tractors and Skidders CO2 equivalent per Acre Harvested (metric tonnes)	Step 12. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Helicopter CO2 equivalent/mbf (metric tonnes)	Computed. Helicopters CO2 equivalent per Acre Harvested (metric tonnes)	Computed. Landing Saws CO2 equivalent per Acre Harvested (metric tonnes)	Steps 13 and 14 below Step 13. Enter Estimated Load Average: MBF/Truck	Computed. Estimated Metric Tonnes CO2e per harvested acre for each harvesting period.
0	(0.02)	24	1	-0.01	-0.13	2	-0.05	-0.42	0	0.00	0.00	-0.01	4.5	-0.26644898
20	(0.03)	24	1	-0.01	-0.19	2	-0.05	-0.61	0	0.00	0.00	-0.02		-0.384870748
40	(0.03)	24	1	-0.01	-0.19	2	-0.05	-0.61	0	0.00	0.00	-0.02		-0.384870748
60	(0.03)	24	1	-0.01	-0.21	2	-0.05	-0.65	0	0.00	0.00	-0.02		-0.41447619
80	(0.03)	24	1	-0.01	-0.21	2	-0.05	-0.65	0	0.00	0.00	-0.02		-0.41447619
100	(0.03)	0	0	0.00	0.00	1	0.00	0.00	0	0.00	0.00	-0.02	8	-0.41447619
0	-	0	0	0.00	0.00	1	0.00	0.00	0	0.00	0.00	0.00		0
0	-	0	0	0.00	0.00	1	0.00	0.00	0	0.00	0.00	0.00		0
0	-	0	0	0.00	0.00	1	0.00	0.00	0	0.00	0.00	0.00		0
0	-	0	0	0.00	0.00	1	0.00	0.00	0	0.00	0.00	0.00		0
Sum Emissions	-0.19				-0.94			-2.94		0.00		-0.12		-2.28

Project Carbon Accounting: Harvested Wood Products and Processing Emissions

This worksheet addresses the non-biological emissions associated with the project area's harvesting activities. Complete the input for Steps 15- 16 on this worksheet.

Harvest Periods	Quantity of Forest Carbon Delivered to Mills				Non-Biological Emissions Associated with Mills	Quantity of Forest Carbon Remaining Immediately After Milling (Mill Efficiency)		Long-Term Sequestration in Wood Products	
	Conifer Percentage Delivered to Mills	Hardwood Percentage Delivered to Mills	Conifer CO2e Delivered to Mills / Acre	Hardwood CO2 equivalent Delivered to Mills / Acre	Assumption. 20 kw/hour (mill energy use) / (40mbf lumber processed/hour) * (.05 metric tonnes/kw hour) * mbf processed	Computed. Remaining CO2 equivalent after Milling Efficiency for Conifers	Computed. Remaining CO2 equivalent after Milling Efficiency for Hardwoods	Computed. CO2 Equivalent Tonnes in Conifer Wood Products in Use- 100 Year Weighted Average / Acre and Landfill	Computed. CO2 Equivalent Tonnes in Hardwood Wood Products in Use- 100 Year Weighted Average / Acre
from Inventory, Growth, and Harvest Page (Time of Harvest as years from project approval)	Step 15. Insert the percentage of conifer trees harvested that are subsequently delivered to sawmills	Step 16. Insert the percentage of hardwoods harvested or treated that are subsequently delivered to sawmills	Computed: The merchantable portion determined by the conversion factors (Sampson, 2002) on the Inventory, Growth, and Harvest worksheet. This is multiplied by the percent delivered to mills to reflect the carbon delivered to mills.	Computed: The merchantable portion determined by the conversion factors (Sampson, 2002) on the Inventory, Growth, and Harvest worksheet. This is multiplied by the percent delivered to mills to reflect the carbon delivered to mills.	Calculated. The CO2e associated with processing the logs at the mill	The difference between carbon delivered to mills and carbon remaining after milling is assumed to be emitted immediately		Estimate. The weighted average carbon remaining in use at year 100 is 46.3%	Estimate. The weighted average carbon remaining in use at year 100 is 23.0%
			Estimate. The carbon in landfills at year 100 is 29.8% of the initial carbon produced in wood products.			The efficiency rating from mills in California is 0.67 (DOE 1605b) for conifers	The efficiency rating from mills in California is .5 (DOE 1605b) for hardwoods	Estimate. The carbon in landfills at year 100 is 29.8% of the initial carbon produced in wood products.	Estimate. The carbon in landfills at year 100 is 29.8% of the initial carbon produced in wood products.
0	100%	0%	34.37	0.00	-0.23	23.03	0.00	17.52	0.00
20	100%	0%	49.65	0.00	-0.33	33.26	0.00	25.31	0.00
40	100%	0%	49.65	0.00	-0.33	33.26	0.00	25.31	0.00
60	100%	0%	53.47	0.00	-0.35	35.82	0.00	27.26	0.00
80	100%	0%	53.47	0.00	-0.35	35.82	0.00	27.26	0.00
100	100%	0%	53.47	0.00	-0.35	35.82	0.00	27.26	0.00
0	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum of emissions associate with processing of lumber					-1.93	Sum of CO2 equivalent in wood products		149.94	0.00

Summary			Years until Carbon Stocks are Recouped from Initial Harvest (Includes Carbon in Live Trees, Harvested Wood Products, and Landfill)
	Beginning Stocks	Ending Stocks	
Emissions Source/Sink/Reservoir	Metric Tonnes CO2 Equivalent Per Acre Basis		13 Years
Live Trees (Conifers and Hardwoods)	200.16	232.15	
Wood Products		149.94	
Site Preparation Emissions		-1.77	
Non-biological emissions associated with harvesting		-6.46	
Non-biological emissions associated with milling		-1.93	
Sum of Net Emissions/Sequestration over Identified Harvest Cycles (CO2 metric tonnes)		171.76	
Project Summary			
Project Acres	Step 17- Insert the acres that are part of the harvest area.	305	
Total Project Sequestration over defined Harvesting Periods (CO2 metric tonnes)		52,388	

Project Carbon Accounting: Inventory, Growth, and Harvest

This worksheet addresses the sequestration and emissions associated with the project area's balance of harvest, inventory, and growth plus any emissions associated with site preparation. Complete the input for Steps 0- 8 on this worksheet.

Forest Type				Harvest Periods		Inventory		Growth Rates		Harvest Volume								
Multipliers to Estimate Carbon Tonnes per MBF (Sampson, 2002)				Time of Harvest (years from project approval)		Conifer Live Tree Volume (MBF/Acre) - Prior to Harvest		Hardwood Live Tree Volume (BA square feet/Acre) - Prior to Harvest		Conifer Growth Rate (BF/Acre/Year)		Hardwood Growth Rate (BA/Acre/Year)		Conifer Harvest Volume (MBF/acre)		Hardwood Harvested / Treated Basal Area (BA/Acre)		
Forest Type	Step 0. Identify the approximate percentage of conifers by volume within the harvest plan. Must sum to 100%	Multiplier from Cubic Feet (merchantable) to Total Biomass	Pounds Carbon per Cubic Foot	Step 1. Enter the anticipated future harvest entries. The re-entry cycles should be supported by management plan, if available.	Step 2. Enter the estimated conifer inventory (mbf/acre) present in project area prior to harvest.	Step 3. Enter the estimated hardwood inventory (basal area per acre) present in project area prior to harvest.	Step 4. Enter the average annual periodic growth of conifers between harvests based on estimated growth in management plan, if available. Must be entered for each harvest cycle identified in Step 1.	Step 5. Insert average annual periodic growth of hardwoods between harvests based on estimated growth in management plan, if available.	Step 6. Enter the estimated conifer harvested per acre at current and future entries. The estimate should be based on projections from the management plan, if available.	Step 7. Enter estimated hardwood basal area harvested/treated per acre								
Douglas-fir	50%	1.675	14.38	User must enter harvest cycles to 100 years and/or at least three entry cycles.	0	25	75	0	0	25	75	0	0	0	0	0	0	
Redwood	50%	1.675	13.42		20	0	0	0	0	0	0	0	0	0	0	0	0	0
Pines	0%	2.254	12.14		40	0	0	0	0	0	0	0	0	0	0	0	0	0
True firs	0%	2.254	11.18		60	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardwoods	0%	2.214	11.76		80	0	0	0	0	0	0	0	0	0	0	0	0	0
Conversion of Board Feet to Cubic Feet	0.165	154	2,204		100	0	0	0	0	0	0	0	0	0	0	0	0	0
Multipliers to Estimate Total Carbon Tonnes per MBF	Conifer	1.74			0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardwoods	1.95			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Multipliers to Estimate Merchantable Carbon Tonnes per MBF	Conifer	1.04			0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardwoods	0.88			0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Harvest Periods	Inventory Conversion to Carbon (prior to harvest)		Inventory Conversion to Carbon Dioxide Equivalent (prior to harvest)		Site Preparation									
				from above (Time of Harvest as years from project approval)	Conifer Live Tree Tonnes (C/acre)	Hardwood Live Trees Tonnes (C/acre)	Conifer Live Tree Tonnes (CO ₂ equivalent/acre)	Hardwood Live Tree Tonnes (CO ₂ equivalent/acre)	Step 8. Enter the value (in bold) for each harvest cycle that best reflects the site preparation activities, as averaged across the project area.									
					Computed: MBF * Conifer Multiplier from Step 0.	Computed: BA*Volume/Basal Area Ratio (to convert to MBF) * Hardwood Multiplier from Step 0.	Computed: Conversion of carbon to CO ₂ (3.67 tonnes CO ₂ per 1 tonne Carbon)	Computed: Conversion of carbon to CO ₂ (3.67 tonnes CO ₂ per 1 tonne Carbon)	Heavy - 50% or more of the project area is covered with brush and removed as part of site preparation or stumps are removed (mobile emissions estimated at .429 metric tonnes CO ₂ e per acre, biological emissions estimated at 2 metric tonnes CO ₂ e per acre). Medium - >25% <50% of the project area is covered with brush and removed as part of site preparation (mobile emissions estimated at .202 metric tonnes CO ₂ e per acre, biological emissions estimated at 1 metric tonne per acre). Light - 25% or less of the project area is covered with brush and is removed as part of site preparation (mobile emissions estimated at .09 metric tonnes CO ₂ e per acre, biological emissions estimated at .5 metric tonnes per acre). None - No site preparation is conducted.									
					0	44	11	160	40	History	-2.49							
					20	0	0	0	None	0	0							
					40	0	0	0	None	0	0							
					60	0	0	0	None	0	0							
					80	0	0	0	None	0	0							
					100	0	0	0	None	0	0							
					0	0	0	0	None	0	0							
					0	0	0	0	None	0	0							
				0	0	0	0	None	0	0								
				0	0	0	0	None	0	0								
				Difference between ending stocks and beginning stocks		-160	-40.24	Sum of emissions (Metric Tonnes CO ₂ e) per acre		-2.49								

Project Carbon Accounting: Harvesting Emissions

This worksheet addresses the non-biological emissions associated with the project area's harvesting activities. Complete the input for Steps 9- 14 on this worksheet.

Harvest Periods	Falling Operations	Production per Day	Emissions Associated with Yarders and Loaders			Emissions Associated with Tractors and Skidders			Emissions Associated with Helicopters			Landing Saws	Trucking Emissions	
from Inventory, Growth, and Harvest Page (Time of Harvest as years from project approval)	Assumption: (((.25 gallons gasoline per MBF harvested * 5.33 (pounds carbon per gallon))/2205(conversion to metric tonnes)* mbf per acre harvested)	MBF (all species) Yarded Delivered to Landing Step 9. Enter the estimated volume delivered to the landing in a day.	Assumption: (((35 gallons diesel per day per piece of equipment * 6.12 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day			Assumption: (((55 gallons diesel per day per piece of equipment * 6.12 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day			Assumption: (((200 gallons jet fuel per day per piece of equipment * 5 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day			Assumption: (((.16 gallons gasoline per MBF * 5.33 (pounds carbon per gallon))/2205(conversion to metric tonnes)* 3.67 to convert to metric tonnes CO2 equivalent)/mbf per acre harvested. Applies to all species whether harvested or not.	Assumption: Round Trip Hours/Load average (from below, to compute the mbf/hour) /(6 gallons diesel/hour * 6.12 pounds carbon/gallon)/2205 (conversion to metric tonnes carbon))*3.67 (conversion to metric tonnes carbon dioxide equivalent)	
	Computed. Metric Tonnes CO2 equivalent per mbf harvested Applies to all species whether harvested or treated		Step 10. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Yarders and Loaders CO2 equivalent/mbf (metric tonnes)	Computed. Yarders and Loaders CO2 equivalent per Acre Harvested (metric tonnes)	Step 11. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Tractor and skidder CO2 equivalent/mbf (metric tonnes)	Computed. Tractors and Skidders CO2 equivalent per Acre Harvested (metric tonnes)	Step 12. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Helicopter CO2 equivalent/mbf (metric tonnes)	Computed. Helicopters CO2 equivalent per Acre Harvested (metric tonnes)	Computed. Landing Saws CO2 equivalent per Acre Harvested (metric tonnes)	Steps 13 and 14 below Step 13. Enter Estimated Load Average: MBF/Truck	Computed. Estimated Metric Tonnes CO2e per harvested acre for each harvesting period.
0	(0.07)	20	1	-0.02	-0.45	2	-0.06	-1.40	0	0.00	0.00	-0.04	4.5	-0.740136054
20	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00		0
40	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00		0
60	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00		0
80	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00		0
100	-	154	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00	8	0
0	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00		0
0	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00		0
0	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00		0
0	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00		0
Sum Emissions	-0.07				-0.45			-1.40			0.00	-0.04		-0.74

Project Carbon Accounting: Harvested Wood Products and Processing Emissions

This worksheet addresses the non-biological emissions associated with the project area's harvesting activities. Complete the input for Steps 15- 16 on this worksheet.

Harvest Periods	Quantity of Forest Carbon Delivered to Mills				Non-Biological Emissions Associated with Mills	Quantity of Forest Carbon Remaining Immediately After Milling (Mill Efficiency)		Long-Term Sequestration in Wood Products		
	Conifer Percentage Delivered to Mills	Hardwood Percentage Delivered to Mills	Conifer CO2e Delivered to Mills / Acre	Hardwood CO2 equivalent Delivered to Mills / Acre	Assumption. 20 kw/hour (mill energy use) / (40mbf lumber processed/hour) * (.05 metric tonnes/kw hour) * mbf processed	Computed. Remaining CO2 equivalent after Milling Efficiency for Conifers	Computed. Remaining CO2 equivalent after Milling Efficiency for Hardwoods	Computed. CO2 Equivalent Tonnes in Conifer Wood Products in Use-100 Year Weighted Average / Acre and Landfill	Computed. CO2 Equivalent Tonnes in Hardwood Wood Products in Use-100 Year Weighted Average / Acre	
from Inventory, Growth, and Harvest Page (Time of Harvest as years from project approval)	Step 15. Insert the percentage of conifer trees harvested that are subsequently delivered to sawmills	Step 16. Insert the percentage of hardwoods harvested or treated that are subsequently delivered to sawmills	Computed: The merchantable portion determined by the conversion factors (Sampson, 2002) on the Inventory, Growth, and Harvest worksheet. This is multiplied by the percent delivered to mills to reflect the carbon delivered to mills.	Computed: The merchantable portion determined by the conversion factors (Sampson, 2002) on the Inventory, Growth, and Harvest worksheet. This is multiplied by the percent delivered to mills to reflect the carbon delivered to mills.	Calculated. The CO2e associated with processing the logs at the mill	The difference between carbon delivered to mills and carbon remaining after milling is assumed to be emitted immediately	The efficiency rating from mills in California is 0.67 (DOE 1605b) for conifers	The efficiency rating from mills in California is .5 (DOE 1605b) for hardwoods	Estimate. The weighted average carbon remaining in use at year 100 is 46.3%	Estimate. The weighted average carbon remaining in use at year 100 is 23.0%
			Estimate. The carbon in landfills at year 100 is 29.8% of the initial carbon produced in wood products.	Estimate. The carbon in landfills at year 100 is 29.8% of the initial carbon produced in wood products.						
0	100%	0%	95.48	0.00	-0.63	63.97	0.00	48.68	0.00	
20	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
60	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
80	100%	15400%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
100	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0	100%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sum of emissions associate with processing of lumber					-0.63	Sum of CO2 equivalent in wood products		48.68	0.00	

Summary			Years until Carbon Stocks are Recouped from Initial Harvest (Includes Carbon in Live Trees, Harvested Wood Products, and Landfill)
	Beginning Stocks	Ending Stocks	
Emissions Source/Sink/Reservoir	Metric Tonnes CO2 Equivalent Per Acre Basis		101 Years
Live Trees (Conifers and Hardwoods)	200.16	FALSE	
Wood Products		48.68	
Site Preparation Emissions		-2.49	
Non-biological emissions associated with harvesting		-2.70	
Non-biological emissions associated with milling		-0.63	
Sum of Net Emissions/Sequestration over Identified Harvest Cycles (CO2 metric tonnes)		-157.29	
Project Summary			
Project Acres	Step 17- Insert the acres that are part of the harvest area.	154	
Total Project Sequestration over defined Harvesting Periods (CO2 metric tonnes)		(24,223)	

Project Carbon Accounting: Inventory, Growth, and Harvest

This worksheet addresses the sequestration and emissions associated with the project area's balance of harvest, inventory, and growth plus any emissions associated with site preparation. Complete the input for Steps 0- 8 on this worksheet.

Forest Type				Harvest Periods		Inventory		Growth Rates		Harvest Volume	
Multipliers to Estimate Carbon Tonnes per MBF (Sampson, 2002)				Time of Harvest (years from project approval)		Conifer Live Tree Volume (MBF/Acre) - Prior to Harvest	Hardwood Live Tree Volume (BA square feet/Acre) - Prior to Harvest	Conifer Growth Rate (BF/Acre/Year)	Hardwood Growth Rate (BA/Acre/Year)	Conifer Harvest Volume (MBF/acre)	Hardwood Harvested / Treated Basal Area (BA/Acre)
Forest Type	Step 0. Identify the approximate percentage of conifers by volume within the harvest plan. Must sum to 100%	Multiplier from Cubic Feet (merchantable) to Total Biomass	Pounds Carbon per Cubic Foot	Step 1. Enter the anticipated future harvest entries. The re-entry cycles should be supported by management plan, if available.	Step 2. Enter the estimated conifer inventory (mbf/acre) present in project area prior to harvest.	Step 3. Enter the estimated hardwood inventory (basal area per acre) present in project area prior to harvest.	Step 4. Enter the average annual periodic growth of conifers between harvests based on estimated growth in management plan, if available. Must be entered for each harvest cycle identified in Step 1.	Step 5. Insert average annual periodic growth of hardwoods between harvests based on estimated growth in management plan, if available.	Step 6. Enter the estimated conifer harvested per acre at current and future entries. The estimate should be based on projections from the management plan, if available.	Step 7. Enter estimated hardwood basal area harvested/treated per acre	
Douglas-fir	40%	1.675	14.38	User must enter harvest cycles to 100 years and/or at least three entry cycles.	0	25	75	700	0.4	0	0
Redwood	60%	1.675	13.42		20	39	83	850	0.25	0	0
Pines	0%	2.254	12.14		40	56	88	975	0.25	0	0
True firs	0%	2.254	11.18		60	75.5	93	1100	0.25	0	0
Hardwoods	0%	2.214	11.76		80	97.5	98	1250	0.25	0	0
Conversion of Board Feet to Cubic Feet	0.165	151	2,204		100	122.5	103	1250	0.25	0	0
Multipliers to Estimate Total Carbon Tonnes per MBF	Conifer	1.73			0	0	0	0	0	0	0
	Hardwoods	1.95			0	0	0	0	0	0	0
Multipliers to Estimate Merchantable Carbon Tonnes per MBF	Conifer	1.03			0	0	0	0	0	0	0
	Hardwoods	0.88			0	0	0	0	0	0	0
Harvest Periods	Inventory Conversion to Carbon (prior to harvest)	Inventory Conversion to Carbon Dioxide Equivalent (prior to harvest)		Site Preparation							
from above (Time of Harvest as years from project approval)	Conifer Live Tree Tonnes (C/acre)	Hardwood Live Trees Tonnes (C/acre)	Conifer Live Tree Tonnes (CO ₂ equivalent/acre)	Hardwood Live Tree Tonnes (CO ₂ equivalent/acre)	Step 8. Enter the value (in bold) for each harvest cycle that best reflects the site preparation activities, as averaged across the project area.						
	Computed: MBF * Conifer Multiplier from Step 0.	Computed: BA*Volume*Basal Area Ratio (to convert to MBF) * Hardwood Multiplier from Step 0.	Computed: Conversion of carbon to CO ₂ (3.67 tonnes CO2 per 1 tonne Carbon)	Computed: Conversion of carbon to CO ₂ (3.67 tonnes CO2 per 1 tonne Carbon)	Heavy - 50% or more of the project area is covered with brush and removed as part of site preparation or stumps are removed (mobile emissions estimated at .429 metric tonnes CO2e per acre, biological emissions estimated at 2 metric tonnes CO2e per acre)						
	0	43	11	159	Medium - >25% <50% of the project area is covered with brush and removed as part of site preparation (mobile emissions estimated at .202 metric tonnes CO2e per acre, biological emissions estimated at 1 metric tonne per acre).						
	20	68	12	248	Light - 25% or less of the project area is covered with brush and is removed as part of site preparation (mobile emissions estimated at .09 metric tonnes CO2e per acre, biological emissions estimated at .5 metric tonnes per acre).						
	40	97	13	356	None - No site preparation is conducted.						
	60	131	14	480	None						
	80	169	14	619	None						
	100	212	15	778	None						
	0	0	0	0	None						
	0	0	0	0	None						
0	0	0	0	None							
0	0	0	0	None							
Difference between ending stocks and beginning stocks			619	15.02	Sum of emissions (Metric Tonnes CO2e) per acre						

Project Carbon Accounting: Harvesting Emissions

This worksheet addresses the non-biological emissions associated with the project area's harvesting activities. Complete the input for Steps 9- 14 on this worksheet.

Harvest Periods	Falling Operations	Production per Day	Emissions Associated with Yarders and Loaders			Emissions Associated with Tractors and Skidders			Emissions Associated with Helicopters			Landing Saws	Trucking Emissions	
from Inventory, Growth, and Harvest Page (Time of Harvest as years from project approval)	Assumption: ((.25 gallons gasoline per MBF harvested * 5.33 (pounds carbon per gallon))/2205(conversion to metric tonnes)* mbf per acre harvested)	MBF (all species) Yarded Delivered to Landing Step 9. Enter the estimated volume delivered to the landing in a day.	Assumption: ((35 gallons diesel per day per piece of equipment * 6.12 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day			Assumption: (((55 gallons diesel per day per piece of equipment * 6.12 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day			Assumption: (((200 gallons jet fuel per day per piece of equipment * 5 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day			Assumption: (((.16 gallons gasoline per MBF * 5.33 (pounds carbon per gallon))/2205(conversion to metric tonnes)* 3.67 to convert to metric tonnes CO2 equivalent)/mbf per acre harvested. Applies to all species whether harvested or not.	Assumption: Round Trip Hours/Load average (from below, to compute the mbf/hour) /(6 gallons diesel/hour * 6.12 pounds carbon/gallon)/2205 (conversion to metric tonnes carbon))*3.67 (conversion to metric tonnes carbon dioxide equivalent)	
	Computed. Metric Tonnes CO2 equivalent per mbf harvested Applies to all species whether harvested or treated		Step 10. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Yarders and Loaders CO2 equivalent/mbf (metric tonnes)	Computed. Yarders and Loaders CO2 equivalent per Acre Harvested (metric tonnes)	Step 11. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Tractor and skidder CO2 equivalent/mbf (metric tonnes)	Computed. Tractors and Skidders CO2 equivalent per Acre Harvested (metric tonnes)	Step 12. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Helicopter CO2 equivalent/mbf (metric tonnes)	Computed. Helicopters CO2 equivalent per Acre Harvested (metric tonnes)	Computed. Landing Saws CO2 equivalent per Acre Harvested (metric tonnes)	Steps 13 and 14 below Step 13. Enter Estimated Load Average: MBF/Truck	Computed. Estimated Metric Tonnes CO2e per harvested acre for each harvesting period.
0	-	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.000001	0
20	-	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0
40	-	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0
60	-	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0
80	-	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0
100	-	151	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	8	0
0	-	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0
0	-	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0
0	-	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0
0	-	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0
Sum Emissions	0.00			0.00		0.00		0.00		0.00	0.00			0.00

Project Carbon Accounting: Harvested Wood Products and Processing Emissions

This worksheet addresses the non-biological emissions associated with the project area's harvesting activities. Complete the input for Steps 15- 16 on this worksheet.

Harvest Periods	Quantity of Forest Carbon Delivered to Mills				Non-Biological Emissions Associated with Mills	Quantity of Forest Carbon Remaining Immediately After Milling (Mill Efficiency)		Long-Term Sequestration in Wood Products	
	Conifer Percentage Delivered to Mills	Hardwood Percentage Delivered to Mills	Conifer CO2e Delivered to Mills / Acre	Hardwood CO2 equivalent Delivered to Mills / Acre	Assumption. 20 kw/hour (mill energy use) / (40mbf lumber processed/hour) * (.05 metric tonnes/kw hour) * mbf processed	Computed. Remaining CO2 equivalent after Milling Efficiency for Conifers	Computed. Remaining CO2 equivalent after Milling Efficiency for Hardwoods	Computed. CO2 Equivalent Tonnes in Conifer Wood Products in Use-100 Year Weighted Average / Acre and Landfill	Computed. CO2 Equivalent Tonnes in Hardwood Wood Products in Use-100 Year Weighted Average / Acre
from Inventory, Growth, and Harvest Page (Time of Harvest as years from project approval)	Step 15. Insert the percentage of conifer trees harvested that are subsequently delivered to sawmills	Step 16. Insert the percentage of hardwoods harvested or treated that are subsequently delivered to sawmills	Computed: The merchantable portion determined by the conversion factors (Sampson, 2002) on the Inventory, Growth, and Harvest worksheet. This is multiplied by the percent delivered to mills to reflect the carbon delivered to mills.	Computed: The merchantable portion determined by the conversion factors (Sampson, 2002) on the Inventory, Growth, and Harvest worksheet. This is multiplied by the percent delivered to mills to reflect the carbon delivered to mills.	Calculated. The CO2e associated with processing the logs at the mill	The difference between carbon delivered to mills and carbon remaining after milling is assumed to be emitted immediately		Estimate. The weighted average carbon remaining in use at year 100 is 46.3%	Estimate. The weighted average carbon remaining in use at year 100 is 23.0%
			Estimate. The carbon in landfills at year 100 is 29.8% of the initial carbon produced in wood products.			The efficiency rating from mills in California is 0.67 (DOE 1605b) for conifers	The efficiency rating from mills in California is .5 (DOE 1605b) for hardwoods	Estimate. The carbon in landfills at year 100 is 29.8% of the initial carbon produced in wood products.	Estimate. The carbon in landfills at year 100 is 29.8% of the initial carbon produced in wood products.
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80	0%	15100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum of emissions associate with processing of lumber					0.00	Sum of CO2 equivalent in wood products		0.00	0.00

Summary			Years until Carbon Stocks are Recouped from Initial Harvest (Includes Carbon in Live Trees, Harvested Wood Products, and Landfill)
	Beginning Stocks	Ending Stocks	
Emissions Source/Sink/Reservoir	Metric Tonnes CO2 Equivalent Per Acre Basis		1 Years
Live Trees (Conifers and Hardwoods)	199.06	833.47	
Wood Products		0.00	
Site Preparation Emissions		0.00	
Non-biological emissions associated with harvesting		0.00	
Non-biological emissions associated with milling		0.00	
Sum of Net Emissions/Sequestration over Identified Harvest Cycles (CO2 metric tonnes)		634.41	
Project Summary			
Project Acres	Step 17- Insert the acres that are part of the harvest area.	151	
Total Project Sequestration over defined Harvesting Periods (CO2 metric tonnes)		95,796	

APPENDIX S

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Trenching 08/15/2012-09/24/2012	0.08	0.91	0.32	0.00	0.00	0.03	0.03	0.00	0.03	0.03	109.17
Trenching Off Road Diesel	0.08	0.91	0.28	0.00	0.00	0.03	0.03	0.00	0.03	0.03	105.21
Trenching Worker Trips	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.96
Coating 08/27/2012-09/24/2012	40.37	0.03	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48.04
Architectural Coating	40.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.02	0.03	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48.04

Phase Assumptions

Phase: Fine Grading 5/28/2012 - 6/4/2012 - Vineyard Development - Smoothing of Soil Surface

Total Acres Disturbed: 173

Maximum Daily Acreage Disturbed: 43.25

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Mass Grading 4/2/2012 - 4/30/2012 - Reservoir Development

Total Acres Disturbed: 173

Maximum Daily Acreage Disturbed: 43.25

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day

0.3 Other General Industrial Equipment (238 hp) operating at a 0.51 load factor for 8 hours per day

2 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day

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- 1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day
- 2 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
- 2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
- 1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Mass Grading 5/2/2012 - 5/28/2012 - Vineyard Development - Initial Grading/Excavation

Total Acres Disturbed: 173

Maximum Daily Acreage Disturbed: 43.25

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

- 1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
- 1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day
- 1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Trenching 6/6/2012 - 8/13/2012 - Vineyard Development - Irrigation/Trellis Installation

Off-Road Equipment:

- 1 Concrete/Industrial Saws (10 hp) operating at a 0.73 load factor for 8 hours per day
- 1 Generator Sets (549 hp) operating at a 0.74 load factor for 8 hours per day
- 0.8 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
- 1 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
- 4.3 Other Material Handling Equipment (191 hp) operating at a 0.59 load factor for 8 hours per day
- 4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
- 1 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Trenching 8/15/2012 - 9/24/2012 - Vineyard Development - Planting

Off-Road Equipment:

- 1 Concrete/Industrial Saws (10 hp) operating at a 0.73 load factor for 8 hours per day
- 1 Generator Sets (549 hp) operating at a 0.74 load factor for 8 hours per day

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- 0.7 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
- 1 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
- 4 Other Material Handling Equipment (191 hp) operating at a 0.59 load factor for 8 hours per day
- 3 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day

Phase: Paving 8/13/2012 - 8/17/2012 - Paving of small area near Corp Yard

Acres to be Paved: 0.01

Off-Road Equipment:

- 4 Cement and Mortar Mixers (10 hp) operating at a 0.56 load factor for 6 hours per day
- 1 Pavers (100 hp) operating at a 0.62 load factor for 7 hours per day
- 1 Rollers (95 hp) operating at a 0.56 load factor for 7 hours per day
- 1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

Phase: Building Construction 8/1/2012 - 8/27/2012 - Corp Yard Building Construction

Off-Road Equipment:

- 1 Cranes (399 hp) operating at a 0.43 load factor for 7 hours per day
- 3 Forklifts (145 hp) operating at a 0.3 load factor for 8 hours per day
- 1 Generator Sets (49 hp) operating at a 0.74 load factor for 8 hours per day
- 3 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day
- 1 Welders (45 hp) operating at a 0.45 load factor for 8 hours per day

Phase: Architectural Coating 8/27/2012 - 9/24/2012 - Corp Yard Building Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: I:\Projects\Active\Sonoma County\Fairfax Conversion Project\Artesa EIR\Partially Recirculated ADEIR\Appendices\Appendix S_AQ\Artesa Vineyards - Operation and Maintenance Equipment GHG.urb924

Project Name: Artesa Vineyards - Operation and Maintenance Equipment

Project Location: Sonoma County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
2013 TOTALS (tons/year unmitigated)	0.03	0.28	0.15	0.00	0.00	0.01	0.01	0.00	0.01	0.01	46.26

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
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2013	0.03	0.28	0.15	0.00	0.00	0.01	0.01	0.00	0.01	0.01	46.26
Trenching 03/01/2013-05/10/2013	0.02	0.22	0.09	0.00	0.00	0.01	0.01	0.00	0.01	0.01	38.64
Trenching Off Road Diesel	0.02	0.22	0.08	0.00	0.00	0.01	0.01	0.00	0.01	0.01	37.33
Trenching Worker Trips	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30
Trenching 06/03/2013-07/16/2013	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82
Trenching Off Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trenching Worker Trips	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82
Trenching 07/22/2013-07/26/2013	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.79
Trenching Off Road Diesel	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67
Trenching Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
Trenching 10/21/2013-12/11/2013	0.01	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.01
Trenching Off Road Diesel	0.01	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.53
Trenching Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48

Phase Assumptions

Phase: Trenching 3/1/2013 - 5/10/2013 - ATV Use over the course of a year (~400 hrs)

Off-Road Equipment:

2 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

Phase: Trenching 6/3/2013 - 7/16/2013 - Farm Tractor Use over the course of a year (~250 hrs)

Off-Road Equipment:

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day

Phase: Trenching 7/22/2013 - 7/26/2013 - Harvest Tractor Use over the course of a year (~30 hrs)

Off-Road Equipment:

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

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Phase: Trenching 10/21/2013 - 12/11/2013 - Sump Pump Motor Use primarily during winter (~300 hrs)

Off-Road Equipment:

1 Pumps (53 hp) operating at a 0.74 load factor for 8 hours per day