METHOD OF STUDY

We first met with representatives of the East Kootenay Value Added Society (EKVAS) to clarify the objectives of the study and the intended outputs. We then undertook an extensive research program, which included:

- Interviews with 25 members of the East Kootenay Value Added Society
- A survey of other potential Co-op members and likely users of the portable dries facility.
- A review of several independent dry kiln studies and other materials relevant to the study.
- A survey of 5 custom kiln operators in B.C. and interviews with representatives of the various kiln associations in BC;
- Interviews with a sample of 20 companies involved in value-added activities, including sawmills, manufacturers, brokers, distributors and other selected experts in Canada and the U.S.;
- Development of capital and operating cost estimates for the proposed value added cooperative and kiln operations. In order to develop the capital and operating cost estimates, we obtained capital cost quotes from 4 kiln suppliers and other equipment suppliers.
- Explored possible ownership scenarios and advantages of hooking up with other Community Partners, including the College of the Rockies.
- Assessed the potential economic impact of the proposed kiln operation.

FEASIBILITY OF THE PROPOSED KILN

The major findings of our review with respect to the feasibility of the proposed kiln operation are as follows:

1. **The potential volumes that could be dried by a custom kiln operation in the East Kootenays are significant.**

   The strongest commitment for volumes to be put through the kiln in the first year is from Crestbrook Forest Industries (Tembec). Crestbrook expects that they could annually put through 7 million to 10 million board feet of lumber from their new Value Added Plant in Cranbrook. They will be producing 2 X 4 and 6 clear spruce and lodgepole pine.

   Based upon their existing production, it is expected that the **value-added producers** who participated in the original "Pilot Project" would put through 400,000 to 500,000 board feet in the first year. These producers expect that their volumes will increase sharply to over 800,000 board feet a year within a relatively short time after the kiln is built.

   As evidenced by the strong response to our dry kiln questionnaire, which indicated that 12 other members expect to process 900,000 board feet of lumber it is expected that a custom kiln operation would draw **new operators** into the value-added industry. However, because they do not have existing operations, these individuals can only provide soft commitments at this time to utilize the facility. Some **other companies** also indicated that there is potential for them to put significant volumes through a custom kiln operation. Annual volumes have been estimated as listed below:

ESTIMATED ANNUAL VOLUMES (assembled from survey)

	UNDER 150,000 FBM	OVER 150,000 FBM	TOTAL
Tembec (Cranbrook)			
➢ Clears from new VA plant		1,000,000	
➢ 2X4 & 6 clear spruce		3,300,000	
➢ 2X4 & 6 lodgepole pine		3,300,000	**7,600,000**
EKVAS Cooperative (Cranbrook)			
➢ Large construction timbers	40,000		
➢ Clear Italian window stock	50,000		
➢ #4 Window stock	40,000		
➢ Shop grade	100,000		
➢ Small export timbers	40,000		
➢ Clear edge strips	50,000		
➢ Door core	2,000		**462,000**
McDonalds Lumber(Grasmere)			
➢ 2X4 & 6 Construction grade		300,000	
➢ #3 & better T&G Cedar	26,000		
➢ #2 shop & better D-Fir	26,000		
➢ #2 shop & better Birch	14,400		**366,400**
Agnus Creek Lumber (Elkford)			
➢ Cedar – various grades	30,000		
➢ Larch flooring	60,000		
➢ Cottonwood – various grades	15,000		
➢ Birch – various grades	15,000		
➢ Lodgepole pine – various grades	45,000		**165,000**
Moreau Lumber (Cranbrook)			
➢ #3 & better spruce	35,000		
➢ #3 & better larch (some clears)	50,000		
➢ #3 & better D-fir (some clears)	30,000		
➢ #3 & better Cottonwood	1,000		
➢ #3 & better Balsam	10,000		
➢ #3 & better Yellow pine	4,000		**130,000**
Spiritwood Products (Cranbrook)			
➢ 3X3 lumber – any species/grade	80,000		80,000
River City Woodworks (Fernie)			
➢ 1X4 & 6 Clear fir larch & pine	60,000		**60,000**
Broad Boards Lumber (Jaffrey)			
➢ White Pine – various grades	10,000		
➢ Larch – various grades	25,000		**35,000**
5 other respondents - small operators			
➢ Various grades & species	20,000		**20,000**
Additional volumes expected from others once kiln is built @ 15% of Total (excluding Tembec)	185,000		**185,000**
TOTALS	**1,203,400**	**7,900,000**	**9,103,400**

PRELIMINARY DESIGN AND PROJECTED CAPITAL COSTS

The preliminary kiln facility design was based on information drawn from interviews with association members, other potential users,

1. Kiln Location:

The East Kootenay Value Added Society has members throughout the East Kootenay area, from Elko to Golden. When surveying the members, numerous sites were mentioned as possible locations for the kiln facility. The factors that should be considered in the selection of the kiln location are:

1. The site must have access to 3-phase power as well as highway and possibly rail access.

2. It should be located close to a facility or partner with whom it can share manpower if required. Operation of the kiln itself is not a full time job. Most custom kiln operations provide a range of services.

3. To effectively minimize labour costs in the absence of other services, it would be useful to co-locate the kiln with another operation or facility that could use these workers and perhaps could share equipment such as a forklift.

4. The location should be consistent with the needs of the major customers

5. Land should be available at the site to support future expansion

SITE CRITERION ANALYSIS

The facility is likely best located in the immediate Cranbrook area given that both major potential users (EKVAS and Tembec) expressed a strong preference for this location. EKVAS also uses the planer facilities of the College of the Rockies in Cranbrook as a sorting, grading and distribution site for its production. It may be possible to complement this facility by establishing one or more small kilns in other areas of the region at a later date.

A description of some of the assumptions underlying this estimate is provided below:

- The site paving costs were derived using a formula given by the Cranbrook office of ,based on tons of asphalt, price per ton (given as $dollars/ton) and an estimation of the site size.

- The required green Storage/Stickering area is a function of the pack size (figures given by …….), the kiln charge size (estimated by the dimension of ,and the area required for green stickering wood (given by Tembec Forest Industries). Then dry storage area was calculated using the rule of thumb given by and work flow and shipping requirements. As outlined earlier, the required size for the green storage stickered area is 14,000 square feet, the required dry storage are is 28,000 square fee, the kiln are is 2,600 square fee, the work flow area (kiln loading etc.) is 2,400 square feet, and the paved area for shipping is 10,000 square feet giving a total of 57,000 square feet for the kiln facility site area.

- Dry storage costs were based on truss estimates for a 28,000 square foot building, for a rough post and beam costs. Truss costs are $3.00 per square foot, posts and beams double the cost to $6.00 per square foot.

- The kiln, wiring, piping, concrete and installation costs are based on figures provided by Koetter Dry Kiln. The quotes from obtained from Koetter were $ for a 53,000 bft charge load kiln and $ for a 19,000 bft chare load kiln. We used an exchange rate of $1.40 Canadian per $1 US.

- The selection of the kiln supplier will be further examined when the business plan is developed. For the purposes of this study, the Vacuum kiln was selected because a prefabricated kit model was preferred, it's capital costs are well developed and would identify maximum construction costs, and because this is new age technology that appears to be the way of the future. It is also the preferred method of drying wood in Europe. Primary concern is the learning curve associated with this new technology and environmental issues.
- The cost of Industrial land in the Cranbrook Industrial Park is approximately $25,000-$35,000 per acre which is equal to $50,000 to $60,000 for a two acre parcel.

- The contingency amount is based on extra costs to prepare the site plus an additional $50,000 of the total costs to cover cost overruns, legal and items not included.

PROJECTED OPERATING COSTS

There are three types of operating costs associated with a kiln operation, two of which are variable in nature and one of which is fixed.

Some costs vary per charge and are not affected by how long the wood is in the kiln. These include the costs of stickering and destickering as well as the costs of loading and unlaoding the kiln.

Some costs vary depending upon the kiln time (how long the wood is in the kiln). This includes energy costs and the costs of managing the wood while it is in the kiln.

Some costs are fixed and do not vary depending upon how many charges are put through or how long the cycles are. These costs would include maintenance, insurance and depreciation.

A description of these costs is provided in the following paragraphs.

1. Per Charge Costs

The cost per charge is projected to be $1,250.00 per charge as outlined below:

PROJECTED OPERATING COSTS PER CHARGE

	Estimated Per Charge Costs		
	Large Charge 50,000 bft	**Small Charge 18,000 bft**	**Combined 68,000 bft**
Stickering:			
➢ Materials, sticks and bolsters	700	$253	889
➢ Labour, stickering & destickering	654	235	889
	1,354	488	1,842
Load/unload:			
➢ Fork lift, fuel	70	25	95
➢ Fork lift, labour	46	17	63
	116	42	158
Miscellaneous	75	35	110
Total	**1,545**	**$ 565**	**$2,110**

The assumptions underlying the per charge cost projections include:

- The load sizes are in accordance with the kilns supplied by ISO. These kilns approximate the 50 bft and 18,000 bft required. The exact charge sizes are 52, bft and 18,850 bft respectively.

- The stickering material costs were derived from per stick and per bolster costs given by Tembec Forest Products. The sticks can range in price from .38 to .65 each. The .38 sticks can be 11/16 think by 1 ½ inches wide and 47 ¾ inches long. The .65 sticks can be ¾ or 7/8 inches think and 2 ½ inches in width. According to Tembec it is better to buy the more expensive sticks as they are more durable and typically last 10 kiln charges. Kiln sticks, for both soft and hardwoods, according to Tembec, are placed every 2 ft/layer/package of wood. This amounts to approximately 9,972 sticks/52,300 bft charge and 3,600 kiln sticks/18,850 bft charge. Bolsters are placed under the load, between the packages of wood and on top of the load. There are approximately 433-required/52,300 bft charge and 156 required/18,850 bft charge. Assuming a 10 kiln charge life for both the sticks and the bolsters, the actual stick and bolster costs of materials per charge can be divided by 10; therefore, the effective per load cost is $700/52,300 bft charge and $253/18,500 charge.

- The stickering labour rate was derived from manual stickering time estimates given by Tembec and a nominal $10.00 labour rate. It should be noted that the $10.00 labour rate was assumed for the ease of calculations and a untion rate of approximately $12.00 to $14.00 may be a more realistic amount. The manual sticking time given by Tembec as 30 minutes for every 800 bft, in other workds it takes 30 minutes to stick 2 packages of wood (1,600 bft/hour).

- The forklift figures were calculated from fuel costs estimates given by Fi8nning Equipment and labour time estimates given by Tembec. Finning estimated $15.00/hour for fuel cost, if propane was used. Tembec estimated that it would take 2 hours for a fork lift operator to load and unload a 45,000 bft kiln charge (22,500 bft/hour).

- The miscellaneous category would include the cost of banding, truck loading and unloading, and time associated with invoicing for loads.

The kiln operation could also charge users for wrapping their kiln-dried lumber. According to industry sources, the cost of this services ranges from $10 to $1`2.00 per thousand board feet (including $7 to $8 for paper costs and $3 to $5 per thousand board feet for labour). Because the costs are expected to be directly recouped from the customers, we have not included the wrapping expense in the per charge costs.

2. Kiln Time Costs

We have calculated kiln time costs on a per diem basis to reflect the fact that costs vary depending upon how long the wood is in the kiln. For example wood that takes 14 days to dry may incur much higher energy costs than wood that takes 4 to 5 days to dry. Kiln time includes the cost of energy and the cost associated with monitoring the wood while it is in the kiln.

It is estimated that it costs $200 per day to operate the kilns, as shown below:

ESTIMATED KILN TIME COSTS PER DAY

	Estimated Daily Kiln Costs		
	Large Charge 50,000 bft	**Small Charge 18,000 bft**	**Combined 68,000 bft**
Gas	46	23	63
Electricity	78	39	107
Labour	25	25	50
Total	150	97	247

The assumptions underlying these projections are as follows:

Electricity costs were derived from usage figures supplied by and rates given by B.C. Hydro. As for usage, it is estimated to take approximately kwh to operate the vacume kiln to dry a kiln charge of 110,000 bft of wood. This usage can e spread over any number of days depending on the moisture in the wood, level of heat and the fan speed. The rate for electricity is .65/kwh. Electricity costs for the largest kiln would then total approximately $390 for the large 52,300 kiln charge, which ould be equal to $78.00 per day if we assume a five day cycle.

Labour cost to oversee the daily kiln operation is estimated using the $25.00 hourly rate. It will take approximately 1 hour/kiln/day for kiln management.

3. Fixed Costs

In addition to the per charge and kiln time variable costs, there are some costs that are fixed and do not vary depending upon how many charges are put through or how long the cycles are. As indicated below, we estimate the fixed costs will total about $178,000 annually.

ANNUAL COSTS AND GENERAL EXPENSES

Cost Item	**Amount**
Maintenance	3,850
Facility Insurance	8,000
Electricity, fixed portion	225
Forklift leasing	9,600
Telephone & office	3,500
Miscellaneous	5,000
Interest Costs	30,000
Total	**60,175**

The assumptions underlying these cost projections include:

- The maintenance expenses are comprised of facility painting, mechanical checks and yard maintenance. The cost of kiln site painting/staining/preserving was estimated at $2,000 for labor and $1,700 for materials to be done every two years. ($1,850.00 per year) Mechanical check costs are estimated at $1,000 per year. Other yard maintenance was simply estimated at $1,000 per year.

- Facility insurance costs were estimated to be $665.00 per month, if the facility did not have any remanufacturing facilities. Further clarification of insurance rates can be obtained from Jardine and Jardine in Victoria (250) 388-4416)

- The fixed portion of electricity costs were given by C.C. Hydro at $8.29/bi-monthly

- Forklift leasing costs are $800.00/month for a new Cat GP 40, given by Finning Tractor. This costing was based on an 8,000-lb machine, used on average, less than 2 hours/day.

- Financing costs are based on a debt load of $250,000 at 10% per annum simple interest.

4. Prices to be charged

Of particular interest to the Value-added Society and many of the survey respondents is the price that the proposed kiln operation would have to charge. The price has to be sufficient to:

- Cover the per charge costs and the kiln time costs

- Contribute towards the fixed overhead costs

- Provide a return on capital, which could be used in part to pay for financing charges.

- Generate sufficient surplus to finance future growth and ensure proper working capital levels

The price will vary depending upon the amount of time that the wood is in the kiln, which itself is a function of the moisture content when the wood enters the kiln and the target moisture content. It will also vary depending upon capacity utilization; if capacity utilization is low the markup on per charge and kiln time costs has to be higher in order to cover the fixed overhead costs.

We have developed the following table in order to demonstrate how the price per thousand-board feet would vary depending upon the number of days in the kiln and the capacity utilization rates.

VARIATIONS IN REQUIRED PRICES PER THOUSAND BOARD FEET BASED ON DAYS IN KILN AND AVERAGE CAPACITY UTILIZATION

Number of days in kiln	Capacity Utilization			
	70%	80%	90%	100%
3	79	74	70	67
5	112	103	97	92
10	194	177	164	154
15	276	251	231	216
30	522	472	433	402

As indicated, if the facility operated at 80% capacity over the course of the year, it would have to charge $103 per thousand board feet for a five day load average in order to cover variable and fixed costs and to provide a 10% return on capital and cover interest costs. In developing this table, we assumed that the revenues would provide for a return on capital of $35,000 as indicated below.

PROJECTED NET INCOME STATEMENT
ASSUMING 80% CAPACITY AND 5 DAY CHARGES

Assumptions

➢ Capacity Utilization	80%
➢ Number of Days per charge	5
➢ Board feet Dried Annually	1,200,000
➢ Average Price per Mbf	$170.56

	Dollars	Percent	Per Mbf
Revenue	**$204,675**	**100.0%**	**$170.56**
Per Charge and Kiln Time Charges			
➢ Stickering Materials	26,600	13.0%	22.17
➢ Kiln Time Energy	12,000	5.8%	10.00
➢ Forklift Fuel	2,600	1.3%	2.17
➢ Labour			
➢ Stickering	24,800	12.1%	20.67
➢ Forklift	18,420	.9%	15.35
➢ Kiln management	7,000	3.4%	5.83
➢ Miscellaneous	3,000	1.5%	2.50
	94,420	**46.1%**	**$78.69**
Contribution Margin	**110,255**	**53.9%**	**$91.87**
Fixed & General Expenses			
➢ Maintenance	3,850	1.9%	3.21
➢ Facility Insurance	8,000	3.9	6.67
➢ Electricity (fixed portion)	225	.11%	.19
➢ Forklift lease	9,600	4.7%	8.00
➢ Telephone and office	3,500	1.7%	2.92
➢ Debt Servicing	71,500	34.9%	59.58
	96,675	**47.2%**	**$80.57**
Surplus	**13,580**	**6.7%**	**$11.30**

VACUUM DRYING - "THE SAFEST WAY"

Vacuum technology applied to wood drying permits extremely rapid drying times with:

low temperatures in the wood being dried,
limited humidity gradients between the inside and the surface ,
the elimination of the risk of cracking, collapses and colour changes,
easy running,
and reduced plant maintenance.

The extremely compact nature of the plant, the absence of any preparatory brick-work, the low amount of space required, and the high second-hand value all limit the initial investment risks.

The low rated power, simplicity of installation, and the limited complexity of the plant, reduce the start-up time and personnel training times to just a few hours.

THE I.S.V.E. VACUUM DRYING KILN - "THE MOST RELIABLE"

The desired final humidity content can be obtained for all types of wood, combined with excellent quality.
It dries boards or semi-finished products according to the user's requirements.
The presence of condensers reduces the use of the vacuum pump to the minimum indispensable amount, giving minimum electrical consumption and less wear on mechanical components.
The external insulation and the thermal dispersion reduce consumption, the effect of the ambient temperature on the drying progress and reduce condensation on the internal walls of the autoclave protecting its paintwork.
The use of materials such as stainless steel and aluminium in all the parts especially exposed to corrosion guarantees long life and low maintenance.
The low operating costs make the grouping and interlocking of several autoclaves to one single command group useless which also conditions programming and limits the elasticity of the system.

EMV TECHNOLOGY - "THE MOST UP-TO-DATE"

This model encapsulates all the experience of I.S.V.E. acquired in the production of continual vacuum drying kiln production with heating plates and a discontinuous vacuum without heating plates.
These kilns combine simple loading and unloading using a fork-lift truck and uniform wood heating as takes place in drying kilns with heated plates.
A device connected to suitable probes permits the reading and programming of the temperature and humidity of the internal chamber, the humidity of the wood drying and the temperature of the condensers by adopting the drying process to the characteristics of the material with automated management.
The simple construction, the low number of moving parts, the abundance of rust-proof materials and the process automation permit the use of unskilled personnel in the drying of the wood.
The monolithic nature of the plant and the simplicity of the connections - cold water, waste water discharge - do not condition the lay-out to the detriment of production requirements.