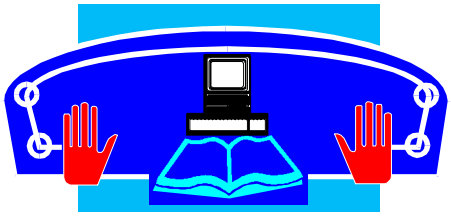

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Feasibility Study For An Aklavik Fur Atnnery
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FINDINGS AND RECOMMENDATIONS

Major Findings and Recommendations

1. A fur tannery located in Aklavik can be a viable business. However, in order to operate and be successful, several things are necessary:

   1) Tanneries operate primarily on a custom work basis. An Aklavik tannery must be assured of the western Arctic supply of furs to dress on a custom basis. In order to facilitate this it will be necessary for the Government of the N.W. T. to establish a procurement system for the furs of the western Arctic to be dressed on a fee basis by the Aklavik tannery.
   2) The major market for the furs from the tannery will be the crafts and garment manufacturing industries and people of the north. In order to realize this market, the cottage and garment manufacturing industries must be encouraged through special programs and assistance.
   3) The markets for the products demand top quality. Inferior quality fur products will not find a market. This will require excellent workmanship and high quality dressed fur.
   4) Operating a fine fur tannery to turn out a quality dressed fur is an art that few possess. It will be necessary for the Aklavik operation to locate and hire an expert tanner. The tanner will be in charge of the tannery and will train the staff on the various job functions.
   5) Approximately one year before the tannery begins operating, it is recommended that a person from the community be selected to be the flesher. An arrangement should then be made with one of the southern tanneries, preferrably in Winnipeg, to send this person down for at least one years training prior to commencing the operation at Aklavik.

6) The tanner should be hired shortly after the decision is made to proceed with the tannery. The tanner should then assume control of the building construction, equipment purchasing, chemicals and other materials ordering and help to set Up the fur procurement system.

7) A minimum one-year lead time should be made available for all of the construction materials, equipment purchasing and planning necessary for good start-up.

8) Sufficient capital should be made available for the planning period, for all inventory and equipment purchasing and for the initial period of operating. The tannery should then be operated as a profit making enterprise using sound business management principals and independent of government subsidy.

9) Unless dressed furs are made available to the northern crafts people andgarmet manufacturing industries, northern fur products will not be made or be manufactured in the small quantities as they are now made. The skills which some of the craftspeople now have to work with fine furs will be lost.

10) Northern and Arctic furs are superior in quality. They can, in the form of products, be marketed as a superior and differentiated product. They should be retained in the North for the manufacturing of northern products by northern people.

11) Northern furs can be made available in dressed form to northern people by one or twomethods:

a) Obtained, at auction bloc prices, from trappers through a central procurement system, to be dressed in an N. W. T. located tannery.

b) obtained, at auction bloc prices, from trappers through a central procurement system, to be dressed on a custom basis in a southern tannery, to be returned to the N. W. T. for local use.

12) The tannery should be designed to initially dress approximately 90, ØØØ furskins annually. The plant design should be modular in order to easily accomodate future potential growth. Ninety thousand furskins represent approximately 50% of the average

annual fur harvest from the western N.W. T. This is the recommended scale of operation since it is unlikely that all of the western Arctic furs will be available for the tannery even with a central procurement system.

13) Aklavik is a good location for a fine fur tannery. It is at the heart of an abundant fur 'narvest area: through the local crafts industry, it has a ready demand for the dressed furs; there is an abundant supply of labour from Aklavik that would be available to fill the positions at the plant; the water supply and effluent discharge system are adequate for the refinery; although isolated, there is a winter road for ma jor supply requirernents and good air serviceat other times of year; and its major advantage is its unique location. This will enable market differentiation for Aklavik dressed furs bound for southern markets.

supply of Furs

1. The prime season for northern furskins are from early December to the end of May. This represents the time period the tannery would be receiving most of its furs. Proper storage and presentation of the dressed furs will be necessary in order to stage the dressing throughout the year.

2. The communi' ties of the north western Arctic together harvest a large number of furs from a variety of species on an annual basis. The Delta communities produce more furs for fine fur tanning than other areas of the N.W. T. The average number of pelts harvested over a five year period in the Inuvik region is estimated at 115,000. Over 8Ø% of all pelts are muskrat. There are large seasonal variations in the total pelt harvest. The most recent estimates for the 1986-87 seaso$_n$ indicate a large harvest of 112,000 for muskrat alone.

3. Fur price fluctuations and availability of alternate employment are two of the leading variables that affect the numbers of pelts harvested in the N .W T.

4. The total western N. W. T. estimated average annual harvest , is approximately 180,000 furskins. This number can vary considerably from one year to the next.

5. Virtually all furs are marketed through southern auction markets. The trappers sell their furs to local buyers or to the G.N.W.T. Renewable Resources. Theseinturn, ship them to the southern auctions and ultimately end up all over the world.

6. Prices are set on the auction bloc by the degree of competition amongst the buyers, many of which are international. Prices fluctuate tremendously. The last season, 1986-87, prices were considered to be very high. This was due to buying pressure from overseas, mainly far east buyers.

7. It is virtually impassible to predict future fur prices because of the very volatile nature of the markets and the total lack of control and predictability of the variables that affect prices. A best guess suggests that prices may not vary considerably over a five year period.

9. It is recommended that a procurement system be established to obtain the furs of the western N.W. T. for a potential tannery in Aklavik. The system should contain the following:
   i) be administered through changes to the existing G. N.W. T. fur buying system,
   ii) allow opportunity for other licensed buyers to participate,
   iii) buy at estimated auction bloc prices,
   iv) be accessible to all trappers, and
   v) make all furs available directly to the tannery.

9. It is recommended, when necessary, that furs from other jurisdictions such as the Yukon, or purchased through the auction bloc, be used to supplement the fur supply to the tannery.

10. It is recommended that, as necessary and desirable, the tannery supplement its workload through tanning for others on a custom basis. This would be for, local residents who want hides for domestic use, and as well custom orders from southern manufacturers.

Markets

1. It is recommended that the primary market for dressed furs from a tannery be the western Arctic garment and crafts industry. The secondary market would be other northern manufacturers such as the Inuvik Parka Factory and Yukon Native Products. Additional markets would be with southern manufacturers.

2. It is recommended that the G. N. W. T. take a lead role in organizing the production of fur garments and other craft products in the delta communities, particularly in Aklavik, where the tannery would be located. In Aklavik, many women possess the skills and have the equipment necessary for the production of quality fur garmets. Without some form of outside organization, the production potential will not be realized and local demand for dressed furs will not realize its potential.

3. High and increasing prices will have both a beneficial and negative impact on the operation of a northern tannery. They will result in more trappers and thus a greater supply of raw furs. However, they will also reduce demand for the products manufactured from the dressed furs. Low and decreasing prices will have the opposite impact.

4. It is recommended that along with the organization of production, a quality control system be implemented. In order to be marketable at good prices, the products must be of high quality workmanship made from top quality tanned pelts.

5. A potential annual demand forecast fortressed furs in all markets is 113,200 mustrats and 22,600 furs other than muskrat. This can only be realized through Stimulation of the local crafts industry and through effective marketing in other markets.

6. A tannery should not be built unless the demand for the product of the tannery, the dressed furs, is first created in the local cottage and garmet manufacturing industries. Without these local markets, it would be too difficult to market all the product of the tannery to southern users.

Labour Requirements

1. It is likely that the more significant economic benefits will be realized through the stimulus the tannery will create with the local crafts people than at the tannery itself.

2. The basic positions required to operate a tannery from start-up in Aklavik are the following:
   - Tanner: highly skilled, will eventually manage the operation.
   - Tanner Trainee (s): to learn the skills of the Tanner.
   - Buyer/Salesperson: to purchase raw furs and sell to the various markets.
   - Flesher: requires extensive on-the-job training.
   - Labourer(s): for many variou jobs.
   - Bookeeper/Secretary.

   Not all job functions need be separate. For example, the tannery and buyer/salesperson could be combined.

3. It is recommended that a well experienced master tanner be hired from outside the Delta and that all other positions be filled as a first choice from Aklavik residents and as a second choice from res idents of other Delta communities. All necessary skills can be acquired 'through

on-tie- job training supplemented with select courses. The flesher need to be trained at another tannery or by bringing in an experienced flesher to train or by the tanner if he/she possesses the expertise.

4. The total number of jobs that will be created at the tannery will vary considerably depending on the scale of the operation. It is anticipated that approximately six to eight positions will be required if the tannery opens at the recommended scale. Experience may necessitate variations to this number.

Fur Dressing

1. Although there are alternative methods of tanning furskins, modern methods require the use of relatively large quantities of chemicals in order to produce good quality furs.

2. When the raw (usually dried) fur arrives at the tannery it is prepared for tanning through a process of soaking to re-hydrate the skin and then fleshing to remove unwanted layers of fat, flesh and skin from the hide. The fur is then dressed through alternative and/or combined prccesses of acid pickling, chrome tanning, fermentation or meal dressing and formaldehyde dressing. Once dressed the final preparation involves oiling, drumming, bleaching, glazing, beating, carding, brushing, combing, ironing, stretching, and removal of excess fat and hair.

Production Requirements

1. A new building of between 7,000 and 10, ØØØ square feet till be required for the tannery. A well insulated, metal structure set on a cement pad is required. Northern architects and engineers estimate the cost of the building fully serviced with inner partitions to be approximately

$70.00/sq. ft . For the recommended level of operation the cost of the building would be approximately $500, 000.

2. Most of the required equipment will have to be purchased new from Europe . Some used equipment may be available in North America. The plan will require a large variety of specific equipment. It will take several months from order to receive the equipment. Total equipment costs including office equipment, for the recomm ended scale of operation and with new equipment will be in the neighborhood of $435,000.

3. The production material inputs include sawdust, chemicals and salt. The costs of these on an annual basis are anticipated to be in the neighborhood of $100, 000.

4. Ef feet on environmental and personnel safety controls measures will need to be implemented and enforced.

1.0 INTRODUCTION

1.1 Background

In their traditional setting, the indigenous people of the north lived entirely from their surroundings. They were hunters and often led a nomadic life. Winter Was spent in a snow house, and during the summer they travelled to inland camps where they hunted. Their diet consisted largely of seal or caribou mat depending on the season. Animals provided more than food. Animal skins provided mobile shelter, and boats during the sum=. Caribou fur was used f r inking parkas and pants, and sealskin was used for bmts. Bird bones made needles, sinew was used as thread, and animal fat was rendered into oil and poured over a row of mossy, wick-like substance to produce a long, low flame supplying heat and light. Livelihood and survival was based extensively on wildlife.

With the early explorers came the arctic fur trade. Trapping became as important activity as hunting for food. Pelts were used to pay for imported goods such as foodstuffs (flour, tea, sugar, tobacco, etc.) .

Hunting and trapping evolved to become an important part of the northern peoples existence and their economy. It provided the people a source of cash income, not only from raw furs, but also from the crafts and garments made by the women.

Commercial trapping by the native people in the MackenzieDelta dates back to the 1840 ‘s. The establishment of the Aklavik post (1924) in the heart of the muskrat territory of the delta, emphasized for line first time the economic importance of the delta for muskrat fur. The Hudson’s Bay Company's fur trading post at Fort McPherson was instrumental in setting up fur trading in the North .

Today furs are bought and sold at large auction blocs in the south . The vast majority of the furs harvested in the N.W. T. are marketed at these auctions through the Department of Renewable Resources, under the G. N. W. T. Fur Marketing Service. Some furs are held for domestic use or sold to other outlets. Currently the N.W. T. imports tanned leather and furs to supply the local craft industry. A certain amount of traditional Native tanning is still being done, however the quality is inferior to the dressed hides of expert tanning, which is required for saleable fur products.

Well skilled crafts peop' that produce authentic fur garments and products have to rely on the tanned furs from the southern tanneries. These furs are very expensive due to the intermediary mark-ups and transportation costs . As a result, fur crafts products are not extensively produced because of the high cost of dressed furs. What could be a lucrative craft industry is now basically run on a custom order basis. The furs arepre-purchased by the customers.

The tanning of fur pelts and leather is a very complex and highly skilled process. Although there is sane overlap in equipment requirements for troth leather and fur tanning, each process requires additional specialized equipment and chemicals. A s a result, capital requirements and variable costs for a dual tarming operation would be quite high. This study focuses on the feasibility of establishing a fur tannery.

1.2 Ob jectives

The primary objective of this study is to determine the feasibility of establishing a tannery, and market for the products from a tannery in Aklavik. More specific objectives are to:

- determine the quantities of fur bearing animals which are available to a tannery in Aklavik;

identify the prime season f@ each species, and identify which species are available in sufficient quantities for the tannery;
identify the potential market for tanned furs which could be produced in an Aklavik tannery using the Mackenzie Delta as the primary market, and the Western Arctic as t??e secondary market;
determine the characteristics of the markets for the products including present and pro jected future demand, prices for tanned furs, competing suppliers, and ma jor purchasers;
determine the skills required to operate a tannery, and identify labor and skill availability in Aklavik;
determine how necessary skills could be acquired, and prepare a job description for each position;
evaluate Aklavik as a location for a tannery based on the above, as well as on the availability of transportation systems, community infrastmcture, land, water and other requirements;
give specific recommendations on which fur species should be used, target market, skills required and advantages of Aklavik as a tannery site;
identify capital and operational requirements for production:
identify available buildings appropriate to house a tannery, determine costs of the building and equipment, and associated costs ;
identify and describe tanning processes;
identify the supplies and quantities required for the inputs in the tanni' ng process;
identify all the operational expenses;
design an operational plan including pro forma income statements ;
prepare long-term financial and operational analysis, including five and ten year pro forma income statements; and
address the viability of the operation and design a marketing plan .

2.Ø RAW FURS

2.1 Trapping, Shooting and Processing of Furs

A wide variety of forbearing animals are harvested in the Mackenzie Delta and other regions of the N.W. T. The vast majority of the pelts are harvested for commercial trade. Some pelts are also used for domestic purposes.

Although annual harvests of most pelt species fluctuate widely, the following furbearers account for most of the production:

- Beaver;
- Cross/Red Fox;
- White Fox;
- Lynx;
- Marten;
- Mink;
- Muskrat;
- Squirrel;
- Weasel; and
- Wolf .

Aklavik has long been known for its many rats (Rat River) while the community of Sacks Harbour is known as the "white fox" capital of the north. The communities of the Mackenzie Delta Region are consistently large producers of cross/red fox, marten, mink and ntuskrat.

Over the years the methods of harvesting and preparing the pelts for domestic use and commercial trade have basically remained the same. The wild animals are either trapped or shot. The hunter removes the pelt from the animal as soon as possible after capture taking care to avoid inking cuts in the leather. The pelt is then fleshed as clean as possible and then is either frozen, dried, cr cured with salt and then left to dry.

The care which the hunter/trapper takes in harvesting and handling the pelt can have a profound ef feet on its quality and commercial value.

Factors influencing the quality of the raw fur can effectively reduce the number of pelts available to the proposed tanning operation. The two most important factors influencing the quality of a raw fur, and consequently the quality and commercial usefulness of the dressed pelt, are handling and primeness.

Furskins require greater attention than other types of skins as almost any damage to the pelt can lead to a loss of hair and to bare patches rendering the fur commercially useless. The most common faults resulting in damage to the pelts are bad flaying, inef f icient curing, putrefaction, gunshot and bullet burns. These are further described below:

Flaying: Flaying is the process of removing the pelt from the body. Careless flaying can result in cuts in the flesh side of the pelt. cuts will become holes in the dressed furs.

Curing and Putrefaction: If pelts are not properly cured or skinning is delayed, putrefaction will recur and the pelt will deteriorate and tend to shed fur. Hairslip is the first sign of putrefaction. Putrefied portions of the pelt will not tan properly and may dissolve during the tanning process. Putrefaction can be extremely difficult to detect and can spread to undamaged pelts if they come in contact.

Gunshot and Bullet Burns: Damage can be caused to pelts as a result of bullet burns which lead to holes and bad spots in the dressed pelt. Because almost 70% of the pelts harvested in the region are shot, this factor will undoubtedly be important.

Prime Seasons: Another factor which influences the quality and commercial usefulness of a pelt is the season of harvest. Fur garment manufacturers require pelts harvested when their mats are prime or just slightly under prime. This is when the pelt of a fur-bearer in terms of size, color, and quality is at its best. The hunter/ trappers receive maximum prices for pelts taken at prime.

The prime time for fur-bearers varies from species to species, region to region, and from year to year. A prime pelt is recognized by the clean, white or just slightly blue appearance of its skin side. The leather is soft, pliable and slightly greasy. The fur has a glossy appearance and the under-fur is dense, deep and completely covered by guard hair. The flesh side of an underprice pelt has a dark or bluish appearance, guard hair and under-fur are underdeveloped and the fur has a flat appearance. The leather of an over prime pelt is hard and dry, the color of the fur is poor and the fur is incomplete due to shedding.

In Table 2.1 approximate prime seasons for some of the various fur-bearers harvested in the Inuvik region are listed. Appendix B contains prime charts for the various pelt species. It also shows the desirable characteristics for some species.

2.2 Supply of Pelt Species

Data on fur exports for the period 1981-82 to 1985-86 for 12 communities in the region was obtained from the G. N.W. T. Department of Renewable Resources in Inuvik. This information is used to estimate the type and number of furskins that could potentially be made available to a tanning operation in Aklavik. Table 2.2 shins the number of pelts for each species harvested in the 12 communities from 1981-82 to 1985-86.

Table 2.1

Prime Seasons

Beaver	Jan 15 to May 15
Lynx	March 1 to May 30
Muskrat	March 1 to May 30
Marten	Nov 15 to Jan 15
Mink	Nov 15 to Jan 15
Squirrel	Nov 15 to Jan 15
Weasel	Nov 15 to Jan 15
wolf	Nov 15 to Jan 15
Wolverine	Nov 15 to Jan 15
Red Fox	Nov 15 to Feb 15
Otter	Dec 1 to Jan 30
Fisher	Dec 1 to Feb 15

Source: Trapping and Conservation Manual 1985, Alberta Energy and Natural Resources, Fish and Wildlife Division.

Fur export data for some of the communities was not reported during each of the five years. In order to provide a better estimate of the number of each pelt species harvested in the region, harvest Values for communities not reporting were estimated based on the numbers of each species harvested in the years where data was available.

The number of reported pelts harvested for export in the region fall short of actual harvest levels because, furs sold Privately or retained for personal use by hunters and trappers are excluded. In particular, the pelts of beaver, fox, wolf and wolverine are widely used domestically for trimming arctic clothing. Estimates of the number of pelts retained are between 10% and 20% of export harvest levels. In tile case of wolverine, local value and prestige of the

Table 2.2

Approximate Number of Furs Exported From the Inuvik Region

1981/82 to 1985/86*

Species	1981/82	1982/83	1983/84	1984/85	1985/86	5 Year Average
Bears -						
Polar	7	5	16	20	6	11
Other	17	14	17	23	14	17
Beaver	458	255	295	308	317	327
Fisher	—	—	—	—	13	—
Fox						
Blue	3	1	2	6	—	2
cross	591	370	518	774	382	527
Red	1,736	586	862	1,158	612	991
Silver	88	61	92	134	44	84
White	2,329	1,668	1,692	3,594	330	1,923
Lynx	397	584	441	293	220	387
Marten	8 415	7,362	5,667	7,186	8,930	7,512
Mink	1 115	775	1,207	1,070	1,358	1,105
Muskrat	105 831	115,798	85,941	63,275	44,750	83,119
Otter	4	1	11	5	1	4
Seal -						
Ring	91	1	—	4	—	19
Squirrel	368	52	267	157	118	192
Weasel	146	54	236	568	110	223
wolf	45	34	39	51	41	42
Wolverine	1	4	5	7	6	5
Total	121,642	127,625	97,308	78,633	57,252	96,490

Source: G. N. W. T., Department of Renewable Resources, Inuvik

* 1986/87 data is not available in detail. Estimates are that the muskrat harvest increased by 60% to 112,000 furs.

pelt is very high and in some areas of the Mackenzie Valley export harvest values for this species represent only 10% of the actual harvest values. 1. If you add 20% to the export data you get a rough estimate of the quantity of each pelt species harvested in the region. If a local tannery were in operation, it is expected that most furs kept for domestic consumption would be commercially tanned, on a custom basis, at the @cry.

As shown in Table 2.2, the total number of pelts taken for each species varied from year to year. During the five year period overall harvest declined from 121,642 pelts in 1981-82 to under 58, 000 in 1985-86. A decline in the total number of muskrat harvested in the region is the major cause of the overall decline in harvest levels. Muskrat harvests declined by almost 60 percent during the five year period.

There are a number of factors responsible for year to year variations in the quantities of pelt species harvested. They are described below:

Carrying Capacity of Habitat: Carrying capacity of a habitat is determined by a number of factors including find, shelter, water, space, weather, and disease and parasites. Changes in any of these individual factors may result in either an increase or decrease in the carrying capacity and consequently animal populations. Of these factors weather is the most unpredictable and probably the most significant factor in determining population numbers. Changes in long-term weather patterns directly affect the cover, food, water, space and other components of habitat necessary to wildlife. A severe winter in a region can mean the starvation of many fur-bearers and consequently a low supply of pelts.

Cyclic Populations: Cyclic populations are those that fluctuate periodically even when environmental renditions remain basically the same. There are a number of fur-bearers in the region whose

populations fluctuate cyclically over relatively long periods of times. These populations include lynx, whose population peaks follow a ten year cycle of abundance; fox, which follow a four year cycle; and muskrat population which fluctuates widely and have exhibited cyclic abundance over ten year periods.

Fur Price Fluctuations: Obviously the price of furs will cause the intensity of trapping and the numbers of trappers to vary. This may occur with a bit ofa lag. As an example we should expect a larger harvest of muskrat this year because of the very high prices paid last year.

Fluctuations in the Number of Hunters-Trappers: For many, hunting and trapping is a part-time activity which supplements their wages fran employment and from other sources. As a result, the number of hunters/trappers will fluctuate from year to year depending on the availability of alternate forms of employment.

During the reported period many delta residents found employment with oil and gas exploration companies in the Beaufort Sea. This partly explains the reason for the lower harvest levels in recent years.

Renewable Resources in Inuvik indicate that the regional fur production for 1986-87 was substantially higher than in 1985-86. Muskrat production increased to approximately 112,000; 60 percent higher than 1985-86 levels. This increase in fur production is attributable to higher prices and to a siting down of oil and gas exploration in the Beaufort Sea. Outlook for the 1987-88 season is for moderately higher levels of fur production. However this increase in production could be temporary if construction of the IPL oil pipeline goes ahead in the late 1980's, early 1990's[2].

Table 2.3 presents the pelt species accounting for the majority of the fur production in the Inuvik region on an annual basi S.

Table 2.3

Inuvik Region Average Annual Harvest*

Species	Average Annual Harvest (No. of Pelts)
Muskrat	83,119
Marten	7,512
White Fox	1,923
Red/Cross Fox	1,518
Mink	1,105

* estimated from export data plus 20% for domestic use.

In order to obtain furs for processing at the proposed tannery in Aklavik, a system for procuring pits will have to be set up. This system should be set-up so that pelt species from all parts of the Western N.W.T. and not just the delta region, are made accessible to the tannery. Such a system is described in a following section. Tables 2.4 to 2.6 present fur harvest data for the Fort smith, Kitikmeot and Keewatin Regions indicating the type and quantity of pelt species sold in these regions. Through a pelt procurement system these pelts could potentially be made available to a tannery in Aklavik for processing. Table 2.7 presents the average annual pelt species in all four regions. Furs used for domestic purposes are not added to the other regions as they are less likely to be tanned commercially.

Table 2.4

Approximate Number of Furs Harvested in the Fort Smith Region
1980/81 to 1983/84

Species	1980/81	1981/82	1982/83	1983/84	4 Year Average
Bears -					
Polar	—	—	—	—	--
Other	75	52	21	44	48
Beaver	4,612	1,857	2,459	2,297	2,806
Coyote	16	52	29	15	28
Fisher	107	64	55	51	69
Fox -					
Blue	3	—	7	—	2
Cross	346	296	247	121	252
Red	844	521	504	268	534
Silver	64	45	39	14	40
White	332	16	374	32	188
Lynx	2,963	2,051	1,616	858	1,872
Marten	18,318	17,283	10,153	6,517	13,068
Mink	2,968	1,933	1,093	1,242	1,809
Muskrat	37, 601	27,619	15,311	27,983	27,128
Otter	94	52	39	74	65
Squirrel	20, 524	6,863	2,360	12,218	10,491
Weasel	1,497	1,183	303	865	962
Wolf	94	121	248	292	189
Wolverine	35	54	91	59	60
Total	90, 493	60, 062	34,949	52, 950	59,611

source : Resource Initiatives (1985)

Table 2.5

Approximate Number of Furs Harvested in the Keewatin Region, 1980/81 to 1983/84

Species	1980/81	1981/82	1982/83	1983/84	4 Year Average
Polar Bears	78	96	98	100	
Fox -					
Blue	10	7	21	3	10
cross	7	7	19	3	9
Red	64	35	70	24	48
Silver	6	2	7	1	4
White	6,274	1,426	7,666	1,943	4,327
Weasel	14	—	.	1	4
wolf	142	71	107	129	112
Wolverine	15	6	3	6	6
Total	6,610	1,649	7,991	2,210	4,520

Source: Resource Initiatives (1985)

Table 2.6

Keewatin Fur Harvest

1980/81 to 1983/84

Species	1980/81	1981/82	1982/83	1983 /84	4 Year Average
Polar Bear	96	50	25	60	58
Fox -					
Blue	96	32	28	39	49
Cross	113	140	79	2134	536
Red	383	283	304	538	377
Silver	19	45	8	40	28
White	22,882	8,642	3,495	8,773	10,948
Marten	—	4	2	1	2
Otter	—	1	2	—	—
Rabbit	—	—	—	3	—
Squirrel	—	10	64	12	21
Weasel	14	7	—	1	5
Wolf	142	157	95	170	141
Wolverine	15	26	38	37	29
Total	23,760	9,397	4,140	9,878	12,194

source: Resource Initiatives (1985)

Table 2.7

Western N. W. T. Estimated Average Annual Harvest

species	Average Annual Harvest (No. of Pelts)
Muskrat	110,247
Marten	20,580
White Fox	17,386
Squirrel	10,704
Red/Cross Fox	3,274
Beaver	3,133
Mink	2,914
Lynx	2,259
Weasel	1,194
Wolf	484

Source: Resource Initiatives (1985)

It must be noted that the values presented in Table 2.7 are only an average. The fluctuation in either direction can be very large. For example, estimates of the 1986/87 muskrat harvest for all regions exceed 150,000.

The number of furs available to an Aklavik tannery need not be limited to the Western Arctic fur harvest. It would also be possible to get furs on a custom basis for southern customers and/or to purchase furs for tanning and re-sale. An arrangement could possibly be negotiated with the Yukon to set up a procurement system and thereby obtain most of the Yukon furs. Additionally, it would also be possible for new furs to be bought at the auction sales in the south for tanning in Aklavik.

2.3 Marketing Raw Furs

Virtually all furs, except those used domestically, are sold at southern fur auctions. The process from trapper to retailer is decribed below:

i) The hunter/trapper prepares the raw pelt for sale.

ii) The pelt , in raw form is sold to the G. N. W. T. Fur Market Service or to local fur buyers. The G.N. W. T. Fur Market Service pays an initial price of 75% to 80% of what they estimate the auction bloc price will be. When it is auctioned the difference is paid to the trapper. The local fur buyers who include co-operatives, the Hudsons Bay Company and other licensed buyers, pay the trappers approximately 70% to 80% of the estimated auction bloc price. The difference they keep to cover their costs and commission.

iii) The furs are sold at auction houses. There are three major fur auction firms in Canada: Dominion/Soudack Auction Sales Ltd. , Western Canadian Fur Auction Sales Ltd., and Ninth Bay Fur Auction Service.

iv) The buyers at the auctions are international fur buyers brokers, manufacturers representatives, tanners, and furriers.

v) The raw furs are then tanned mostly on a custom basis.

vi) The dressed furs are used to manufacture products such as hats, coats, jackets, vests, gloves, etc.

vii) Products are sold to consumers by retail outlets.

The fur marketing process is described in detail below:

i) Dominion/Soudack Auction Sales Ltd. - Dominion/Soudack is a subsidiary of the Hudsons Bay Company and is the largest fur auction firm in Canada. The company holds five to six

auction sales per year from September to June. Often the May-June sales are combined.

Dominion/Soudack consigns furs for auction, but also receives furs forauction through the Hudson 's Bay Company's northern stores which purchase furs directly from the trappers.

At one time the company held fur auctions in most of the major cities throughout Canada. However, over the years the company has rationalized its operations in order to provide buyers with a larger selection of furs. The company has not held a fur auction in Edmonton for approximately 15 years, and ceased holding auction sales in Winnipeg and Montreal when the company opened its n- auction house facility in Toronto, approximately two years ago. Presently, Dominion/Soudack holds all its fur auction sales in Toronto. The auction houses in Edmonton, Montreal and Winnipeg now act as receiving departments, and ship furs consigned to Toronto for sale.

ii) Western Canadian Fur Auction Sales - Western Canadian Fur Auction Sales is the smallest of the three Canadian auction firms. It is a family run business located in Vancouver.

The company holds three major auctions each year: January, March and May. Depending upon the supply of furs it has available for sale, the company may hold two or three smaller sales between September and May.

iii) **North Bay Fur Auction SexVice** - North Bay Fur Auction Service is a non-profit auction house owned by the Ontario Trapper Association. The company holds five auction sales a year in North aay. The first sale of the season is held in mid-December. The company has a receiving depot in Edmonton and most other major cities throughout southern Canada.

All three of these auction houses solicit fur consignments and sell the furs at auction sales on a commission basis of 8%.

The furs produced in the N.W. T. are delivered to the fur auction houses usually through one of the following outlets:

- The Hudson's Bay Store
- Local co-operatives
- Private traders
- G.N.W.T. Fur Marketing Service
- Directly by the trapper

Each of these outlets grade the furs offered for sale by the trapper for quality and damage, and offer the trapper a price for his furs based on potential auction market prices.

The majority of the furs produced in the N.W.T. are marketed through the G.N.W.T. Fur Marketing Service. This service is a non-profit service offered through the Department of Renewable Resources with a primary goal of ensuring trappers fair market prices for their furs. Through this service trappers are advanced up to 75% of the estimated price the furs will sell for at the auction sale. When the furs are sold, the auction house forwards to the agency, a cheque for the furs and the trapper receives the balance owing him for the sale of his furs. The balance is the difference between the partial cash advance paid to him by Renewable Resources and the price paid for the furs by buyers at the auction sale.

Unlike the G. N.W. T. Fur Marketing Service, most of the other outlets (the Hudson's Bay Company and private traders), buy and sell furs for a profit. As such, the prices these buyers offer trappers for their furs must be high enough to secure continued business, but low enough to allow them to make a profit from the furs when sold at the fur auction. Conversations with local fuy buyers and trappers indicate that the prices paid by these outlets translate into a price about 20% to 30% below what the buyer expects the auction

price to be. This difference includes the cost of shipping furs to market, a profit and a risk margin. The risk the buyer takes is that if he pays the current price for furs quoted by the auction houses, prices could fall by the time the next auction takes place and the buyer could lose money on the transaction. However, if auction prices rise above the level at the time of purchase from the trapper, the buyer could realize a good profit.

When the raw furs reach the auction house they are cleaned and their appearance is improved. The furs are again graded and sorted into lots according to quality and damage.

Potential buyers are notified of the auction dates by advance notice, and a catalogue containing a description of the furs according to lots is prepared. Buyers examine the lots prior to the auction. This enables them to determine which lots will meet their needs and what the lot is worth to them. The market price of the fur is determined from bids placed on the floor by the buyers.

There are essentially two types of buyers at fur auctions: the speculators or brokers who buy raw furs for resale, and the garmet manufacturers' representatives. Both of these buyers prefer to buy raw fur pelts rather than dressed pelts. The major reasons for this preference are:

- furriers prefer to buy pelts raw and have them dressed to their specifications;
- there is no duty charged on raw furs exported out of the country. On dressed furs the fur buyer must pay a duty to import them into their own country; and,
- because of the highly unpredictable nature of the fur fashion industry, the inherent risk of holding raw, as opposed to dressed furs, is less. The inventory cost is also lower.

2.4 Prices for Raw Furs

2.4.1 How Prices Are Set

The market prices for raw furs are determined by bids placed on the floor at auction sales by international fur buyers. The price these buyers pay for raw furs varies, and is a function of the degree of competition among the buyers for the furs at the sale, and the quality of the furs being marketed.

Market demand for furs is sub ject to highly variable international and political influences. Consequently, the market price of a pel species can vary widely and unpredictably. Factors contributing to the volatility of the demand for furs include:

- Prices and demand for pelt species are determined by international fashion trends set by fur garment designers around the world. These trends change yearly and unpredictably.
- Many buyers of Canadian furs are from Europe, Japan or the United States. As a result, fluctuations in international currency rates can have a significant influence on the demand and consequently on price.
- Political lobby influences such as anti-trapping/save the animal movements have had, and continue to have, a significant impact on the demand for fur products. In the past these groups have been effective in decreasing public demand for fur products. This makes it difficuLt for trappers to economically realize large harvests. The amount of pressure that these groups will exert and the influence they have is unpredictable.

The quality of the pelts being marketed is an important factor in establishing prices. Table 2.8 shows top and average price information for pelt species at the Edmonton Fur Auction Sales Ltd. during the 1986-87 auction season. As shown in the table there is a substantial difference between top and average price for some pelt species, and the prices paid for pelt species at the

different auction sales vary widely. These price fluctuations are, to a very large degree, a reflection of the difference in quality between the pelts being marketed.

Prime pelts, in term of size, color, and quality are at their best . Thus, when handled properly prim pelts command top prices. The value of pre-prime and late fur is downgraded according to quality loss. Appendix B which contains the primeness charts for some of the various pelt species harvested in the Inuvik region, also show by approximately how much the value of pre-prime and late fur are discounted.

As shown in Table 2.8 the highest top and average price for most pelt species was obtained at the February, 1987 sale. This is when the greatest quantity of prime pelts are available and the greatest number of fur buyers attend fur auctions. The highest top and average price for muskrat was obtained at the May sale reflecting the later pricing of this pelt species.

The ma jor factor accounting for the significant variations between top and average price paid for a pelt species other than primeness, is the extent and type of damage caused to pelts during harvesting and handling. The most frequent damages that lower the value of a pelt are flaying cuts, putrefaction, gunshot holes and bullet burns . The value of the pelt is downgraded according to the extent and location of damage.

2.4.2 Historic Prices

Tables 2.9 and 2.10 present historic price information for pelt species harvested in the Inuvik Region, and the whole of the N.W. T. , respectively. Price information for the Inuvik Region was available for a five year period. Because five years is too short a period to use as a base for analyzing historic price trends, fur price data for pelt species harvested in the entire N.W. T. is used

Edmonton Fur Auction Sales Average and Top Prices

at 1986-87 Auction Season

Species	September, 1986 Top	September, 1986 Average	December, 1986 Top	December, 1986 Average	February, 1987 Top	February, 1987 Average	April, 1987 Top	April, 1987 Average	May, 1987 Top	May, 1987 Average
Bear -										
Polar	—	—	—	—	2,660.00	1,736.80	—	—	—	—
Other	140.00	55.71		—	111.72	54.32	105.00	60.00	182.00	67.10
Beaver	102.00	30.59	132.00	40.00	162.26	44.38	162.00	45.00	113.00	37.70
Fisher	230.00	128.85	525.00	241.00	864.50	324.67	485.00	270.00	324.00	197.65
Fox -										
Blue										
Cross	120.00	57.81	201.00	84.00	172.90	106.87	98.00	57.63	88.00	47.60
Red	54.00	32.05	78.00	40.00	80.00	36.50	94.00	28.34	66.00	34.95
Silver	—	—	56.00	47.00	71.82	38.30	66.00	28.34	54.00	27.95
White	27.00	27.00	34.50		30.00	24.82	—	—	34.00	19.23
Lynx	680.00	399.09	1,150.00	654.00	1,396.50	682.13	983.00	511.00	905.00	474.16
Marten	110.00	58.45	192.00	107.00	293.00	126.63	177.00	120.00	221.00	109.16
Mink	44.00	14.33	—	—	164.92	73.94	118.00	62.30	73.00	45.69
Muskrat	6.40	3.39	6.10	4.00	7.21	3.84	7.70	5.05	8.00	5.17
Otter	88.00	33.50	94.00	49.50	120.00	46.45	92.00	33.80	86.00	31.89
Squirrel	1.50	.88	—	—	1.46	1.01	1.44	.88	1.20	.70
Weasel	3.00	1.50	—	—	—	—	6.80	2.57	3.70	1.48
Wolf	300.00	103.00	—	—	425.60	140.22	393.00	90.46	527.00	94.39
Wolverine	175.00	137.50	—	—	452.20	204.17	—	165.16	338.00	177.34

Source: Edmonton Fur Auction Sales Ltd.

Table 2.9

5 Year **Average Prices** of **Pelt Species**, Inuvik Region, N.W. T.
1981/82 to 1985/86

Species	1981/82	1982/83	1983/84	1984/85	1985/86	Average
Bears -						
Polar	1,063.77	783.33	867.19	852.25	1,116.00	936.50
Other	71.87	215.00	208.47	172.27	422.58	218.04
Beaver	18.02	18.97	14.97	13.74	23.44	17.81
Fisher					11.40	-
Fox -						
Blue	46.67	55.00	45.00	37.50	-	46.04
Cross	95.57	86.76	103.32	99.04	62.66	89.47
Red	30.17	54.71	55.66	44.43	29.42	43.4a
Silver	65.75	56.41	50.42	48.48	30.39	50.29
White	27.%	31.67	25.12	22.12	16.27	24.62
Lynx	246.71	269.50	325.74	558.48	616.70	403.43
Marten	48.28	50.97	61.38	66.33	65.65	58.52
Mink	44.48	39.31	39.69	41.94	63.63	45.81
Muskrat	2.60	2.65	2.75	2.30	2.45	2.55
Otter	38.75	40.00	17.86	24.00	30.00	30.00
Seal -						
Ring	14.05	12.00	-	6.00	-	10.68
Squirrel	1.00	1.31	.94	.87	.81	.99
Weasel	1.02	1.51	1.57	1.82	1.88	1.56
Wolf	146.94	214.24	176.60	199.49	131.28	173.71
Wolverine	275.00	350.00	350.00	251.43	317.50	310.79

Source: G.N.W.T. Department of Renewable Resources, Inuvik.

instead. The prices for pelt species in the Inuvik region will follow the same general trend as fur prices for the N. W. T. as a whole.

Analysis of the fur price data presented in Table 2.10 for the N.W. T . shows that prices for most pelt species peaked between 1978 and 1979. Prices dropped off suddenly and remained low for about four to five years. In 1985 prices started to move up slowly and have continued to climb. Interviews with fur industry experts indicate that sane species, namely mink, marten and lynx, may have reached their peak market prices during the 1986-87 auction season.

2.4.3 Future Prices

The volatile and unpredictable nature of market demand for furs makes any discussion of future prices for raw furs highly speculative. Fur industry experts interviewed were on the whole very reluctant to make predictions about prices for pelt species even for the current auction season. The major reason for this is that, although historic price trends are pointing to a decrease in fur prices, the entry of two new foreign fur buyers into tie Canadian fur market, namely Japan and Korea, has over the last two years intensified the competition for furs and pushed prices up. Thus, industry experts are saying anything could happen, prices could increase more or they could drop. The following is a sample of some of the comments about current and future prices made by industry experts interviewed:

- Overall, wild fur prices are expected to remain strong throughout the current auction season.
- Some industry experts stated that fur prices have reached close to the maximum price markets will bear. Based unhistorical trends, prices are expected to drop in two to three years time.
- Political campaigns by the fur industry in response to anti-'trapping/save the animal movements are experiencing success in Europe . European consumers are buying more fur products and

Table 2.10

Average Annual Prices for Pelt Species Harvested in the N.W.T.

Species	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86
Beaver	14.78	15.94	23.96	31.80	24.89	18.74	15.16	16.42	1[illegible]23	21.65
Fisher	52.57	59.39	123.60	113.07	64.98	93.[illegible]5	169.07	102.69	129.44	112.13
Cross/Red Fox	46.00	76.84	114.20	71.38	67.53	74.42	61.79	65.85	62.89	43.06
White Fox	35.31	29.35	39.27	38.38	26.81	27.28	20.95	19.29	[illegible]7.51	14.09
Lynx	206.38	223.01	305.88	244.48	244.60	111.51	281.92	316.07	524.65	615.64
Marten	24.40	25.42	36.74	19.96	35.01	40.46	43.98	53.24	56.72	59.10
Mink	24.45	21.66	36.07	39.57	35.35	36.43	22.98	31.44	33.47	34.42
Muskrat	3.07	3.47	4.58	5.25	4.66	2.64	2.60	2.77	2.23	2.53
Otter	53.35	42.80	71.98	68.48	51.80	52.73	43.33	34.89	44.33	29.69
Squirrel	.61	.62	1.50	1.63	1.12	1.28	.93	1.05	.96	.86
Weasel	.83	.89	1.24	1.45	1.36	1.22	1.08	1.37	1.51	1.65
Wolf	138.66	137.64	212.87	190.66	156.27	191.46	210.02	233.53	240.25	197.47
Wolverine	156.86	149.40	220.67	175.99	201.73	191.51	208.52	226.93	216.[illegible]	232.01

Source: Statistics Canada

consequently demand for raw fur by European garment manufacturers has increased.

- Increases in wild fur prices over the last two years is to a large degree attributed tom increase in competition among fur buyers as a result of the entry of two new fur buyers (Japan and Korea) in the raw fur market.
- Increasing fur prices over the last few years has led to increases in finished garment prices. Retailers may have more difficulty roving stock at these higher costs.
- Muskrat prices are expected to remain strong again this year as garment manufacturers turn to muskrat as an alternative to higher priced furs.
- Beaver prices are expected to remain strong as new methods of dyeing and shearing have increased the popularity of this fur.
- Russian sable prices fell by 25% at the opening auction sale in Leningrad this year. Some industry sources are predicting a corresponding fall in Canadian sable.

Table 2.11 presents the average annual percentage price change for pelt species harvested in the Inuvik region. As shown, beaver and muskrat prices are assured to grow at conservative rates over the next three years. The prices for lynx, marten and mink are expected to fall slightly over this period. In 1990, an overall decline iii @t species prices is predicted. Table 2.12 forecasts price changes over the next few years based on the above assumed price changes. It must be emphasized that these are very tentative forecasts since it is a market that is highly volatile.

The price of raw furs and changes in the price will have contradictory impacts on an Aklavik housed tannery. Low and decreasing prices will man a decrease in the supply of locally trapped and shot pelts. This may necessitate the need for additional pelts to be purchased further away such as at auction sales or through brokers.

Table 2.11

Raw Fur Historical Price Changes and Projections (%)

Species	1981-86 Actual	1987-89 Projected	1990-91 Projected
Beaver	11.8	10.0	-15.0
Red Fox	-7.7	0.0	-5.0
Cross Fox	7.3	0.0	-5.0
White Fox	-1.2	0.0	-3.0
Lynx	31.2	-10.0	-10.0
Marten	7.5	-5.0	-10.0
Mink	11.9	-5.0	-10.0
Muskrat	-1.0	10.0	-15.0
wolf	1.8	0.0	-3.0

Source: Edmonton Fur Auction Sales Data

Table 2.12

Estimated Average Prices for Pelt Species

1987-88 to 1990-91

Species	1986-87*	1987-88	1988-89	1989-90	1990-91
Beaver	$ 39.51	$43.46	$47.81	$ 52.59	$44.70
Cross Fox	70.78	70.78	70.78	70.78	67.24
Red Fox	34.37	34.37	34.37	34.37	32.65
White Fox	23.68	23.68	23.68	23.68	22.97
Lynx	544.05	489.64	440.68	396.61	356.94
Marten	104.24	99.03	94.08	89.38	80.44
Mink	49.07	46.62	44.29	42.07	37.86
Muskrat	4.29	4.72	5.19	5.71	4.85
Wolf	107.02	107.02	107.02	107.02	103.81

* Average pelt species sales prices for furs marketed through Edmonton Fur Auction Sales in 1986-87.

On the positive side, the lower prices will reduce the price of the products manufactured from the pelts. This increase in demand will result in a consequent increase in the demand for dressed furs from the tannery.

High and increasing prices will have the converse affect. It is impossible to say which will be better for the tannery. It is likely that a happy medium, which can't be defined until the tannery is in operation, will be preferred.

2.5 Availability of Raw Furs for a Tannery

Besides environmental and cyclical fluctuations affecting the availability of each pelt species, there is no mechanism to keep the delta furs in the region. At present, the bulk of the delta furs are marketed at southern fur auctions through Government fur marketing systems, local co-operatives, Hudson's Bay stores or independent furbuyers. Only a small percentage of the furs produced in the delta and N. W. T. are retained for domestic use. Under the current system, there is no mechanism for getting furs to a tannery. It would also be impractical for the tannery to buy furs directly from the trappers. To do this they would need to set upa network of buyers necessitating a totally different expertise than that of tanni" ng and incurring considerable extra costs.

In order to make locally harvested furs available to a tannery a system of procurement will be necessary. The system will have to ensure the tannery has first option on the purchase of all furs. The system should possess the following characteristics:

i) be accessible to all trappers;
ii) provide an opportunity for participation to all existing licensed fur buyers;
iii) reflect auction bloc prices;
iv) be set-up and co-ordinated by government;
v) sell all raw furs to the tannery directly, by-passing the auctions.

This system could be accommodated through the existing G. N.W. T. fur buying program if modifications were made to it. The buying agency could buy pelts from throughout the Western Arctic and not just the delta region. As needed additional pelts could be bought from other sources.

It would be possible for the tannery to also operate on a custom tanning basis as do other southern tanneries. This would require soliciting raw furs from southern buyers to tan for a set fee. To be successful at this would require effective marketing, competitive Prices and excellent quality work.

FOOTNOTES

1. Science Advisory Board of the N. W. T., Management of Some Mammals in the N.W. T. for Sustained Yields, Report No. 4

2. Personal Communication, Renewable Resources, G. N.W. T.

3.0 MARKET FOR TANNED FURS

The market for tanned furs is very small relative to the total market for furs. This is due to the fact that manufacturers buy raw furs according to consumer tastes and demands, and send the raw furs to a tannery to be processed to their specifications. Usually the raw furs of the northern region are sent to tanneries in eastern Canada and as a result, very little if any tanned furs are sold.

The Aklavik tannery fur market would consist of the following:

domestic (local) use: local women would produce parkas if tanned furs were readily available locally. The manager at Northern Images in Inuvik estimated that they could sell 150 parkas per year, but that none are available. This was also expressed at other Northern Image stores. As well, there is a demand for authentic handicrafts such as fur mittens, hats, moccasins, slippers, mukluks and other clothing articles.

local crafts: novelty fur iterns such as purses, cushions, rugs, dolls, tukpiks, Aklavik Mosquito and Ice Worms are just a few.

fur factories: such as the parka factory in Inuvik, where tanned fur required for trim on the parkas could be supplied. This would increase the demand for tanned furs outside of Aklavik.

tourist/souvenir shoos: local crafts, and authentic handicrafts could be produced for northern tourist shops, and for handicraft outlets nationwide. Some of these include the Hudson Bay Company stores, private stores and hotels, and other established distributors.

western furriers: some potential lies in supplying Western furriers. The high quality and thicker hairs of the northern furs make them a superior fur product and highly competitive with furs from other areas.

3.1 Market for Fur Products Made in North

Various handicraft outlets which carry northern crafts and products

exist throughout Canada. Canadian Arctic Producers (CAP), in Winnipeg, provide central servicing for36 member co-ops throughout the Northwest Territories, and have 750 active accounts around the world. Artists sell their products to co-ops, the co-op sells to CAP, and they in turn sell the products to retail outlets. CAP owns five Northern Image retail stores. Their image is northern, and 65% of the arts and crafts carried in the stores are from the eastern Arctic. At one time CAP and the Northern Image stores used to sell a lot of fur garments and products. The demand for these products still exists, however, there is very limited production. 13yproviding tanned furs for crafts people to work with, a higher demand for tanned furs will result and the potential for saleable products will be realized.

Interviews with various local and regional arts and crafts retailers, and wholesalers indicated that frustration builds up from not being able to supply the demand. CAP has indicated that if fur products could be produced locally, and if supply were constant, they would be eager to carry and market these products.

Tables 3.1 and 3.2 show the various fur products that could be produced with northern furs, and the approximate number of pelts required to produce them.

Increasing the supply of tanned furs alone is not sufficient. For the potential demand to become actual demand, workers who will produce the fur products must be organized. A centre must be set up with a complete operational structure to encourage crafts people to produce their fur handicrafts and garments. The center will encourage high quality workmanship and products are necessary to meet the standards of the distribution outlets, and thus the potential demand. This will be discussed in more detail in a recommendations section.

Table 3.1

Fur Garments Produced

Item	Type of Fur	Approx. No. of Pelts Required
All Fur Parkas (Adult)	Muskrat	55 - 60
	Seal	3- 4
Parka Trim	Fox	3/4
	Coyote	3/4
	wolf	3/4
	Wolverine	3/4
Hats	Beaver (Kitt)	1
	Marten	5
	Muskrat	5
	Otter	5
Slippers	Beaver	Part
	Muskrat	Part
	Rabbit	1
	Seal	Part
Mukluks	Beaver	Part
	Rabbit	1- 2
	Seal	Part
	wolf	Part
Mittens	Beaver	Part
	Rabbit	2
	Seal	2
	Wolf	Part

3.2 Prices For Tanned Furs

As previously mentioned, several factors affect the price of tanned furs . Raw pelts marketed through the N.W. T. Fur Marketing Service generally ensures a fair price. However, the price of the raw pelt is also determined by supply and demand, and the condition of the pelt to the raw pelt price. The tanner adds on his tanning cost, plus any contingency costs such as transportation and handling.

Table 3.3 shins the dressing price list for three different tanneries, British Columbia Fur Dressers, International Fur Dressers and D. Cohn Trans Canada. The prices listed are for the

Table 3. 2.

Novelty Fur Items

Item	Type of Fur	Approx. No. of Pelts Required
Cushions	Muskrat Rabbit Seal	Odds and ends from larger fur products.
Rugs	Muskrat Seal	"
Dolls	Various types of fur	"
Tukpiks	Various types of fur	"
Ice Worms	Various types of fur	"
Aklavik Mosquite	Various types of fur	"

furs most commonly found in the north, with an average price taken. Since the fir market fluctuates so widely, it is very difficult to predict the price of raw pelts, and thus difficult to identify a price structure for tanned furs. To arrive at a close price estimate for tanned furs, Table 3.4 was completed using the average tanning price, and the average auction price from Table 2.8. A 10% contingency has been incorporated to arrive at an approximate price for various dressed furs.

3.3 Demand Forecasts

With a fur tannery in Aklavik, the supply of tanned furs would be readily available for local crafts persons to produce fur products. The demand for tanned furs would increase as the crafts people increase their production of fur parkas, mittens, hats, novelty items, etc.

The following scenario will provide an example of the potential demand for tanned furs:

Table 3.3

Dressing Price List

Types of Fur	Jan. 1987 International Fur Dressers & Dyers Co. Winnipeg	1987 D. Cohn TransCanada Winnipeg	Oct. 1986 British Columbia Fur Dressers & Dyers Ltd. Vancouver	Average Price
Beaver				
- Tail	$ —	$ —	$ 5.50	$ 5.50
- small	25.00	—	13.00	19.00
- Medium	30.00		16.00	23.00
- Large	35. m	—	22.00	28.50
Bear (Blk/Brwn)				
-cub	—	—	35.00	35.00
- Small	75.00	—	60.00	67.50
- Medium	85.00	—	60.00	72.50
- Large	105.00	85.(30	60. 00	83.33
Grizzley				
- Cub	—		45.00	45.00
- Small/Med	100.(30	—	80. 00	90.00
Large	150. 00	150.00	120.00	140.00
Polar				
- Small	100. 00	—	—	100. 00
- Medium	150. 00	—	110. GO	130.00
- Large	200.00	—	165. GO	182.50
cats				
Lynx/Bobcat	30.00	26.80	27.00	27.93
Coyotes	30.00	—	27.03	26.00
Fisher	25.00		27.00	26.00
Fox (all)	25. 00	13.00	21.50	19.83
White	—	—	37.50	37.50
Marten	8.00		16.50	12.25
Mink	6.00	—	16.50	11.25
Muskrat	5.00	2.60	4.85	4.15
Rabbit	5.50		4. 50	5.00
Timber Wolf	45. #0	37.00	47.50	43.16
Wolverine	40. 00	22. 00	43. 00	35.00
Cattle and Big Game Hides	7.50/sq.ft.		4. 50/sq. ft .	6. 00/sq. ft .

Table 3.4

Potential Price of Furs from an Aklavik Tannery (F. O.B.)

Fur Species	Average Auction Price (Edmonton)	Average Tanning Price	Contingency (10%)	Total
Beaver	$ 40. ØØ	$23.50	$ .10	$ 69.85
Fisher	232.00	26.00	.10	283.80
Fox - Cross	70.00	19.83	,10	98.80
- White	23.00	37.50	.10	66.55
- Red	34.00	19.83	.10	59.20
Lynx	544.00	27.93	.10	629.12
Marten	104.00	12.25	.10	127.88
Mink	49.00	11.25	.10	66.28
Muskrat	4.00	4.15	.10	8.97
Wolf	107.00	43.16	.10	165.18
Wolverine	171.00	35.00	.10	226.60

. Parkas:

- Within the Aklavic area, there are approximately 12 women who can work with fur to make parkas and other fur items. 1.
- Each fur parka (adult size) requires approximately 60 muskrat pelts, and three-quarters of a coyote pelt for trim.
- A matching hat for each parka would require approximately five muskrat pelt.
- If each woman produced one parka per week with a matching hat, approximately 3, 100 muskrat pelts would be required for a month's work. As well, approximately 40 coyote pelts would be required for trim.
- There would also be a fair amount of trim (flank) left to make other products such as vests.

The above scenario does not take into account the other women of the northern region (it is estimated that there are 20 in total) who can make fur parkas. Nor does it take into account the parka factory in Inuvik which requires a large amount of fur for trim. Thus the above is a very conservative scenario. Different furs are used to produce other fur items as shown in Table 3.1.

However, if handicraft production is not encouraged to increase, the tanned furs would have to be marketed to other manufacturers outside the delta. The costs of tanned furs would increase substantially due to promotion and marketing rests needed to create awareness, and transportation costs of shipping the furs outside the delta.

The following is a potential demand scenario for tanned furs from an Aklavik tannery:

i) 12 women producing one parka and one hat per week for 40 weeks per year: 31, 200 muskrat, 360 coyote, wolf, or wolverine.

ii) 12 other crafts people using an average of 1,000 muskrat each per year for various other prcducts: 12,000 muskrat.

iii) Other northern garment manufacturers purchasing muskrat for garments and various other products (Aklavik Parka Factory, Yukon Native Products): 10, 000 each, 20,000 muskrat.

iv) other northern garment manufacturers purchasing furs other than muskrat for other products and for trim (3, 000 parkas with 3/4 fur for t-rim): 2,250 pelts other than muskrat.

v) Southern manufacturers purchasing for their operations. If good quality tanning and competitive prices are available, dressed furs from an Aklavik tannery could be in high demand because they could be differentiated as the product "made from Arctic furs", also the fur is thicker and better quality from the north. If marketed this demand could be very high. Assume: 10 producers at 5,000 muskrat, 2,000 other furs each = 50, 000 muskrat, 20,000 other furs.

Total demand: 113,200 muskrat
22,610 furs other than muskrat

It is important to emphasize that the above is simply a demand scenario. In sane areas such as local crafts, demand will only occur if there is sane encouragement and assistance. In other areas such as with southern manufacturers, the demand will have to be created and could conceivably far exceed that projected above.

FOOTNOTES

1. Personal Communication, Aklavik Crafts People.

4.0 LABOUR AND SKILL REQUIREMENTS

This section will detail the labour and skill requirements for the proposed tanning operation. In order to facilitate a better understanding of the type of skills required, the basic steps of fur dressing are outlined below.

4.1 Fur Dressing Process

Raw Pelts are stiff and brittle. The purpose of tanning is to turn these pelts into soft wearable furs preserving the natural gloss, color and quality of the fur. Commercial fur dressing is a highly complex and involved process which combines modern chemical knowledge and techniques with traditional tanning methods. Each type of fur must be treated differently. Although the formulas and processes used for each fur are different, the basic steps are similar. These steps are described briefly below:

1. Pelt Selection and Storage: Careful attention must be paid to the selection and storage of pelts for processing. A good quality dressed fur cannot be produced from a poor quality pelt. The basic rule of selecting pelts for processing is to select only good quality prim pelts. Pelts with extensive damage such as cuts and holes, excessive hair loss or putrefaction will be uneconomical to process as their commercial value will be low, or even non-existant.

   Once pelts have been selected for processing, care must be taken to preserve their quality until they can be dressed. Adequate protection of the pelts from rodent and other vermin attack, and also excessive heat or dampness must be assured. The pelts should be stored in a cool dry place with adequate space to allow for periodic inspection of the pelts if they are to be stored for more than three or four days.

2. Soaking and Washing: The purpose of soaking is to relax the pelt to make it soft and flaccid for subsequent mechanical and chemical treatments. Washing also cleans off dirt and blind, removes salt, and degreases the hair. The length of time each pelt will need to be soaked will vary according to the thickness, primeness, and method used for curing. Care must be taken not to leave the pelts in the soaking and washing solutions for too long as the hair will slip.

3. Fleshing and Shaving: All fat and flesh must be removed fran the leather side of the @t and the leather must be shaved so that the leather of the pelt is of an even thickness throughout . This job can be done with the aid of a machine or completely by hand with a curved knife. Even when using a fleshing machine, a certain amount of fleshing must be done by hand . The fleshers task is physically demanding and requires great skill as severe damage to the pelt can easily be done by cutting too deeply or by cutting the dermis which will expose the hair mats and allow hair to be lost .

4. Pickling: The purpose of pickling is to prepare the pelt for dressing and prevent bacterial attack. The pH of the pelt must be brought to the right level for dressing. Each pelt species' pH level will vary, and the pickling formula must be adjusted accordingly. The pH of the pelt is of utmost importance for the success of the dressing operation.

5. Dressing: The pelts are now ready for the application of the dressing solution. There are several cliff erent solutions that can be used and each solution will yield a different result. The choice of a dressing solution is dependant upon the type of furskin being processed and its ultimate use. Thus, no one standard solution can be used and each type of fur processed will require individual attention. The tanning solution must be adjusted for each type of fur. This is where the knowledge and experience of the fur dresser is of critical importance.

Because the pickling and dressing solutions must be changed for each type of fur in order for the operation to be efficient and to minimize processing costs, large runs of each type of fur are required.

6. Neutralizing, Softening and Stretching: After tanning, the pelts are washed with a neutralizing agent to lower the acidity of the pelts and remove excess tanning liquid. The pelts are hung to dry for a while and then excess moisture is removed fran the pelts by applying a stroking pressure from one end of the pelt to the other. The extraction of moisture from the pelt can be done manually or mechanically. The pressure exerted on the leather side of the pelt during the process softens the leather, inking it pliable.

7. Oiling and Drying: If oil is not introduced during tanning, fat liquoring of the furskins is necessary. The object of oiling is to restore the natural fats which were lost during the dressing. The oil is usually applied to the leather side with a brush and care must be taken not to contaminate the hairs.

After oiling, the pelts are hung over pies or on hooks to let dry. However, the furs are not allowed to dry out completely as some moisture must be left in the fur to facilitate subsequent stretching, cleaning* degreasing and softening processes.

8. Drumming and Stretching: The furs are put into a drum with a special grade of sawdust and spun around in order to thoroughly cleanse the hair from dirt and other impurities. After drumming with sawdust the pelts are placed in a wire mesh drum to remove excess sawdust. In order to further soften the firs they are stretched over a staking knife or knee staking device to separate skin fibres from each other and acquire more softness and suppleness.

9. Ironing and Sanding: This step is optional. The purpose of ironing is to improve the lustre of the fur, and sanding will give the leather a softer and more supple finish.

10. Finished Goods Storage: The finished products are then sorted by grade, size and stored in a cool, dry place, well insulated from any damaging effects of weather.

4,2 Skill Levels

The labour and skill requirements for a tannery in Aklavik are based on consultations with tanning professionals. It is not possible to specify exactly how many workers the proposed tanning operation should employ as the number of workers required would depend on the scale of the operation.

Fur Dressing Expert: First and foremost, the services of a fur dressing expert must be secured. It is important that this person have extensive experience in fur dressing, be completely familiar with all aspects of a fur dressing operation, be knowledgeable about the latest technological advances in dressing, and have sane knowledge of chemicals. Fur dressing is an art as well as a skill. The level of expertise of the fur dresser will be a very important factor influencing the quality of the finished product the operation will turn out.

The dressing expert will be responsible for the overall operation of the tannery in both a business and technical sense. He will supervise the actual establishment of the tannery including the selection and purchasing of equipment; tanning inputs such as salt, sawdust and chemicals; building site, design and layout; and the hiring and training of workers.

The tanning expert should be someone who is willing to relocate to the community for however long it will take to train a permanent resident of the community on the art of fur dressing. Fur dressing

is a very complex and involved process taking many years of training and experience to learn well. It can take at least four years of apprenticeship for a tanning trainee to reach a level of proficiency.

The fur dressing expert should possess the following characteristics:

- previous experience at operating a commercial fur dressing plant
- extensive and up-to-date knowledge in fur dressing technology
- good management skills
- good interpersonal skills in order to train and handle staff effectively
- knowledge of chemicals

Apprentice Fur Dresser: The apprentice should be a permanent member of the community who will be trained in all aspects of operating the tannery, including the selection of pelts for dressing, fleshing, mixing of chemicals, and business management. It will take the apprentice several years of training, observation and experience to become good. The apprentice should be someone with a high degree of dedication and determination and willing to devote himself to learning the art of fur dressing. He should possess a good education with preferably some post-graduate training in chemical technology and business management and be willing to take additional courses if necessary to supplement his on the job training.

Buyer/Salesperson: This job will involve the purchasing and/or consigning of raw pelts for processing, and the marketing and selling of the tanneries service and finished product. The characteristics needed for this job include the following:

- Previous experience in assessing the quality of raw pelts based on standard grading procedure;
- accounting and bookkeeping skills in order to keep accurate records of purchases, consignments and sales:

- some experience at selling;
- and a good personality.

Flesher: The flesher's task is physically demanding and requires a high level of skill and extensive experience to do well. With poor fleshing damage to the pelt can be done by cutting too deeply, or by cutting the dermis which will expose the hair roots and allow hair to be lost. Industry experts estimate that it takes at least one year of on the job training with constant supervision to teach a person how to flesh a pelt properly and at least two years before an apprentice flesher is proficient at the job.

Production Workers: Additional workers will be required to perform the tasks of stretching, staking, oiling and physical handling of the pelts to move them through the tanning process. The stretching and operations require care, otherwise the skin may be torn. The other more general tasks do not require any specialized skills. It is recommended that the production workers be trained to do a number of tasks so that they can interchange jobs and labour is not wasted in slack time.

Depending on the scale of the operation, not all of these need be different people. For example the buyer/seller could be the same as the tanner. The staff requirements will be further assessed when the scale of the plant is determined in subsequent sections.

4.2.1 Training

All workers can be hired from the local population except for the tanning expert. Specific on-the- job training programs would be developed by the tanner. It may be advisable for the apprentice to take specific courses by night school or correspondence. These could include accounting, sales techniques, chemical technology, etc. A survey of the labour force in Aklavik has revealed that there is a sizeable labour force to draw upon. The skill levels of

the population identified in the survey show that the skills would have to be acquired.

It will be necessary for the flesher to acquire the necessary skills by going and working for a tannery in southern Canada or by having a . southern flesher come to work and train in Aklavik for a minimum period of one year.

The following presents a summary of potential positions, skill levels and training requirementts:[1].

i) Tanner: highly skilled; must be experienced in all phases of the operation: will need to be hired from outside.

ii) Tanner Trainee: should come from community; have high school and/or supplementary course work; make a long-term commitment; will require extensive on-the- job training plus supplementary courses.

iii) Buyer/Salesperson: can come from community; experience with furs beneficial as well as good personality; some on-the-job training and supplementary courses would be beneficial.

iv) Flesher: can come from community; will require extensive on-the-job training.

v) Labour: can come from community; necessary skills can all be acquired through on-the job training.

FOOTNOTES

1. Personal Communication, Inuvik Native Band, Economic Development Coordinator.

5.0 LOCATION ANALYSIS

Aklavik, as the location for a northern tannery, will benefit not only the local crafts industry, (by supplying quality and reasonably priced tanned furs), it will also utilize the available resources (fur pelts), and create employment. More specific benefits of Aklavik as a location are as follows:

Abundance of Fur Bearing Animals

As Table 2.7 presented, the Western N.W. T. as having a good supply of the ma jor northern fur species (muskrat, marten, white fox, etc.) . There is a good supply of furs in the delta to serve the partial requirements of a local tannery. However, a procurement system must be set up to get access to this supply which is , currently being sent to southern auction blocs. Aklavik itself is a good location since it has a larger fur harvest, considering muskrat furs, than the other delta communities.

Market For Tanned Furs

Section 3.0 identifies a high potential demand for tanned furs. The local craft industry will grin, and with it the demand for tanned furs will grow. As well, North American and international demand for authentic northern fur products could be met with the aid of CAP and other co-operatives. Because there used to be a fur shop in Aklavik, the expertise for inking garments and other craft products is more abundant in Aklavik than the other delta communities.

Local LAOur Supply

Within Aklavik there is a good supply of laker. All the required labor for the tannery can be hired from the local population, except for the tanning expert. It is highly unlikely that the specialized expertise will be available in any other delta

community. On-tile-job training, supplemented with selective course work, is what will be required to have the skills necessary to operate the tannery. The training till benefit the community in that it will introduce new skills in the people.

Water Supply

The operation of a tannery requires a great deal of inter, Which must meet recommended levels. The test results of the water in Aklavik indicate that it meets the recommended levels for water used in a tannery (See Appendix C). During the summer months water is distributed by pipe in Aklavik. During the winter months it is trucked. Community sources indicate an adequate transport system exists to supply the necessary water to the tannery, and haul the waste water away.

Transportation

There is access to Aklavik in the winter via winter roads, and in the summer via air. The air service is frequent with up to eight scheduled daily flights in the summer.

Aklavik is located just west of Inuvik. Inuvik is well seined by large, air and roadways. It is the distribution centre of the north western Arctic. Ran a transportation view point Aklavik, as other delta communities, has the disadvantage of requiring the chemicals, salt and sawdust needed for tanning, to be brought from large distances in the South. It has the advantage of being at the centre of a large fur harvest area and craft production area, thereby minimizing transportation rests of raw furs to the tannery and dressed furs to the crafts people.

Building

At present there is not a building in Aklavik that could house the tannery. What is required is a winterized building large enough to hold the equipment and supplies, and with an adequate water and drainage system.

Uniqueness:

One of the major advantages Aklavik has as the location for a tannery is that the far northern furs can now be sold as a differentiated northern product. As it stands now the northern furs are sold at auction blocs along with furs from all over North America and thereby not differentiated. It will also enable the products from those furs to be differentiated, and thereby result in a unique product characteristic with distinctive market appeal.

6.0 FUR DRESSING

Tanning of furs and hides has been carried out for as long as man has inhabited the earth. Hides are considerably easier to tan than furs and have been tanned using a variety of home methods. since fur dressing is more complex because it involves preservation of the hair, home dressing methods are not as common nor as successful.

Commercial fur dressers, in order to produce good quality and durable dressed furs, must use a variety of chemicals. The success of any fur dressing is in the chemical formulas that are utilized. Fur dressing is an art thereby the "tanner" must possess an intimate knowledge of chemicals and formulas that must be utilized in the tanning process. This knowledge cannot be adequately obtained through texts and classroom instruction. It must be acquired through direct experience.

Very large quantities of chemicals are required for fur dressing. An industry ruLe of thumb is one kilogram of tanned furskins will require five kilograms of diluted chemical input. It is important to note that chemicals are purchased in concentrated form and then diluted with local water according to the tanners formula.

The decision on how to specifically dress furs depends on a number of variables. These include the type of furskin, the end use of the fur, local conditions and the preferences of the tanner. The basic objective in the choice of any method is the production of excellent quality fur with respect to handling, softness and suppleness.

Improper use of chemicals and formulas in the tanning process and improper handling of furs will yield inferior quality dressed furs. These will not readily find a market since most furs are used for mainly garmets and will not be acceptable by furriers unless they are of top quality.

Most often the particular chemical composition or tanning recipe used by a tanner is the product of extensive experimentation and development. It is subject to frequent testing and alteration.

The following describe the necessary characteristics of a dressed fur:[1].

1. The dressing must be sufficiently permanent to withstand the damping and drying operations, without any loss of suppleness.
2. The dressing should be sufficiently pliable to be able to stretch to the required shape, should cut readily and easily and have sufficient tensile strength to hold the stitches firmly after sewing.
3* The dressing should not be elastic, i.e., it must retain its shape after nailing and drying.
4. It should produce no after effects, such as grease on the lining or salt spew, or excessive acidity.
5. It should withstand without deterioration subsequent cl-g by the accepted fur trade methods.
6. Its weight should be commensurate with the type Of furskin used and should be such as to make a reasonable light weight garment which should not exceed 6 1/2 pounds for a full-length mat, or approximately 3 1/2 ounces per square foot of surface area.
7* The fur properties must remain intact and the dressing should in no way detract from the natural gloss, color or quality of the fur.
8. The dressing should be unaffected by the normal conditions of war and storage, i.e. variations in relative humidity and temperature.

Fur dressing is complex. There are several sequential steps that must be followed during the process . These are described below.

6.1 Soaking

Soakingis the firSt Step in the process. It involves bringing the furskin back to its natural state before it was cured by the

trapper. Since more cured furs are dried the main purpose of soaking is to put water back into the hide (dehydration) iii order to make it soft and supple.

Soaking should be done as soon as possible after curing in order to prevent undue hair loss. Proper soaking is absolutely essential to good dressing.

Some furskins, mainly those of the smaller variety, are not totally imnersed . Rather a salt solution is either brushed on or a "poultice" of wet sawdust is applied to the raw pelt.

The two most important factors during soaking are time and temperature. Soaking times are reduced with relative increases in the water temperature. Although only cold water is recommended, soaking water is used at the temperature of the main supply and soaking time is adjusted accordingly.

Soaking takes place in large tanks or tubs to which salt crystal or solution have been added. Generally, three to five percent salt is added. Enzymes active at low pHs compatible with acid soaks may be added.

6.2 Fleshing

The basic purpose of fleshing is to remove the thin membrane of protein separating the skin proper from the fat layers and organs. This membrane inhibits the absorption of chemical solutions. Manual operations implementing a knife or beaming can be used, although mechanical blades are most often employed for their relative cost and time efficiency.

Proper fleshing depends on the skill of the operator, the efficiency of soaking and the sharpness of the blades. Improper fleshing results in cutting through the dermis, or cutting too deeply causing hair 10ss. It renders a furskin useless. Industry sources indicate that it takes a minimum of one year on-the-job training and preferably two years before a flesher becomes good.

6.3 Dressing

The actual process of dressing occurs after soaking and fleshing. This is basically the process by which the properties of the dressed furskin are made permanent.

There are alternative methods of processing the furskin. Any tannery may use one or a combination depending on the preferences of the tannery, the types of furskins being dressed and other renditions. The four most common are described below*

6.3.1 Acid Pickling

Pickling serves two functions:

1) prevents the furskin from bacterial attack;

2) and contributes to the hydrolytic breakdown of the collagen fibre structure.

The pickle can be applied to the fleshed furskin by total immersion in vats or by brush. Brush application is commonly used for long-haired furskins and at least two applications are required to ensure effective penetration.

Sulphuric, formic and lactic acids, aim, formaldehyde, chromium and common salts are alternate choices us@ in fur dressing. Concentration levels may be from 25 ml to 100 ml sulphuric acid and 100 to 150 grams salt per litre of water.2•

Although sulphuric acid and salt is the best known method of pickling, other acids such as formic, acetic, lactic and glycollic are generally regarded as safer though they are more expensive than sulphuric acid and are used in higher concentrations. In recent years these safer organic acids have largely replaced the use of sulphuric acid.

In comparison to other acids, glycollic acid is milder, non-volatile and less likely to cause darnage to the pelt. Concentration

levels are 20 to 30 grams glycollic acid and 60 to 100 grams common salt per litre of water .3" The crystalline form of glycollic acid inhibits adhesion of the collagen fibres during drying.

Alum pickling is the preferred mans of dressing due to its water resistance and stability. Alum pickling is usually carried out by total immersion rather than by brush application. Immersion time ranges between 12 to 48 hours at a temperature of 30 to 38 degrees C.[4]. Concentration levels are 40 grams aluminurn sulphate and 30 grams common salt per litre of water.[5]. Additions may include formic or glycollic acids, alkalis such as soda or sodium bicarbonate. The pH value of the pickle lies between three and four. Alum dressed furskins tend to be less stretchy and slightly heavier than acid dressed furskins.

The addition of salt to an aluminum sulphate solution is necessary to repress swelling of the tissues and allow for total absorption of alum. The addition of alkali to alum and salt solutions increases the absorption of alum by collagen and improved water stability of the dressed furskin. Basic aluminum salts prepared from the chloride on the phthalate with a basicity ranging from 25% to 60%, compensate the sensitivity of alum and salt solutions.[6].

The major risk in using acid pickles is the damage caused by the excess of acid residing in the pelt. In order to combat this damage, ammonia is added to oil at the oiling stage to neutralize the excess acid. The results acquired in neutralizing an acid pickled furskin are a higher shrinkage temperature, greater inter stability (although not sufficient) and a reduction in the quality of the dressing.

Generally furskins exposed to an acid pickle are light and soft, but tend to swell and dry hard and 'tinny" if they become wet. This problem can be avoided by subsequent soaking in a salt solution.

6.3.2 Chrome Tanning

Presently, the best quality furskins are produced using chrome tanning. It must be noted that chrome tanning is an irreversible process. Special care and the skills possessed by an experienced tanner are required for chrome tanni ng. Chrome tanning renders the furskin virtually resistant to all kinds of influences. The most significant results being chrome tanned furskins have a higher shrink teinperature than any other type of dressing, they are resistant to bacterial action, durable and produce a soft and pliable furskin.

Chrome may be used with other dressings such as aim, acid or formaldehyde. Chrome is extremely useful for furskins which subsequently are to be exposed to high temperatures. Chrome is frequently used on furs to be treated with heated rotary ironing machines or dyeing with acid or other textile dyes applied at tentperatures varying from 6Ø to 8Ø degrees C. Chrome is also used for redressing other dressings prior to exposure to high temperatures.

Quantities of commercial chrome liquors or powders vary greatly depending on the requirements and renditions of the process. Factors such as time, temperature and mechanical agitation affect the proper distribution of chrome in the pelt. Chrome alum and chrome salts are widely commercially available.

Two methods of chrome tanning include: [7].

i) Application of chrome liquor to the flesh side of skins only. Concentration levels are 3Ø to 40 grams chrome salts and 6Ø to 100 grams common salt per litre of water.

ii) Immersion of chrome liquor in a vat equipped with paddle. Concentration levels are four to six grams chrome salt and 30 to 4Ø grams common salt per litre of water. Paddling should be continuous.

For initial chrome tanning, concentration levels of 30 grams , alum and 50 grams common salt is used per litre of water. This process should be followed by a reduction of the moisture Content of the furskins, promoting thinning out the flesh side.

For chrome retanning where chrome alum is used, approximately 15% of the shaved initial alum tanned weight is recommended. For tanneries with drum tanning facilities, the following is recommended:8.

1) to 100% inter, add 5% common salt and turn for 15 minutes;
2) add 2% chrome alum and 7.95% sodium carbonate on chrome alum weight turn for one hour;
3) add 3% chrome alum and 10.6% sodium carbonate on chrome alum weight turn for one hour ;
4) add 5% chrome alum and 15. 9% sodium carbonate on chrome alum weight turn for one hour;
5) add 5% chrome alum and 15. 9% sodium carbonate on chrome alum weight turn for two hours ;
6) lastly, add 0.4% to 0.8% sodium carbonate on shaved initial tanned weight, dissolve in 1Ø to 20 times water and turn for three hours until tanned through.

Tanning time using chrome averages around eight hours whereas heavier hides may take 12 to 24 hours. The tanned furs are then "horsed up" for a period up to 12 hours to promote optional fixation of the chromium. Next, the furskins are washed to remove most of the salts and acid. Neutralization of the furskins follows and takes place in a drum. Concentration levels are 10 to 30 grams sodium bicarbonate per litre of inter; inter ratio should be one to 2Ø and the process lasts about half an hour. Lastly, the furskins are washed thoroughly under running water for at least 30 minutes.

Pickling prior to chrome tanning is not required although initial tanning with aluminum salts to bring the furskins to a slight acid rendition, is highly recommended . An alternate procedure is to

pickle with chrome salts prior to tanning with chrome to ensure the pH factor of the furskin lies between 3.5 and 4.0.

Several disadvantages associated with chrome dressing are: the greenish hue of a treated fur; the unsuitability of treated furs for subsequent treatments such as hydrogen peroxide bleaching or dye baths containing large quantities of hydrogen peroxide; furs are heavier and thicker than furs dressed with acid or alum; and the furs have less stretch when dampened. Avoiding over tanning of the hairs requires special attention and expertise.

6.3.3 Fermentation or Meal Dressing

The quality of the dressing obtained by this method can not be reproduced with the use of organic acids. The process employs the use of cereal grains in optimal renditions to induce fermentation. A combination of oats, rye, barley, bran, yeast and salt are commonly used. The raw fleshed furskins are either immersed in the liquor or a paste of fermented liquor is applied to the pelts which are rolled or folded fur side out and revered with a salt solution.

Technically, the reactions and results of the process are complex and varied, thus difficult to access. Initially, starches are broken down by amylolytic enzymes into glucose and dextrin which in turn are further broken down into a mixture of organic acids such as lactic, acetic, formic and butyric. The entire process results in the removal of mucoids by proteolytic enzymes produced by the soured meal. [10]

The disadvantages associated with this fermentation method are its high rest, extended length of immersion time and the possible danger of hair loss initiated by bacterial attack. Depending on temperature and other local factors, the process takes anywhere from five to fourteen days. Accessing the proper length of time of fermentation per furskin requires extensive experience.

6.3.4 Formaldehyde Dressing [11].

Formaldehyde is considered superior to any other cross-linking agent used in tanning. It renders collagen relatively resistant towards enzymes; decreases the tendencyto swell in water, acid or alkali: and increases the hydrothermal stability of the furskin raising the shrink temperature to 90 degrees C.

Formaldehyde, when used as a tanning agent, produces a dressing which is not reversible in water. Employed as a pretreatment before bleaching, formaldehyde is most often used in conjunction with other dressings to avoid future complications. The chemical tends to produce a light furskin which has virtually no stretch and prohibits subsequent dyeing processes.

Minute amounts of formaldehyde within the appropriate acid range are fixed and increasing the Ph increases the amount of hound formaldehyde up to pH 7; stable building rates occur between pH levels of seven and eight and a second rapid rise takes place between nine and eleven.

6.4 Oiling

The primary function of oiling is to act as a lubricant to prevent adhesion between the fibres of the pelt substance during the drying dressed furskin.

There are *three* methods employed for oiling:[12].

1) Application to pelt, followed by drying in heated rooms, or "stove" leathering.
2) Application to pelt, followed by mechanical milling or "kicking".
3) Total immersion in an emulsion of oil in water, or fat liquoring.

Methods Of application and oil composition depends on the type of furskin. The oil treatment must evenly lubricate all parts of the pelt yet leave the fur and weight of the furskin unaffected. Fatty matters suitable for oiling are fish oils, mineral oils and

vegetable oils. Glycerine may be used to facilitate 'the penetration of the oils.

An after oil treatment referred to as "stove" leathering is usually restricted to thin pelted or grained furskins. Easily emulsified oils are generally used. Commercial. stove oils are cunprised of specially treated neat's foot, sperm and cod, soya and olive oils, with additions of mineral oil and untreated animal, fish or vegetable oils.

"Kicking" treatment is a very physical process which promotes the penetration and distribution of oil. The process varies in duration and may range from fifteen minutes to several hours depending upon a number of factors such as the type of furskin, the level of external heat and the propensity of the furskin to absorb the oil. It is most suitable for thick or close-grained pelts such as seal. Four important factors in kicker treatment: 13"

1. The moisture content of the furskin and also of the oil.
   - Water free oils or those with a very low water content are used. The optimal water content during kicking is between 20% to 25%.
2. The viscosity of the oil.
   - Viscosity of the oil can be controlled by the amount of mineral oil in the mixture. Kicking oil is applied at a temperature above its melting point to ensure easy flow.
3. The relative surface tensions of oil and water present.
   - The oil must possess a lower surface tension than the water or pickle contained in the pelt, as well as any other ageous solution present.
4. The composition of oil.
   - Unsaturated oils tend to produce a chamois ef feet during the kicking process. Usually, kicker oil is comprised Of wool grease, mineral oil, cod oil, fish or animal oil. Wool grease is generally preferred because it does not cause yellowing and is readily removed frokm the fur by sawdust drumming.

- Cationic oils depend on cationic surface-active agents" as emulsifiers and offer good stability to acids and salt solutions. The major disadvantage of surface-active agents as emulsifiers is that hydrophilic substances are readily r-veal from the emulsion system, which may then break down . These oils tend to wash out during further wet treatment.

6.5 Drumming

The sawdust drum is one of the most essential pieces of equipment in a tannery. Drums are usually constructed of hued and are fitted internally with pro jections. The average drum size is six to eight feet in diameter and several feet wide and rotates at from eight to 20 rpm. The primary functions of the drum are: 14.

1. To remove *excess* moisture fran both fur and pelt by absorption of the sawdust. Alternately, conditioning or increased moisture levels can be attained by adjusting moisture levels of the sawdust .
2. Sawdust serves an an overall cleaner through absorption of excess moisture; dislodging loose dye or other adhering materials; and in combination with additional solvents or surface-active agents, promotes more intensive cleaning.
3. Friction is a natural by-product generated by the movement of furskins through the sawdust. Since increased temperatures are found to enhance the lustre of furs, it is customary to externally heat drums or introduce heated air flow.

Although substances such as china clay, sand, talc, corn meal or Nlers Earth can be utilized for drumming, the industry preference is for hardwood sawdust . It is available in large quantities, absorbs well, polishes and is easy to remove from furskins .

The type of sawdust preferred depends on several factors:15•

1) Ratio of the weight of furskins to that of sawdust;

2) moisture content of sawdust;

3) size of sawdust particles;
4) additive required during the drumming process, such as solvents, surface-active agents, glazes, silicones, anti-static agents, etc;
5) duration of drumming; and
6) temperature.

After thorough cl-g of the furskins the soiled sawdust is removed from furskins by transferrance to a wire mesh drum which allows sawdust to fall or to be removed by suction.

6.6 Bleaching [16].

The bleaching process varies directly with initial and subsequent treatments, the type of furskin and the desired result. Natural white colored furskins are bleached to obtain an even white color. Black hair pigments can be totally rained by bleaching to obtain a nearly white furskin.

Pretreatment such as formaldehyde and fat liquoring are necessary to provide adequate protection of the furskin against the harsh effects of bleaching. Chrome tanned furskins should not be bleached since the fibre structure of the leather may be destroyed.

Hydrogen peroxide bleaching is used if the furs are to be eventually dyed. The furskins are initially immersed in a bleach liquor with concentration levels of 600 cubic centimeters of hydrogen peroxide, 100 cubic centimeters of water and small additions of ammonia. The temperature should be regulated between 32 degrees to 35 degrees C. and the pH should be continuously checked; when the alkalinity is too high, it reduces the bleaching ef feet, and when the pH value of the liquor falls below pH 7, no bleaching action occurs.

The fumes Of sulphur dioxide can also produce a good bleaching ef feet. An air tight container divided into to distinct compartments is required. Damp furskins are customarily hung in the largest compartment, while sulphur slowly burns in the other.

6.7 Glazing

Although often considered a n optional treatment glazing tremendously improves the gloss by aligning the fur fibres. The process employs brushing mucilaginous or silicone materials onto the furskin and is sometimes followed by ironing. Materials used include linseed, china wed, psyllium seed, guns of various types and a variety of silicone emulsions.

6.8 Beating, Carding, Brushing and Combing

These final stages in fur finishing are very labour intensive and although they may be accomplished by hand, are most often totally or partially mechanized.

Beating serves to free the fur from tangle and also breaks up the adherence of one fibre to another. The furskins are usually supported on a resilient pad or base and the "beating action" traditionally supplied by a cane or leather throngs, is usually mechanized.

Additional processes such as carding, brushing and combing all operate to free the fur fibres and produce a rich looking and noticeably more luxurious product.

6.9 Ironing [17].

When applied properly, heat produces lustre and improves the overall appearance of fur. The mechani" cal feed may be fixed or variable and the speed of the rotating cylinders may be from 500 to 1000 rpm.

Heating may be supplied by gas or electricity and can be thermo-statically controlled. The temperature of the iron ranges from 90 degrees to 220 degrees C. depending on the furskin, its method of dyeing and the nature desired of the finished prcduct. short haired furskins can usually be subjected to higher temperatures whereas long-haired furskins may singe at too high a temperature.

6.10 Stretching

Stretching of furskins requires proper judgement of the correct drying and drumming renditions. Machine stretching is considerably more effective than by hand. The roller stretching machine, the eccentric wheel and the staking wheel are mechanized versions dependant on blunt blades. New mechanized stretchers function with rubber rollers and variable speeds. The correct amount of moisture must be present in the pelt during stretching. Normally, 25% to 30% of the dry weight of the pelt substance is considered the proper moisture content.

6.11 Removal of Fur and Hair

Commercial treatments described as unhairing, plucking, dehairing, pulling or shearing are necessarily applied to particular furskins to increase their value.

Unhairing consists of removing the coarse, unsightly guard hair which overcoats a dense, silky coat of underfur. Unhairing takes place on raw furskins prior to the use of pickles or tans which tend to render the removal of guard hair much more difficult. It is a slow manual process that requires exacting judgment in determining the correct degree of looseness of fibres and expertise in completing the operation.

Dehairing is a mechanical treatment commonly referred to as "electrifying" or "machining". The basic machine consists of a canvas conveyor belt which slowly transports the shorn furskins towards an arrangement of brushes, knives and revolving spiral blades which cut the protruding guard hairs. Its purpose is to remove guard hair intermixed within the soft underfur in order to produce a high quality, soft, silky furskin.

Pulling is a process most often employed when t??e underfur is r-cd intact and not shorn as in the case of long-haired rabbits. One method of pulling is carried out by roving the

which is hand held and supported by a metal bar, towards a rapidly revolving blade and rubber roller, which pulls out the guard hairs.

Shearing produces a specific level weight of fur on skins such as beaver, rabbit, musquash, raccoon, sheep, wallaby and lambs. Varied types of machinery are capable of shearing, all possessing rotating cylinders of spiral blades. Furskins are held in place with the aid of suction, plus other devices on a feed conveyor system.

A shearing machine requiring more manual input employs hand held skins, supported by a metal bar, which are carried towards revolving blades. This system allows the height of shearing to be controlled by the operator, which is extremely useful for different shearing where furskins have variable lengths of fur.

FOOTNOTES

1. Caplan , H., : Furskin Processing. Pergamon Press, Toronto, Ontario, 1971, pp. 125-126
2. Caplan, Op. Cit., p. 133
3. Ibid., p. 133
4. Ibid., p. 135
5. Food and Agriculture Organization of the United Nations, Rural Tanning Techniques. Rome, 1960, p. 154
6. Caplan, Op. Cit., p. 134
7. Focal and 'Agriculture Organization of the United Nations, Op. Cit., p. 153
8. Ibid., p. 154
9. Ibid., p. 155
10. Caplan, Op. Cit., p. 139
11. Ibid., p. 137
12. Ibid., p. 142
13. Ibid., p. 144
14. Caplan, Op. Cit., p. 202
15. Ibid., p. 203
16. Food and Agriculture Organization of the United Nations, Op. Cit., p. 163
17. Caplan, Op. Cit., pp. 206-207

7.0 PLANT LAYOUT

A medium scale fur tanni' ng operation would initially be the most economically fe"asible. Factors contributing to this viewpoint include the availability of raw furs, market demandand associated costs of production. Initial design and construction of the plant should naturally be conclusive to future expansion should the need arise.

A simplistic, functional modular prefabricated building would be most appropriate to house the necessary materials and equipment to operate a fur tannery in Aklavik. Two realistic and conservative estimates of total plant sizes - Scenario A: 10,000 square feet; and Scenario B: 7,000 square feet, are considered as potential feasible operational sizes for the study. Specifics concerning total operating rests of each facility will be later discussed in the financial section.

A clear understanding of the flow of the dressing process is important to determine the plant layout. Figure 7.1 illustrates the flow of the dressing process that is described in the previous chapter.

7.1 Land and Building

A suitable location for a tannery is an area removed from residences. It should be a large site with good drainage and dry access availability. Ideally, the building should & a one storey instruction, with a wood or metal finish and be well insulated.

The standard dimensions for a tannery are dependent upon af foldability, forecast output levels and the actual tanning methods to be implemented. Considering the relative remoteness of Alkavik, additional considerations such as water Supply, waste disposal and storage requirements are important.

Figure 7.1

Simplified Flow Diagram of the Complete Dressing Process

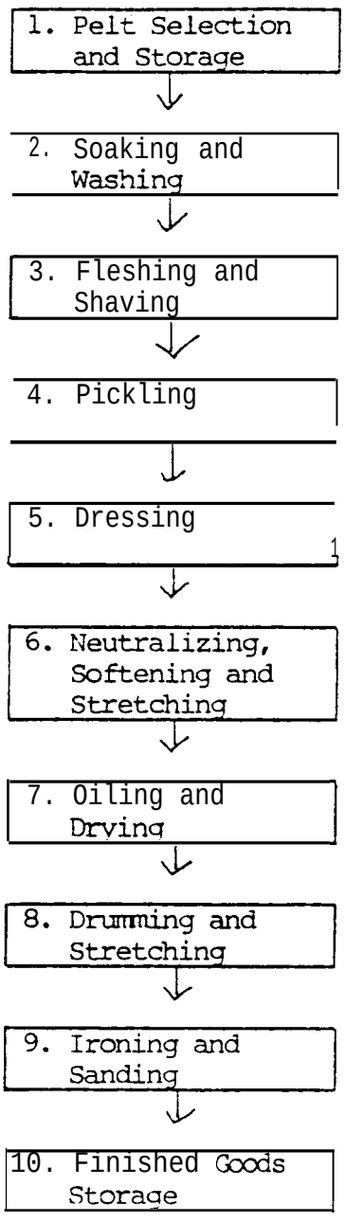


Figure 7.2
General Sketch For A Fur Tannery

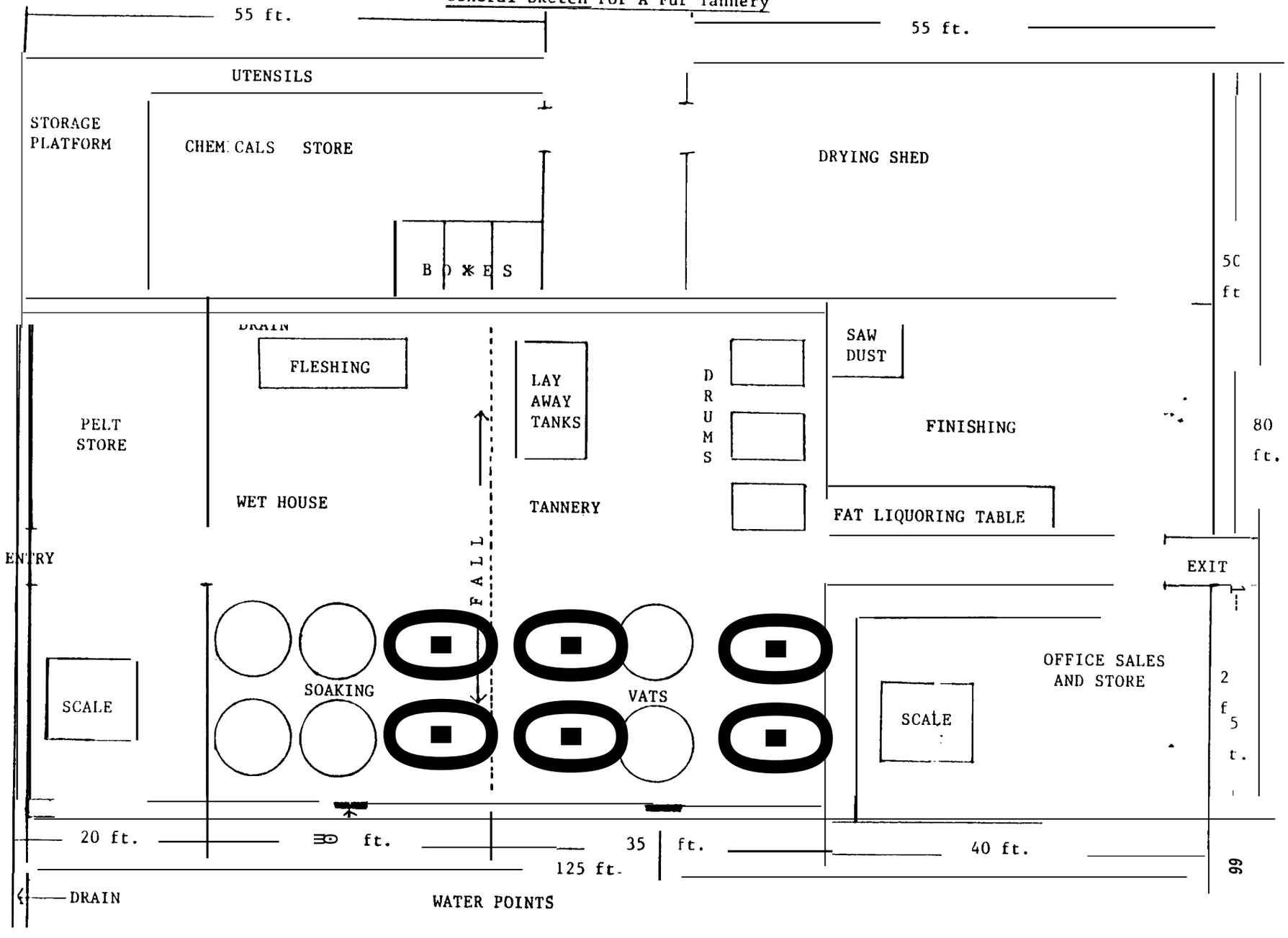
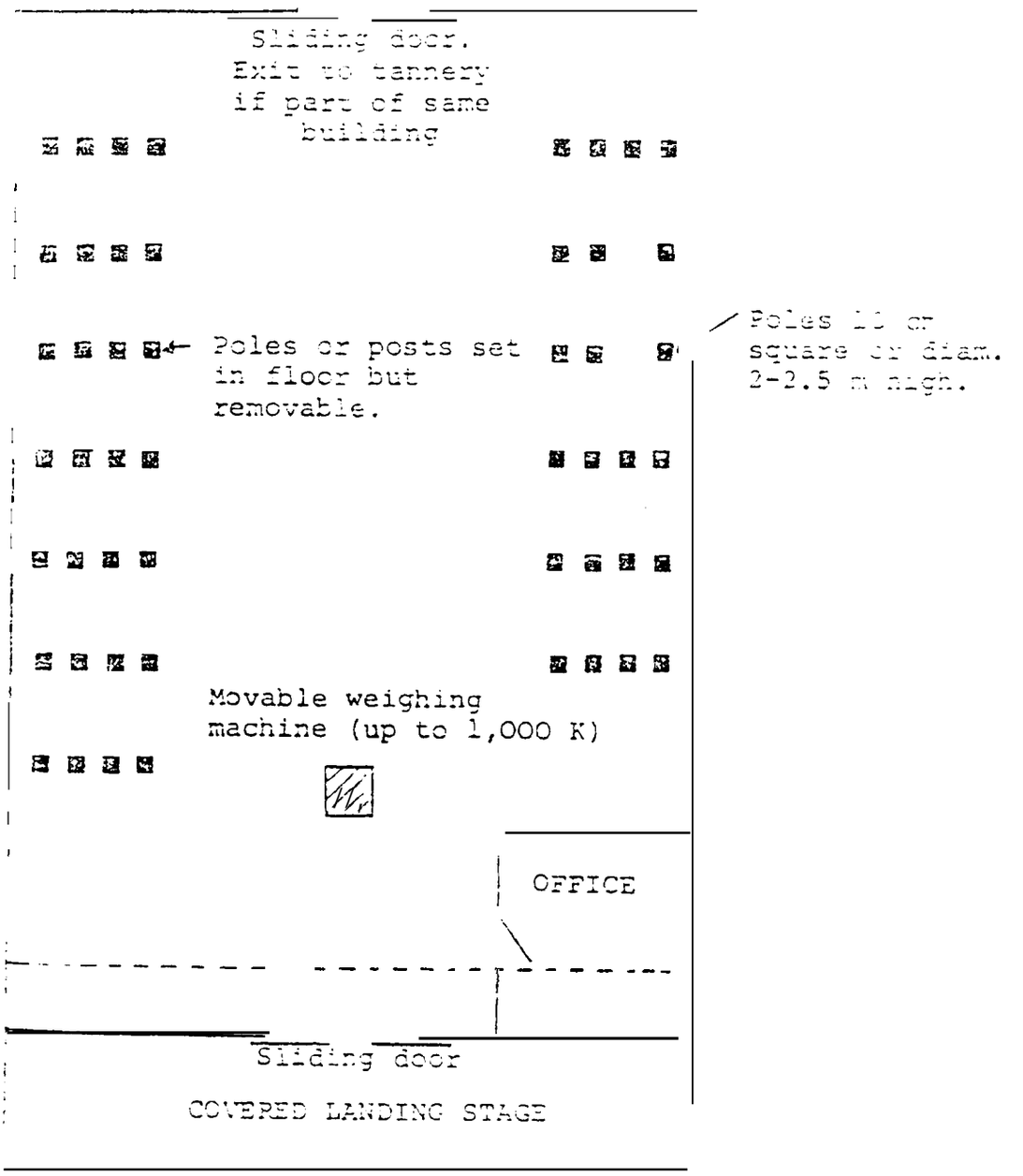


Figure ,7.3

Store for Finished Goods

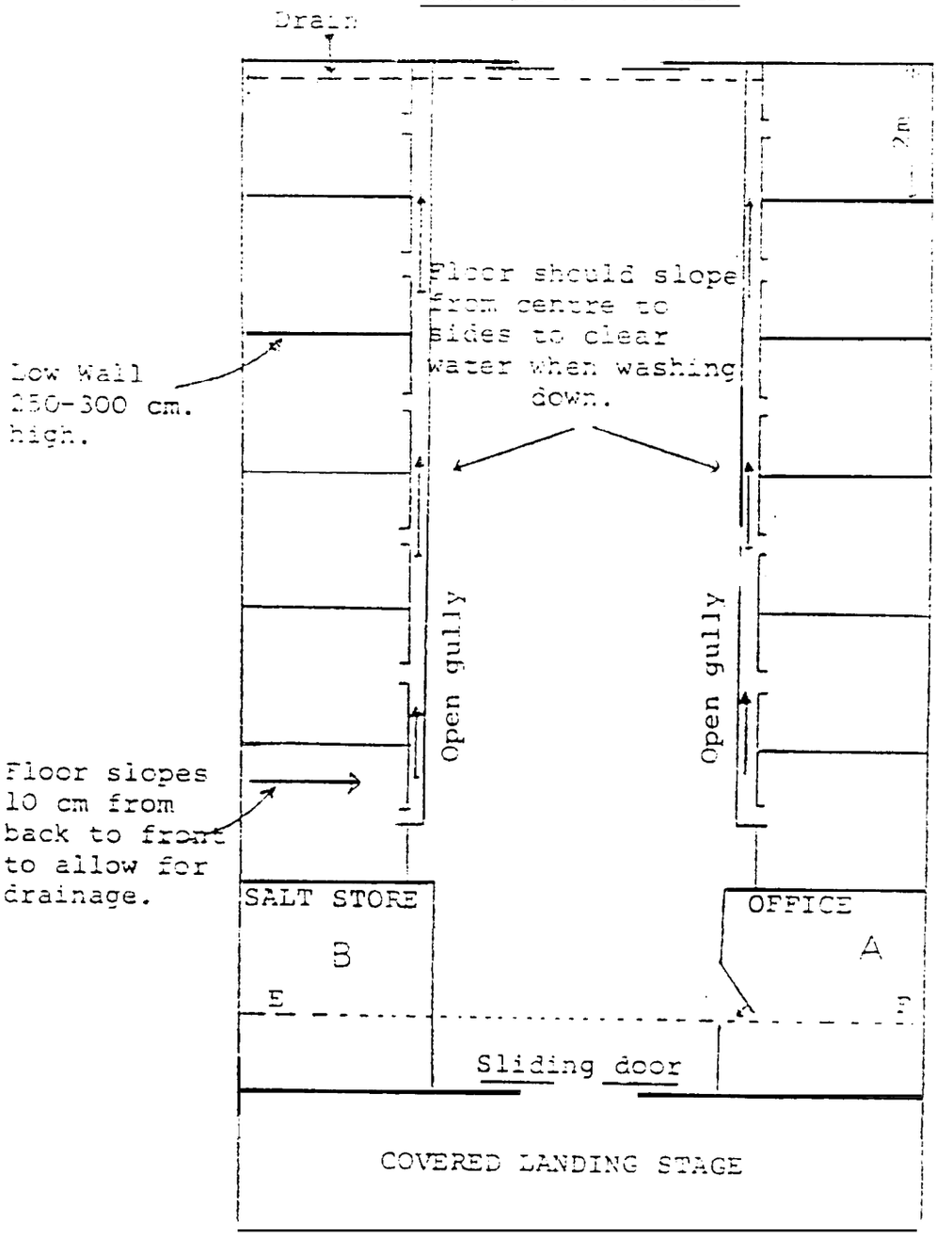


NOTE: Office only required if storage is in a different location from tannery.

Source: International Labour Office , Tanning of Hides and Skins. Technical Memoradum, No. 1, Geneva, 1981

Figure 7.4

Store for Wet Furskins



NOTE: Office only required if storage is in different location from tannery. If in the tannery, the door and front wall would be at dotted line EF, and areas A and B would be available for salt storage.

Source : International Labour Office , Tanning of Hides and Skins . Technical Memorandum, No. 1, Geneva, ! 981

Although the actual physical layout and dimensions of the tannery, as graphically displayed in Figures 7.2, 7.3 and 7.4, may vary somewhat, the basic components are standard requirements for a medium size tannery.

The following are **the basic space requirementts of a medium size tannery:**

1. **Store for pelts**
2. Store for chemicals
3. Soaking area
4. Wethouse
5. Main tannery
6. Drying shed
7. Finishing room
8. Store for finished goods, to include an office

A choice location site should have a plentiful supply of suitable water, easily accessible for transport, a large availability of skilled labor, within close proximity of major markets and a sanitary disposal system for waste products.

Construction specifications are discussed in the following section. The underlying assumption is that it would be a medium scale tannery that could be feasibly expanded in the future.

Several aspects are important to the planning of a tannery:

1) Adequate space to accommodate initial and future output.

2) Continuous flow of hides through the various processes.

3) Should provide a sanitary and safe working environment for workers.

4) Built high enough above ground to allow for easy drainage and waste disposal.

5) Must facilitate installation of adequate windows for lighting and ventilation.

The most economical construction" for a fur tannery located in Aklavik consists of one building which houses all the necessary physical components. Walls may be constructed of stone, metal, brick or lumber.

Moisture is always present within tanneries, therefore, roofing design should effectively reduce condensation and increase ventilation. It is advisable to provide for a ventilation ledge along the whole length of the roof.

Efficient dispersal of effluents from the tannery is essential to attain both a high quality of furskins and a sanitary working environment. Outward sloping floors are usually made of stone, brick or concrete and roughened to provide a firm grip for the feet of workers. Two drains running parallel along the length of the floor are installed to drain off surface liquids.

Figure 7.2 details the initial plant layout for scenario A and appropriate adjustments should be made in the event that scenario B were decided upon.

Other considerations when choosing a building and an interior design are:

- insurance
- expansion capability
- ventilation
- safety requirements
- building standards

7.1.1 Store for Pelts

The primary objective in determining suitable storage requirements is to preserve the furskins in excellent condition. Facilities should provide adequate protection against attack by rodents and other vermin, as well as damaging weather effects. Cool storage is important if they are to remain in storage for any length of time.

7.1.2 Store for Chemicals

Chemicals are brought in seasonally, thus amounts purchased may be far greater than, for immediate consumption. Excess chemicals must be stored. Considering the relatively secluded nature of Aklavik and the high costs of transporting and purchasing chemicals used in the tanning process, it is advisable to purchase sufficient amounts of chemicals to last up to one year of operation. In most cases, it is better to purchase large quantities of chemicals to qualify for price discounts.

Full protection from moisture is therein stipulation in design. Materials should be supported by a slatted platform and the building should be well ventilated. Chemicals should be carefully stored in separate individual containers to prevent contamination or spoilage due to leakage.

7.1.3 Soaking Area

This area accommodates several large vats or drums usually made of metal, brick, stone or cement used for soaking and washing. The floor must also be brick, stone or cement to allow for periodic cleansing. This floor should slope inwards, towards the wall of the central tannery drain.

7.1.4 Wethouse

Sufficient space should accommodate the various preliminary operations such as soaking, fleshing, shaving and pickling. The ma jority of the effluents and solid wastes are emitted during the above process. Therefore a cement, brick or stone floor is most appropriate. Provisions for an adequate and continuous water supply is essential.

In the event that cement or brick vats are to be constructed, they should be erected above and separate from ground level: the bottom of the vat should Slop? in the floor direction; and a hole six to eight centimeters in diameter, fitted with a wooden tap should be inserted at the bottom of that side of the vat which is nearest the drain.

7.1.5 Main Tannery

The size of the main tannery is dependent upon the number and variety of furskins to be treated. The main tannery must be of sufficient proportions to 'house a number of vats, drums, tables and machines. Ideally, the main tannery should be separate from the wethouse, although a disjointed building is not required.

7.1.6 Finishing Room

The final stages of dressing furskins, such as staking, dyeing, glazing and buffing, occur in the finishing room. Proper shelving and storage space for chemicals used in this stage is necessary. A clean sawdust storage box 1.2 inters long, 1.2 meters wide and 0.3 meter deep will occupy additional space.

7.1.7 Drying Shed

The function of a drying shed is to protect the furskins from rain, direct sunlight and heat. This component can be an extension of the main facility or a separate free standing building.

The basic features must provide a cool, dust and other contaminating particle free environment. Construction should facilitate the ability to increase circulation of the air. Thatched or country style roofing in combination with moveable side panels are effective means or promoting air ciruclation. Alternate methods will have to be analyzed to suit Aklavik's climate.

7.1.8 Finished Goods Store

The basic requirements of the finished goods store are to protect against the harmful effects of rodents, rain, direct sunlight and heat and to allow for adequate ventilation of the air. Figure 7.3 provides a suggested design for a finished goods store. The store houses wooden platforms suspended abut 30 centimeters above the floor and wooden posts or poles. The walls should be four or five metres high to protect against putrefaction.

7.2 Capacity

The total annual production capacity of a fur tannery is mainly dependent upon the type of fur processed. Based on the western N.W.T., estimated average annual harvest (Table 2.7), it is most likely that muskrat will be the primary furskin processed within the Aklavik fur tannery.

Two scenarios for the proposed fur tannery in Aklavik have been prepared for comparative analysis purposes and to determine the appropriate scale size of tannery required to best capitalize on the most efficient. economies of scale.

Scenario A: A medium sized fur tannery, processing an estimated 172,175 furskins per year (based on average annual harvests in the western N.W.T.). Assures an average of 120 furskins per drum load. The facility is capable of processing six drum loads per day, 30 drum loads per week or 1,4413 drum loads per year.

Scenario B: A medium small sized fur tannery, processing an estimated 86,088 furskins per year. Basically, scenario B represents a smaller scale version of Scenario A, capable of processing only 50% the number of furskins. Assumes an average of 120 furskins per drum load. The facility is capable of processing three drum loads per day, 15 drum loads per week or 720 drum loads per year.

For this small scale fur tannery, a number of tasks could be manually completed thus eliminating the purchase of unnecessary expensive equipment. A fur tannery of this scale will undoubtedly be much more labour intensive than a larger volume processing fur tannery.

Table 7.1 presents the number of furskins of each species that fit into the drum had.

Table 7.1

Estimates of Capacity Per Drum Load For Each Species

Fur Species	Number of Furskins
Beaver	50
Fisher	100
Fox	70
Lynx	70
Marten	150
Mink	150
Muskrat	175
Wolf	40
Wolverine	80

Source: Derived from "Draft Report on Tannery Study".

FOOTNOTES

1. Food and Agriculture Organization of the United Nation, Rural Tanning Techniques. Rome, 1960, pp. 195-205 .

8.0 PRODUCTION REQUIREMENTS

This section details the ma jor equipment, materials and labour requirements for a proposed fur tannery operation. Considerations such as flexibility for expansion, efficient flow of materials and supplies, and personal safety and convenience have been accounted for.

8.1 Assumptions

A non-rigid set of assumptions are necessary for further discussion regarding capital and production requirements.

Although Scenario A and Scenario B differ with respect to the total amount of furskins processed, the following assumptions apply to both scenarios.

1. The yearly operational schedule assumes operating at full capacity for a total of 48 weeks.
2. The fur tannery operates on a custom tanning basis, where furskins are intially centrally purchased by the government of N.W.T'., then sent to Aklavik to be tanned.
3. Costs of doing business and the revenues generated are held constant during the full five year **pro form period.**

Prior to start up: One year prior to actually commencing production at the tannery, a flesher apprentice will be sent to a south Canadian tannery to acquire the necessary skills. A wage subsidy of $5,000 will be awarded to the apprentice to supplement his wages. Site location, instruction of building, purchase and installation of equipment take place in the year prior to start up.

Year 1: Tannery is operating at half capacity and spoilage is approximately 20%.

Year 2: Tannery is operating at 75% capacity and spoilage is approximately 10%.

Year 3: Tannery is operating at 83% capacity and spoilage has' been eliminated .

Year 4 to 7: Tannery is operating at 100% capacity with no spoilage.

8.2 Capital Requirements

8.2.1 Equipment

Table 8.1 contains a list of the equipment required under the two different scenarios. Scenario B is smaller scale and is more labour intensive. Scenario A is capable of processing a greater number of furskins and will naturally require more specialized equipment.

Tanning equipment most likely needs to repurchased directly from Europe . **Prices quoted for equipment do not include shipping** charges levied from the manufacturer to the fur tannery. Equipment purchased in Europe can be transported to Aklavik by means of shipping, air cargo and surface travel or a combination of methods.

Fully **reconditioned, previously** owned equipment **can repurchased** upon availability and usually sells for substantially lower prices.

The suppliers listed in Appendix E manufacture a comprehensive list of equipment used in a fur tannery. In the event the fur tannery was to expand, unsuitable equipment could be sold and new equipment purchased. In an attempt to reduce transportation costs it may be preferable to purchase all equipment from one equipment supplier.

Equipment purchase conditions regarding means of payment, delivery time, prices and installation are basically the same for all equipment manufacturers.

Delivery times: Varies from one to three months after receipt of order @us letter of credit, with reservation as to the undisturbed proceeding of manufacturing.

Table 8.2

Estimate" Chemical Requirement Per Lot

Process	Chemical	Quantity
Soaking	Salt	10 grams/ litre
Washing	soap	3 grams/ litre
Pickling	Salt	6 grams/litre
	Formic Acid	10 grams/litre
'i'arming	Salt	6 5 grams/litre
	Alum Salt	20 grams/ litre
	Bicarbonate	2 grams/litre
	Chrome Salt	10 grams/litre
Oiling	Oil	4 grams/lot
	Ammonia	80 grams/lot
Cleaning	Sawdust	10 grams/lot
Estimate Chemical rests per lot $100		

Source : Derived from Draft Report on Tannery Study.

It may be necessary to contact several chemical suppliers to obtain all the required tanning inputs as not all suppliers carry a comprehensive inventory.

8.2.4 Sawdust

Sawdust is a vital input for several stages to completion of the fur dressing process. Ideally the texture of the sawdust should be very coarse. The quantity of sawdust used per tanning operation varies. Sawdust is reusable and generally three drum loads can be processed prior to replacing the sawdust.

Only hardwood sawdust is suitable and must be purchased from single distributors located in Quebec. It is recommended that sawdust be purchased on a yearly basis to minimize additional transportation costs . Small amounts of varsol (8 oz. per drum load) can be added to sawdust and acts as a cleaning agent. Varsol can usually be purchased from any petroleum bulk station or chemical supplier.

8.2.5 Water

Large amounts of clean unrecycled water is required, especially in washing and neutralizing stages. Washing takes approximately one hour using fast running water.

Water requirements are approximately 1,350 litres of water to process 50 kilograms of furskins. Assuming an average weight of .91 kilograms for a furskin (weight can vary from 227 gram for squirrel, 1.4 to 1.8 kilograms for beaver, or 3.6 kilograms for wolf), one drum load consisting of 104 skins, would require approximately 2, 555 litres of inter. Assuming a throughput of six drum loads per day (Scenario A) using 15, 330 litres of water equals 76,650 litres per week or 306, 600 litres per month and 3,679, 200 litres per year.

9.0 FINANCIAL ANALYSIS

Capital and operating requirements were presented in Section 8.0. This section presents and summarizes the financial information required to establish and operate the business including costs, revenues, and five year pro forma income statements.

9.1 costs

All costs are summarized in Tables 9.1 through 9.5. Various rests were obtained from equipment manufacturers, transport companies, chemical suppliers, recent publications dealing with the tanning industry and consultations with operating tanneries.

9.1.1 Capital Costs

The funds required to establish an Aklavik fur tannery are approximately $1,613,390 for Scenario A and $1,105,390 for Scenario B. Table 9.1 and 9.2 outline the various capital cost components for Scenario A and Scenario B respectively.

Table 9.1

Capital Requirements - Scenario A

	COST	
BUILDING		$ 700,000
OFFICE EQUIPMENT		
-2 desks	$ 750	
-2 chairs	200	
-2 visitor chairs	75	
-1 typewriter	600	
-2 calculators	200	
-1 storage cabinet	315	
-2 legal size filing cabinets	350	
-miscellaneous equipment (staplers, etc.)	100	
-office supplies	10a	
-tables and chairs for staff room	700	
		3,390
EQUIPMENT		
-12 Vats @ $5000	$60,000	
-3 Sawdust drums and cages @ $15,000	45,000	
-1 Fleshing Machine	60,000	
-1 Ironing Machine	40,000	
-lStakingMachine	50,000	
-1 Stretching Machine	50,000	
-1 Combing Machine	35,000	
-1 Greasing Machine	45,000	
-1 Buffing Machine	50,000	
-1 Beating Machine	50,000	
-1 Automatic Washing Machine	45,000	
-1 Extractor	90,000	
		620,000
WORKINGCAPITAL*		290,000
TOTAL		$1,613,390

+ freight & installation

*Working capital is estimated on the basis of first year costs for sawdust, chemicals, insurance, transportation and four months of all employee wages.

. Table 9. 2

Capital Requirements - Scenario B

		COST
BUILDING		$ 490, ØØØ
OFFICE EQUIPMENT		
-2 desks	$ 759	
-2 chairs	200	
-2 visitor chairs	75	
-1 typewriter and stand	6ØØ	
-2 calculators	200	
-1 storage cabinet	315	
-2 legal size filing cabinets	350	
-miscellaneous equip-rent (staplers, etc.)	1ØØ	
-office supplies	100	
-tables and chairs for staff room	700	
		3,390
EQUIPMENT		
-6 Vats @ $5000	$30,000	
-1 Sawdust drum and cage	15,ØØØ	
-1 Fleshing Machine	60,000	
-1 Ironing Machine	4Ø,ØØØ	
-1 Staking Machine	5Ø,ØØØ	
-1 Stretching Machine	5Ø,ØØØ	
-1 Beating Machine	5Ø,ØØØ	
-1 Automatic Washing Machine	45,000	
-1 Extractor	9Ø,ØØØ	
		430,000
WORKING CAPITAL*		182,000
TOTAL		$1,105,390

*Working capital is estimated on the basis of first year costs for sawdust, chemicals, insurance, transportation and four months of all employee wages.

9.1.2 Operating Costs

This section details the operating costs that are projected t. occur annually in order to operate the fur tannery. Transportation charges as outlined in Table 9.3 and 9.4, are applied for the first year fOr equipment, chemical and sawdust supplies and for all subsequent Years for chemical and sawdust supplies only.

Table 9.3

Equipment Air Transportation Rates to Aklavik

Origin	Price Per Kilogram
Charles de Gaule Airport, France	$ 7.12
Dusseldof f Airport, Germany	7.49
Average	7.31

Source: CD Air Cargo.

Table 9.4

Chemical Land Transportation Rates - Edmonton to Inuvik

Total Weight (Kg.)	Price/45. 3 Kilograms
906	$ 35.1Ø
2,265	29.20
4, 53Ø	25.30
18,120	17.75

Note: A flat rate of $400 per 18,120 kilograms is charged from Inuvik to Aklavik.

Source: Buyer's Transport, Edmonton.

Chemical prices are quoted per kilogram with no discounts applied for large quantit es purchased. Chemica.s must be purchased in large quantities, usually in 2Ø, 3Ø or 4Ø kilogram containers. Sawdust price is estimated, including freight charges.

Table 9.5

Chemical Costs

Chemical	Price Per Kilogram
salt	$ 3.18
Soda Ash	.74
Bicarbonate	1.00
Hydrogen Peroxide	1.60
Aqua Ammonia	1.11
Alum Sulphate	.85
Formaldehyde	1.34
Formic Acid	2.46
Perchlorethylene	1.50
sawdust	5.00/bag

Note: Prices are quoted for delivery within Edmonton.

Source: Van Water and Rogers Ltd., Edmonton.

Scenario A	ANNUAL COST
i) Sawdust costs are estimated at S3,300 per month.	
12 months x $3,300 =	$ 39,600
ii) Chemical costs are estimated at $100 per lot.	
1440 lots per year x $100 =	144,000
iii) Utilities are estimated at $6,500	
12 months x $6,500 =	78,000
iv) Insurance rates are calculated at $1.50 per $100 of building and equipment costs.	
$1,323,390 X $\frac{S1.50}{\$100}$ =	19,851
v) Equipment maintenance charges are calculated as 5% of the total value of machinery.	
$620,000 x 5% =	31,000
vi) Water use is estimated at 2,555 litres per lot of furskins @ $2 per cubic meter (including sewer).	7,358

		ANNUAL COST
vii)	Labour costs:	$176,800
	-1 tanner @ $22/hour year round.	
	-1 flesher @ $15/hour year round.	
	-3 trainees @ $10/hour year round.	
	-2 casual help @ $8/hour year round.	
	-1 bookkeeper/secretary @ $10/hour year round.	
viii)	Accounting and management fees are estimated at $5 , COO/year .	5, 000
ix)	Legal fees for the initial start up year are estimated at $5,000 but drop to $1, 000 for subsequent years.	1,000
x)	Amortization rests:	
	-Building rests of $700,000 amortized over 25 years at 11%.	
	Monthly payment = $ 6,860.80	82,330
	-Equipment costs of $623, 390 amortized over 15 years at 11%.	
	Monthly payment = $ 7,085.44	85,025
	-Working capital of $290, 000 amortized over 15 years at 11%.	
	Monthly payment = $ 3,296.14	39,554
xi)	Depreciation rates are calculated on a straight line basis. An allowance of 15 years for equipment and 25 years for building is alloted.	
	Annual Depreciation: Building = $28,000. 00	
	Equipment = 41,559.33	69,559
xii)	Transportation charges are calculated assuming approximately 60 'kilogram of chemical inputs and 50 kilograms of sawdust are required to process one lot of furskins . Equipment transportation charges are calculated using net weights of equipment and packaging crates supplied by tile manufacturers.	

	ANNUAL COST
Chemicals: $\frac{1440 \times 60 \text{ kg.} \times \$17.75}{45.3 \text{ kg.}} + \$800 =$	$ 34, '654
Sawdust: $\frac{1440 \times 50 \text{ kg.} \times \$17.75}{45.3 \text{ kg.}} + \$800 =$	29, 012
Equipment: 12,005 kg. x $7.31 =	87, 720

xiii) Taxes are not included in the income statement, but are considered an additional cost of conducting business.

Scenario B	ANNUAL COST
i) Sawdust rests are estimated @ $1,650 per month. 12 months x $1,650 =	$ 19,800
ii) Chemical rests are estimated @ $100 per lot. 720 lots per year x $100 =	72,000
iii) Utilities are estimated at $4,550 per month. 12 months x $4,550 =	54,600
iv) Insurance rates are calculated at $1.50 per $100 of building and equipment costs. $\frac{\$923,390 \times \$1.50}{100} =$	13,851
v) Equipment maintenance charges are calculated as 5% of the total value of machinery. $430,4300 X 5% =	21,500
vi) Water use is estimated at 2,555 litres per lot of furskins @ $2 per cubic inter (including sewer).	3,679
vii) Labour costs: -1 tanner @ $22/hour year round. -1 flesher @ $15/hour year round. -2 trainees @ $10/hour year round. -1 casual help @ $8/hour year round. -1 bookeeper/secretary @ $10/hour year round.	147,680
viii) Accounting and management fees are estimated at $5,000 per year.	5,000
ix) Legal fees for the initial start up year are estimated at $5,000, but drop to $1,000 for subsequent years.	

		ANNUAL COST
x)	Amortization costs:	
	-Building costs of $490, 000 amortized over 25 years at" 11%.	
	Monthly payment = $4,802.56	$ 57,631
	-Equipment costs of $433, 390 amortized over 15 years at 11%.	
	Monthly payment = $4,925.90	59,111
	-Working capital of $182,000 amortized over 15 years at 11%.	
	Monthly payment = $ 2,068.61	24,823
xi)	Depreciation rates are calculated on a straight line basis. An allowance of 15 years for equipment and 25 years for building is alloted.	
	Annual Depreciation: Building $19, 600.00	
	Equipment 28,892.67	48,493
xii)	Transportation charges are calculated assuming approximately 60 kilograms of chemical inputs and 50 kilograms of sawdust are required to process one lot of furskins. Equipment transportation charges are calculated using net weights of equipment and packing crates supplied by the manufacturers.	
	Chemicals: $\frac{720 \times 60 \text{ kg.} \times \$17.75}{45.3 \text{ kg.}} + \$800 =$	17,727
	Sawdust: $\frac{720 \times 50 \text{ kg.} \times \$17.75}{45.3 \text{ kg.}} + \$800 =$	14,906
	Equipment: 8,000 kg. x $ 7.31 =	58,480
xiii)	Taxes are not included in the income statement, but are considered an additional cost of conducting business.	

9.2 Revenue

Annual revenue figures are calculated using tie total western N.W.T. average annual fur harvest (Table 2.7) and multiplying by the appropriate average tanning fee for each species (Table 2.12). Forecast revenues assume no fluctuation in current industry tanning

prices over the five year pro forma period. Tanning prices are more stable than fur prices since they are based on costs of production that are relatively stable.

Table 9.6 and 9.7 outlines the potential annual revenue that can be generated for Scenario A and Scenario B fur tanneries respectively.

Revenue figures for t??e Scenario A fur tannery assume a total of 172,175 furskins are processed annually. Revenue figures for Scenario B are proportionately less, assuming only 86,088 furskins are processed annually. The actual number of furs available for tanning will depend on variables, previously discussed, and which are difficult to predict. They include prices of raw furs, trapping activity and the establishment of a fur buying process to supply furs to the tannery.

Table 9.6

Potential Annual Revenue - Scenario A

Species	Number of Furskins Processed	Average Tanning Price	Revenue
Muskrat	110,247	$ 4.15	$ 457,525. 05
Marten	20,580	12.25	252,105.00
White Fox	17,386	37.50	651,975.00
Squirrel	10,704	7.50	80,280.00
Red/Cross Fox	3,274	19.83	64,923.42
Beaver	3,133	23.50	73,625.50
Mink	2,914	11.25	32,782.50
Lynx	2,259	27.93	63,093.87
Weasel	1,194	10.00	11,940.00
Wolf	484	43.16	20,889.44
Total	172,175	Not Applicable	1,709,139.78

Table 9.7

Potential Annual Revenue - Scenario B

Species	Number of Furskins Processed	Average Tanning Price	Revenue
Muskrat	55, 124	$ 4.15	228,764. 60
Marten	10,290	12.25	126,052.50
White Fox	8,693	37.50	325,987.50
Squirrel	5,352	7.50	40,140.00
Red/Cross Fox	1,637	19.83	32,461.71
Beaver	1,567	23.50	36,824.50
Mink	1,457	11.25	16,391.25
Lynx	1,129	27.93	31,532.97
Weasel	597	10.00	5,97am
Wolf	242	43.16	10,444.72
Total	86,088	Not Applicable	854,569.75

Actual revenue figures will largely depend upon the type and number of furskins processed. Certain furskins such as wolf or mink command a much higher tanning fee versus beaver or muskrat and will naturally generate higher revenues.

9.3 Five Year Pro Forma Income Statements

Table 9.8

Five Year Pro Forma Income Statement - Scenario A

	Year 1	Year 2	Year 3	Year 4	Year 5
COSTS :					
Sawdust	29, 700	32,868	39,600	39,600	39, 600
chemicals	108, 000	119,520	144,000	144, 000	144,000
Utilities	52, 000	60, 667	69,333	78,000	78,000
Insurance	19,851	19,851	19,851	19,851	19,851
Maintenance	31, 000	31,000	31,000	31,000	31,000
Water	3,679	5,519	6,107	7,358	7,358
1 Tanner	45,760	45,765	45,760	45,760	45,760
1 Flesher	25,800	23,430	31,200	31, 200	31,200
3 Trainees	62, 400	62,400	62,400	62,400	62,400
2 Casual Help	16,643	16,643	16,640	16,6443	16,6443
1 Bookkeeper/Secretary	20, 800	20, 800	20,800	2a, 800	20, 800
Accounting/Management Fees	5,000	5,000	5,000	5, 000	5, 000
Legal Fees	5, 000	1,000	1,000	1, 000	1,000
Amortization [1]	206, 909	206,909	206, 909	206, 909	206 ,909
Depreciation	69,559	69,559	69,559	69,559	69,559
Transportation	47,750	52,843	63,666	63,666	63,666
Total Operating Costs	749,848	773,736	832,825	842,743	842,743
Contingency[2]	74,985	77,374	83,283	84,274	84,274
REVENUE :	512,742	1, 110, 941	1,418,586	1,709,140	1,709,140
Profit (Loss)	(312,091)	259,831	502,478	782,123	782,123

1. All of the capital rests are amortized. If government program and assistance are used for any or all of the capital rests , the business would show a larger profit at an earlier date.

2. A contingency factor of 10% has been applied to Total Operating Costs to cover all unforseen costs .

Table 9.9

Five Year Pro Form Income Statement - Scenario B

	Year 1	Year 2	Year 3	Year 4	Year 5
COSTS :					
Sawdust	14,850	16,434	19,800	19, 800	19,800
Chemicals	54,000	59,760	72,000	72, 000	72, 000
Utilities	36,400	42,467	48,533	54,600	54,600
Insurance	13,851	13,851	13,851	13,851	13,851
Maintenance	21,500	21,500	21,500	21,500	21,500
Water	1,840	2,759	3,054	3,679	3,679
1 Tanner	45,760	45,760	45,760	45,760	45,760
1 Flesher	25, 800	23, 400	31,200	31,200	31, 200
2 'Trainees	41,600	41,600	41,600	41,600	41,600
1 Casual Help	8,320	8, 320	8,320	8,320	8,320
1 Bookkeeper/Secretary	20,800	20, 800	20, 800	20, 800	20, 800
Accounting/Management Fees	5,000	5,000	5,000	5,000	5, 000
Legal Fees	5,000	1, 000	1, 000	1, 000	1,000
Amortization [1]	141,564	141,564	141,564	141,564	141,564
Depreciation	4a, 493	48,493	48,493	48,493	48,493
Transportation	24,475	27,086	32,633	32,633	32,633
Total Operating costs	509, 253	519,794	555,108	561, 800	561,800
Contingency [2]	50,925	51,979	55,511	56,180	56,180
REVENUE:	256,371	555,471	709,293	854,570	854,570
Profit (Loss)	(303,807)	(16, 302)	98,674	236,590	236,590

1. All of the capital costs are amortized. If government program and assistance are used for anyor all of the capital costs, the business would shcw a larger profit at an earlier date.

2. A contingency factor of 10% has been applied to Total Operating Costs to rover all unforseen costs.

9.4 Price Sensitivity Analysis

Due to the cyclical nature of fur prices in recent years, it is beneficial for comparative purposes to provide a price sensitivity analysis. The price sensitivity analysis in Table 9.10 presents the financial outcomes resulting from changes to the average tanning price thus revenue, when total costs are held constant. The following table details total costs incurred, a 10% of total operating costs contingency, and revenues generated when the tannery is operating at full capacity starting at year 4. For both scenarios, a 10%, 15% and 20% reduction in revenues, while costs remain constant, continues to produce a profit.

Table 9.10
Price Sensitivity Analysis

	Scenario A	Scemrio B
Total Operating Costs	S 842,743	$ 561,800
Contingency	84,274	56,180
Revenue	1,709,14	854,570
Profit (Lass)	782,123	236,590
10% Reduction in Revenue	1,538,226	769,113
Profit (Loss)	611,209	151,133
15% Reduction in Revenue	1,452,769	726,385
Profit (Loss)	525,752	108,405
20% Reduction in Revenue	1,367,312	683,656
Profit (Loss)	440,295	65,676

9.5 Financial and Operating Considerations

The five year financial statements for both scenarios present both income and cash flow projections. Included in the expenses are the amortization costs for the full amount of operating capital required. The operating capital represents a combination of building rests, equipment costs and operating capital requirements

for pre-purchase of chemicals and other supplies plus additional monies required to pay other expenses until revenues are generated.

Given the volatile nature of the fur industry, it is meaningless to predict beyond a five year period. The best estimate for years six to ten would be a continuation of the year five scenario with inflation adjustments to both revenues and expenses. The net figure should remain approximately constant.

Under the reremended Scenario B, wit?? full amortization of buildings over 25 years, equipment over 15 years and initial operating capital requirements over 15 years, the operation begins to showa profit in year three. The profits can be used to expand the operation if the demand for the dressed furs and the supply of raw furs make it feasible. Alternately, the profits could be used to shorten the pay back period on the amortized capital. If this were done the pay back period on total capital would be approximately ten years.

9.5.1 Operating Plan

Throughout the report, elements of the operating plan have been described and rationalized in considerable detail. Below, the plan items are listed with a time sequence.

Start
- Decision
- Select Master Tanner and Flesher

Year 1-2
- contract building construction
- order equipment
- arrange training program for flesher
- set up fur procurement system
- develop cottage industry
- establish other dressed fur markets
- recruit staff
- develop on-the-job training programs
- order start-up inventories
- set-up legal, bookeeping and accounting system
- do detailed planning for all phases of the operation

Year 2-3
- operation start up

As is demonstrated above there. are many things that must be done prior to start-up if the operation is to begin operating successfully. These would take a minimum of one year to accomplish and possibly up to two years depending on how well everything came together.

9.5.2 Economic Benefits

Economic and other benefits are generally discussed throughout the report. In this section they are consolidated and addressed specifically.

There are both tangible benefits that can be measured in monetary terms and intangible benefits that will accrue to Aklavik and to the region as a result of the tannery construction and operation.

Construction Phase:

During this phase the building will be built and the equipment installed. Much of the labour for this work can come from residents of Aklavik and the region, who would be available for this type of work. It is difficult to put a precise value on this work. However, it is estimated that there could be the equivalent of two full-time labour type jobs over this year long period. This would translate to an estimated $40,000 in wages.

There will be additional secondary benefits that will accrue to Aklavik and the region during the instruction/planning phase. These will be in the form of material and supply purchases and the required provision of services such as accommodation, food and transportation for work crews and materials. The value of these, although difficult to estimate precisely, could be in the neighborhood of 10% of total capital costs. This would provide an estimate of approximately $100,000.

Operating Phase:

Once the business is operating and has phased in to full production as specified in Scenario B, there will be an estimated six jobs

created. Total annual payroll will be approximately $150,000. Secondary local and regional benefits, if we assume a multiplier of one, would be $150,000. Total income benefits from the operation of the tannery would then be $300,000 annually.

As previously discussed, very substantial benefits will be realized through the stimulus that ill be generated in the local crafts industry. The potential from 90,000 furskins would be to make over 1,000 parkas and an equal number of other smaller items such as hats, cushions, etc. On a volume basis, we can figure the crafts--person would receive, for labour, at least $300 per parka and probably around $25 for other items. This results in a total of $325, 000 annually in direct income to the craftspeople. With the same multiplier as above, total economic benefits from this are $650,4300 per year.

Total measurable economic henefits, direct and indirect, have a potential of being close of $1, COO, 000 annually. The word "potential" is emphasized. This level of benefit can only be realized if there is sufficient incentive and organization provided to encourage the skilled fine fur crafts people to become active.

9.5.3 Intangible Benefits

The intangible benefits are quite numerous and for the most part, obvious. One of the most critical is that the fine fur sewing skills that have been acquired through considerable effort and expense will have a number better opportunity of being put to use. They can then be passed on to others and not be lost as they otherwise might be in a few years.

Another area of benefit is in the employment generated. A significant number of new jobs will be created in a centre and region where there is not an abundance of employment opportunities. This will serve to lower social assistance dependency and instill pride in working in an area related to traditional activity.

This type of development is consistent with principles of good economic development. It involves local processing of a local renewable resource rather than exporting the secondary processing jobs to a southern jurisdiction. The opportunities for this in the north are limited and where this is possible it can create a good sense of pride in that a unique northern product is being manufactured and marketed.

10.0 ENVIRONMENTAL AND SAFETY CONSIDERATIONS

Negative environmenta 1 impacts can be properly controlled, or eliminated through enforced systematic regulation and testing. Long term control procedures should be instituted and properly administered by qualified personnel. These include: 1.

- preventive maintenance programs;
- regular inspections of plant and storage areas to ensure good housekeeping;
- record keeping;
- administering extensive training and ongoing employee education programs;
- posting and routine drills of emergency procedures;
- careful handling, storing and disposing of chemicals and contaminants;
- prohibition of sinking on the job or in the area of exposure to chemicals;
- installation of appropriate general and local exhaust ventilation;
- personal protective equipment should be worn when performing specific tasks;
- establish proper procedures for safety receiving and unloading of chemicals;
- regular checking of storage tanks for signs of leakage or deterioration;
- frequent cleaning of tanning pits;
- all chemicals should be labelled as to content and date of preparation;
- chemical spills should be immediately isolated, neutralized if necessary, then disposed of in an appropriate manner;
- flammable liquids pose an extremely high fire hazard and should be stored in approved containers in a well-ventilated storage facility at floor level away from heat sources. Flammable liquids should never be stored with oxidizing agents; and careful monitoring of effluent toxic levels and effects.

10.1 Disposal of Effluents

A large quantity of water, approximately 1,350 litres of water, is required per 50 kilograms of furskins. Subsequently, the resulting large quantity of heavily contaminated effluents must be efficiently and hygienically disposed of. The organic matter existing in effluent tends to decompose rapidly and produce unpleasant colors not to mention sanitation risks.

The disposal of effluents requires careful consideration and planning so as not cause unwanted pollution. In the case of Aklavik disposal of effluents in the existing lagoon should create no difficulties.

There are three potential methods of effluent disposal on land . 2"

1. Direct floodin gof land by small quantities of used water which is eventually absorbed through seepage and evaporation.
2. Use of the effluent as an irrigant or fertilizer of crops.
3. Subterranean drains.

Prior to implementing any of the above land treatment methods, effluents must first be treated. A viable solution is to allow effluents to settle as sludge in sedimentation tanks which must be removed periodically. Sedimentation tanks may be constructed of brick, stone, cement or simple unlined pits.

The two operating scenarios assume liquid wastes to be in excess of 7,600 litres per day, therefore holding tanks must be pumped out frequently. Neutralizing of acidic effluents can be done right in the holding tanks with bicarbonate soda. Chrome sulfate, often used in dressing heavy skins such as beaver or bear, cannot be neutralized and should not be disposed of near any water systems as it is a harmful pollutant .

10.2 Personnel Health and Safety[3]

Employees in a fur dressing operation are exposed to a variety of occupational health hazards of a chemical, environmental or mechanical nature. Proper control measures serve to eliminate or reduce exposure to hazards to acceptable levels.

Toxic chemicals in various forms: dusts, fumes, vapours, mists, gases, liquids and solids, are ever present during the tanning prccess. Harmful exposure to toxic chemicals and solvents can pose health dangers and may result in illness.

Chemical control programs consisting of identification of all chemicals in the work place, accessing the degree of hazard, then implementing effective control measures are essential. Elimination of unnecessary toxic substances is desirable, but may not be feasible. Introducing and maintaining proper engineering controls such as ventilation, isolation and design of the work place, plant or equipment may be a more viable option. Instituting well defined work practices for specific tasks minimizes an employee's exposure to hazardous situations, substances and physical agents.

Regular and ongoing education and training programs dealing with issues such as: hazards of substance or agents, required precautions, personal protective equipment and emergency procedures, should be provided.

Appendix D contains guidelines for handling and storing chemicals which pose potential problems.

The following process flow chart identifies the potential hazards associated wit?? each of the fur dressing process steps.

Table 10.1

FUR AND SKIN DRESSING
PROCESS STEPS AND THEIR POTENTIAL HAZARDS

PROCESS STEPS	POTENTIAL HAZARDS	
RECEIVING	manual lifting or moving of materials moving vehicles	- walking/working surfaces - hand carts
SORTING	manual lifting or moving of materials walking/working surfaces	knives/ snippers - hand carts
SOAKING/WASHING	chemicals confined spaces manual lifting or moving of materials	walking/working surfaces - exposed moving machinery parts hand carts
FLESHING/TURNING	- manual lifting or moving of materials walking/working surfaces	exposed moving machinery parts - hand carts
TANNING	chemicals confined spaces manual lifting or moving of materials	walking/working surfaces exposed moving machinery parts - hand carts
EXTRACTING/WRINGING	- manual lifting or moving of materials	exposed moving machinery parts - hand carts
BREAKING/STAKING	- manual lifting or moving of materials	- exposed moving machinery parts - hand carts

Table 10.1

FUR AND SKIN DRESSING
PROCESS STEPS AND THEIR POTENTIAL HAZARDS
(Continued)

PROCESS STEPS	POTENTIAL HAZARDS		PAGE
CREASE AND KICK	oils manual lifting or moving of materials	- exposed moving machinery parts - hand carts	169
TRIMMING	manual lifting or moving of materials	- knives - hand carts	173
SHAVING/BUFFING	- fur dust manual lifting or moving of materials	- exposed moving machinery parts - hand carts	177
DRYING	- heat manual lifting or moving of materials	walking/working surfaces - hand carts	181
FINISHING - SHEEP SKIN	solvents - noise - fur dust manual lifting or moving of materials	- exposed moving machinery parts - hand carts	185
FINISHING - FURS	solvents - noise - fur dust manual lifting or moving of materials	- exposed moving machinery parts - hand carts	191
SORTING AND SHIPPING	manual lifting or moving of materials	walking/working surfaces - hand carts	197

Source: Industrial Accident Prevention Association, Tanning Industry Safety and Health Guides.

FOOTNOTES

1. The Industrial Accident Prevention Association, Tanning Industry Safety and Health Guide. Ontario, 1983.

2. Focal and Agriculture Organization of the United Nations, Rural Tanning Techniques. Rome, 1960.

3. The Industrial Accident Prevention Association, Op. Cit. , pp. 200-225.

APPENDIX A

GLOSSARY

GRADING DESCRIPTIONS

SIZES

XXXL,0	Supers, Jumbo
XXL,1	Extra, Extra Large
XL,2	Extra Large
L,Lge,3	Large
LM,Lge Med.4	Large Medium
M,Med,5	Medium
s, St'; 6	Small
CUB ,7	Cub
x SM	Kitts
AVG	Average

GRADES

Sel,1670 (Select)	Best Quality
I (First)	Very Good Quality
I-II (First & Second	Good Quality
II (Second)	Fair Quality
SL	Good Quality with Slight Imperfections
LOII	Poor Quality
III	Very Poor Quality
IV	No Commercial Value

SECTIONS

AB	ALBERTA
AKA	ALASKA
CAN	CANADIAN
CENT	CENTRAL
COAT,CT	SOUTHERN
EAST.E	EASTERN
HVY	NORTHERN
MB,MAN	MANITOBA
MKR	MACKENZIE RIVER
NE	NORTH EASTERN
NF	NEWFOUNDLAND
NW	NORTHWESTERN
NWT	NORTHWEST TERRITORIES
NDR,N	NORTHERN
NC	NORTH CENTRAL
SOU	SOUTHERN
SK,SASK	SASKATCHEWAN
SW	SOUTH WESTERN
SEMI	CENTRAL
USA,US	UNITED STATES
W	WESTERN
WA	WEST ARCTIC
YUK	YUKON

OTHER

BD	BAD
BL	BLACK
BR	BROWN
CSD	CASED
CLN	CLEAN
CL	CLEAR
CRS , CR	COARSE
DGD , DG	DAMAGED
DK	DARK
DR	DARK RED
ELY , EY	EARLY
FL	FLAT
GC	GOOD COLOURS
GD	GOOD
GW	GOOD WEIGHT
HO	HAIR OUT
HY	HEAVY
LO	LEATHER OUT
LT	LIGHT (WEIGHT)
Oc	ORDINARY COLOURS
OF	OFF
OP	OPEN
ORD	ORDINARY
OW	ORDINARY WEIGHT
PAP	PAPERY WEIGHT
Pc	POOR COLOUR
PL	PALE
PT	PART
PR	POOR
R	RED
RB	RUBBED
RCH	RANCH
SEC	SECOND
SHED	SHEDDER
SLDGD	SLIGHT DAMAGED
SMITH	SMOOTH
so	SLIGHT OFF
SPR	SPRINGY
SS	SLIGHT SINGED
STD , STN	STAINED
STL	STALE
TY	TAWNY
WK	WEAK
WTR	WINTER
XEY , XE	EXTRA EARLY

COLOURS:	Beaver	Raccoon Lynx	Covote	Red Fox	W. Mink Otter	White Fox
A	dark	Clear	pale/clear	cherry red	dark	clear
B	brown	sl. off	sl. off	med red	dk/br	sl. off
C	pale	off	off	red	br	off
D		red/bd. off	bd. off	pale	pale	stained
E				extra pale		
O	red				off	
XC	x pale					

Source: Edmonton Fur Auction Sales.

Terms Used to Describe Raw Fur

1. Badly Sewn - This results when jagged or bloodstained holes of a considerable size are poorly sewen.

2. Badly Shot - This occurs when pelts are peppered by shot, badly holed by a bullet or are bitten or otherwise holed in numerous places.

3. Bitten - This damage usually occurs through battle scars suffered by beaver and muskrats during the mating season.

4. Boardy - Refers to a condition in raw fur where the leather is stiff, generally occurs in springy pelts. Most noticeable on the back of the neck on lynx and fisher.

5. Burnt - This condition occurs when a pelt can be cracked owing to quick drying by fire, not sun, or by grease burn. The pelt will seldom survive the dressing process and thus, is usually worthless.

6. Clean - For weasel or muskrat, means sea so nable skins free of damage. A percentage of slightly shot skins in squirrel is allowed.

7. Clipped or Sheared - This condition occurs when guard hair and/or underfur is missing, caused by knife or other cuts, or where the fur has been eaten away by mice, shrews, etc.

8. Coarse - This condition describes the texture of the hair when it is harsh to the touch.

9. Complete - This refers to a pelt that is fully covered with guard hair.

10. Damaged - A pelt that is rendered incomplete to an extent that it requires expert repairing, or involves a risk in the dressing process. Damage can result from improper handling or can be the result of fighting by the animal or disease.

11. Density - This refers to the thickness of the underfur, which is more important than depth. Dense underfur is usually accompanied by at least an adequate amount of depth to make a good skin.

12. Depth - This describes the lengthof fur.

13. Drowned - This condition of the pelt occurs when animals are trapped in water and can bring about a taint condition. Usually occurs when animals are left too long in the water.

14. Flat - This refers to guard hair lying flat on the back, due to lack of underfur.

15. Flow - This condition refers to a life-like appearance of the fur on a pliable skin when it is handled.

16. Guard Hair - The long outer hair of the fur which provides protection from the weather. This hair is usually fine, silky and lustrous, but in some animals, can be thick, coarse and dull.

17. Hairslip - Hair falling out of the pelt as a result of damage to the hair roots or the fur being left too long on the carcass and spoiling.

18. Heavy - Refers either to the weight of the fur or, as in the case of muskrat, the thickness of leather and fur.

19. Immature - This condition refers to pelts taken too early, showing less than the full growth of underfur and guard hair.

20. Loose (open) Flank - Shortage of guard hair along flanks, indicative of overprime pelt.

21. Loose - This occurs when top hair is coming away from the skin, owing to exposed roots in early caught pelts, or by the seasonal loss of guard hair (shedding) in the case of some late-taken pelts.

22. Low - This refers to underdeveloped underfur.

23. Over-Stretched - Refers to pelts that are stretched too wide, or too long and narrow. Over-stretched pelts may result in a larger size, however, they will lose quality due to the fur being spread more thinly.

24. Oxidation - The natural process by which all organic material, including fur, ages due to exposure to light and air. It usually manifests itself by a darkening or reddening of the fur and the yellowing of the skin. Modern tanning slows the process, leaving the colour more natural.

25. Prime Pelt - The leather side is clear and white or very slightly blue, usually soft, pliable and slightly greasy - the underfur is dense, deep and completely covered by guard hair. The overall appearance is glossy and the fur full of life and flow to the touch. These pelts are only available in season and, unless damaged, are usually placed in Grades I and II.

26. Rough - This condition occurs when guard hair and underfur are fully developed. Rough can refer to heavy but rubbed skins of foxes.

27. Rubbed - This condition is usually found in over developed pelts. The loss of guard hair, due to rubbing or freezing to the snow, is increased and the underfur exposed, as a result of this overprime condition.

28. Scored - This refers to the area of a pelt where a bullet loosens fur and shows a bare or bloodstained trail on the pelt.

29. Shedder - A condition that occurs in muskrats late in the season when the leather becomes light and papery and blotches occur around the kidneys on the side of the raw muskrat pelt.

30. Short Nap - This is a term used to describe the short fur of some mink and indicates types most desirable for coat purposes.

31. Silky - This condition describes the texture of the fur when it is soft to the touch.

32. Singed - A condition in guard hair, expecially in late-caught mink and otter, where the ends of the hair are curled or broken. This may be caused by exposure to excess heat, sunlight or rubbing.

33. Snared - This is caused when the fur is rubbed off down to the skin by a wire snare. The mark is often readily visible on the leather.

34. Springy - This usually occurs in late-caught pelts that appear lifeless or have faded underfur and often is a rather hard or dry pelt. The guard hair may be rubbed, brittle, incomplete or singed. Can be indicated by black markings on the leather.

35. Stain - Pelt discolouration mainly noticeable in polar bear and white fox. Depreciates value of fur.

36. Taintea - This is the worst form of damage. When slight-can be difficult to detect. it causes slipping of guard hair and underfur and is usually indicated by a discoloured or transparent patch on the pelt side. It can be caused by decomposition of the pelt surface when an animal is left too long in the trap. The fur comes away in quantities from the affected area, and an offensive odor is evident.

37. Underfur - The shorter underhair of furs with guard hair. It is usually denser, more compact and lighter in colour than the guard hair. The colder the climate the animal lives in, the denser and more compact (and warmer to wear) the underfur will be.

38. Unprime Pelt - Occurs when fur is coming into prime or leaving the prime condition.

Early-Caught Skins	Late-Caught Skins
(a) Pelt - blue, greasy and plyable	(a) Hard and/or dry pelt, often veined or spotty
(b) Fur - low or flat in center back	(b) Faded or poor colour, open and weak in appearance, or rubbed
(c) Neck - low or flat	(c) Dry and lifeless fur
(d) Complete looking	
(e) Fur at its best for colour	

Unprime pelts are usually graded as seconds. The leather of very late-caught skins is often blotchy or black, especially in mink and otter. They are graded as thirds and fourths.

39. Mailing - length of guard hair around head and neck of foxes.

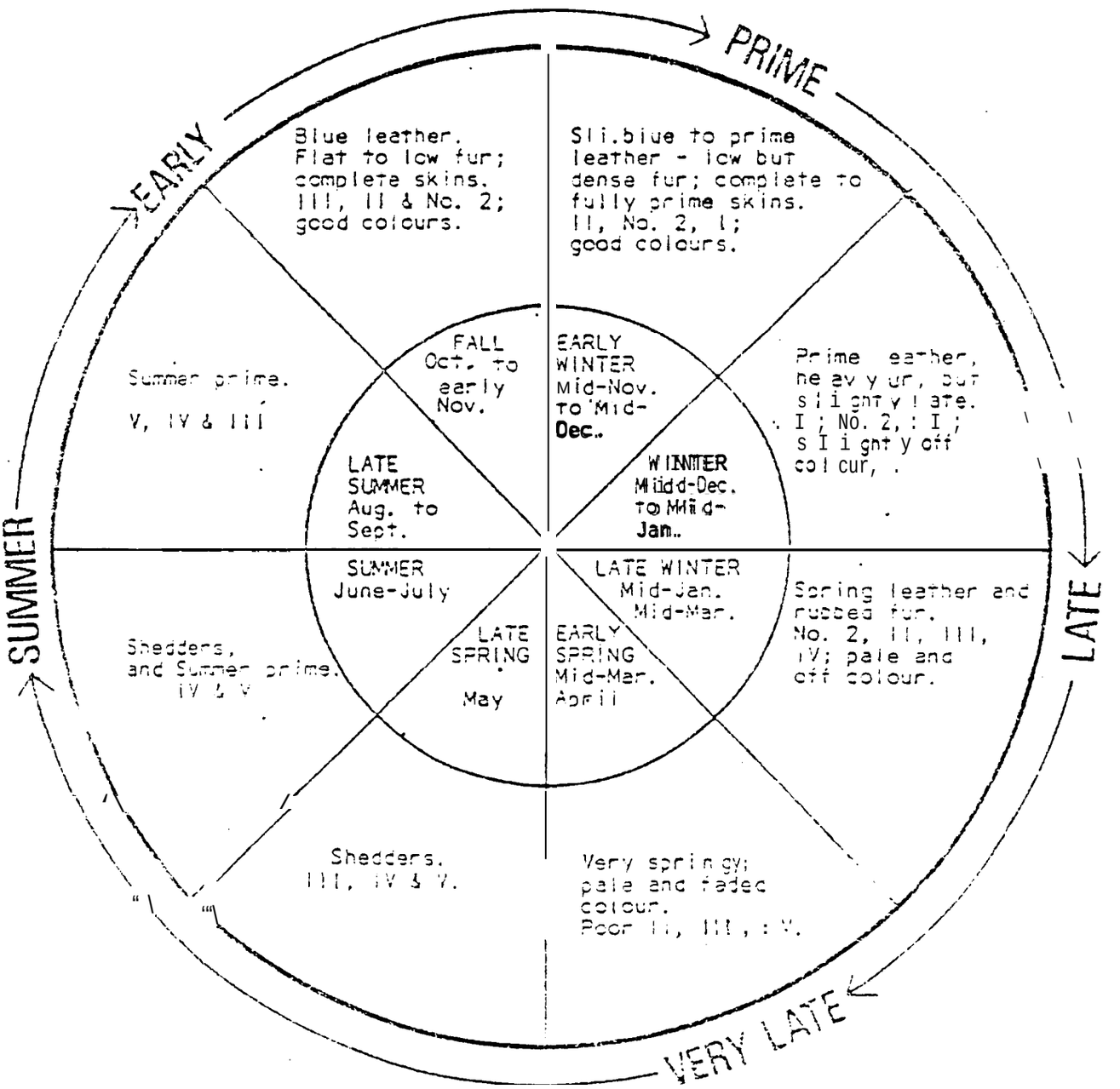
40. Woolly - Refers to a pelt having thick and lifeless underfur and lacking guard hair, but not necessarily rubbed.

Source: Edmonton Fur Auction Sales.

APPENDIX B

FUR SPECIES PRIMENESS CHARTS

FUR CYCLE - SEASONAL CHANGES



Source: Edmonton Fur Auction Sales.

Table 8.1

List of Initial Equipment Requirements

Scenario A and B	Scenario A	Scenario B
-1 fleshing machine	-12 vats	-6 vats
-1 ironing machine	-3 sawdust drums	-1 sawdust
-1 staking machine	and cages	-drum and
-1 stretching machine	-1 combing machine	cage
-1 beating machine	-1 greasing machine	
-1 automatic washing	-1 buffing machine	
- machine		
-1 extractor		
Off ice Requirements - Scenario A and B		
	-2 desks	
	-2 chairs	
	-2 visitor chairs	
	-1 typewriter	
	-2 calculators	
	-1 storage cabinet	
	-2 legal size filing cabinets	
	-miscellaneous equipment	
	(staplers, etc.)	
	-office supplies	
	-tables and chairs for staff room	

Payment: Payment against irrevocable confirmed letter of credit, to be established in company's name with chosen bank.

Prices: Quoted F.O. B. production site, including seaworthy packing.

Installation: **Purchaser's responsibility. Technicians can** be hired directly from the equipment supplier to install parts and oversee the start up of machines. The purchaser is required to pay costs of transportation, accommocation and wages of the visiting technician.

In addition to those listed in Appendix E, there are several other equipment manufacturers located in Europe and the United States. Prices fluctuate widely dependent upon the level of automation, hydraulic system, safety measures, capacity and overall quality of the machinery.

It is highly advisable to maintain an adequate inventory of equipment spare parts in the event that equipment may require maintenance or repairs. Although manufacturer's state a delivery time up to three months personal communications with tanners suggest a one year delivery period is more realistic.

It is recommended when dispersing payment for equipment purchased abroad that funds be sent in foreign currency in order to avoid complications due to daily currency fluctuations.

8.2.2 Building

Scenario A: 10, 000 square feet includes construction of four effluent sedimentation tanks of five to eight cubic metres each.

Scenario B: 7, 000 square feet includes construction of two effluent sedimentation tanks of five to eight cubic metres each.

The building for both Scenarios A and B includes a heating system capable of heating the facilities at optimal required temperatures. An anti-pollution system is installed at 10% of the total building costs.

A prefabricated steel structure would likely be most appropriate for the proposed plant. The structure will have to be approximately 20 feet high, to allow for efficient dust removal and accomodate ventilation facilities.

The building will require basic mechanical, electrical and telephone hook-ups. During the summer months (May - September), water is distributed via pipe in Aklavik. During the winter months

(November - April) water is trucked. To accommodate this arrangement, water storage tanks will have to be constructed.

For specific details regarding a suggested actual building layout, refer to Figure 7.2.

Plant layout was based on discussions with tanners and recently published materials. The exact tannery design will be more accurately determined at the time that equipment purchase decisions are made. The ultimate decisions regarding plant layout lies with the tanner, as he has the necessary knowledge and experience to fully optimize use of space.

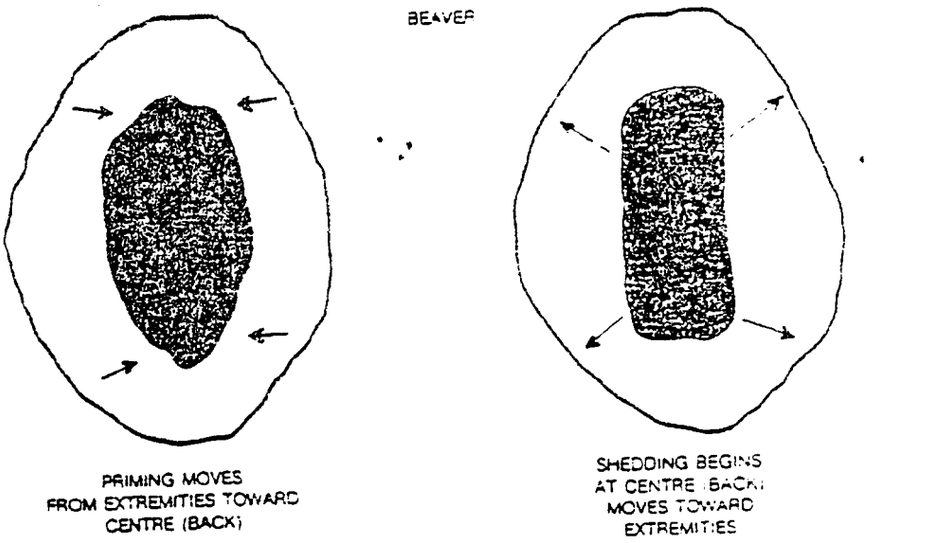
8.2.3 Chemicals

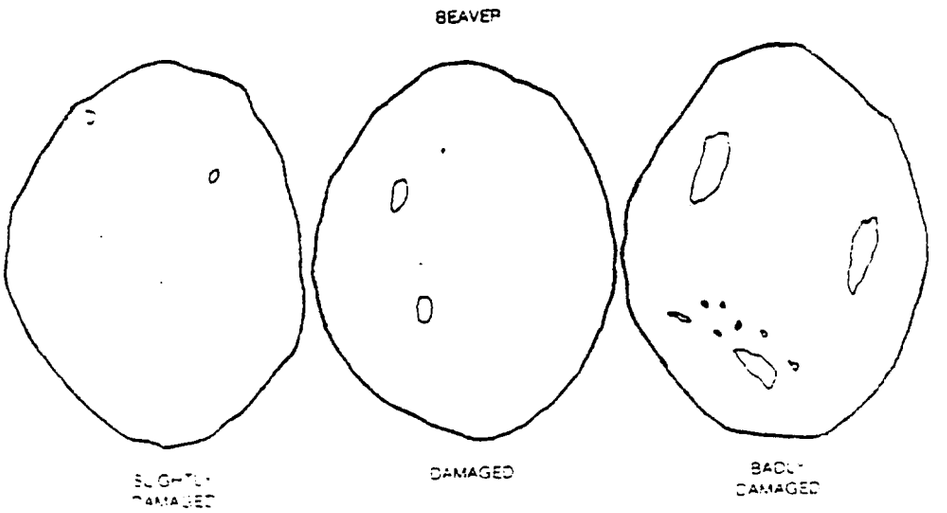
Fur tanning requires a large amount of chemical inputs. Figure 8.2 lists the estimated chemical requirements segmented by process per lot of furskins. Although alternate chemical tanning methods could be employed, the estimated chemical costs per lot is $100. This figure provides a fairly good indication of the quantity of chemicals required to process furskins on an annual basis.

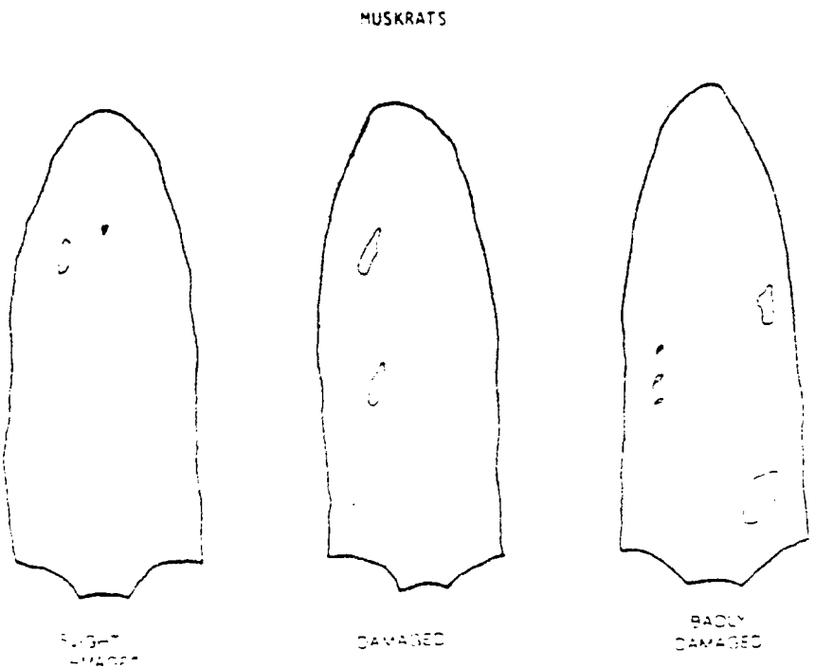
There are no chemical suppliers located in close proximity of Aklavik. Transportation of all chemical supplies should take place during the months of December to April in order to be able to deliver all supplies by truck.

Transportation rates vary significantly per kilogram dependent on the total weight of the cargo. Rates per kilogram vary inversely as the total cargo weight increases. It is recommended chemical supplies be purchased for the entire year due to high transportation costs and seasonal inaccessibility.

Tanning chemicals may be purchased directly from chemical producers or through various national distributors. Most often chemicals are purchased in large volumes such as 20, 30, 40 kilogram containers.



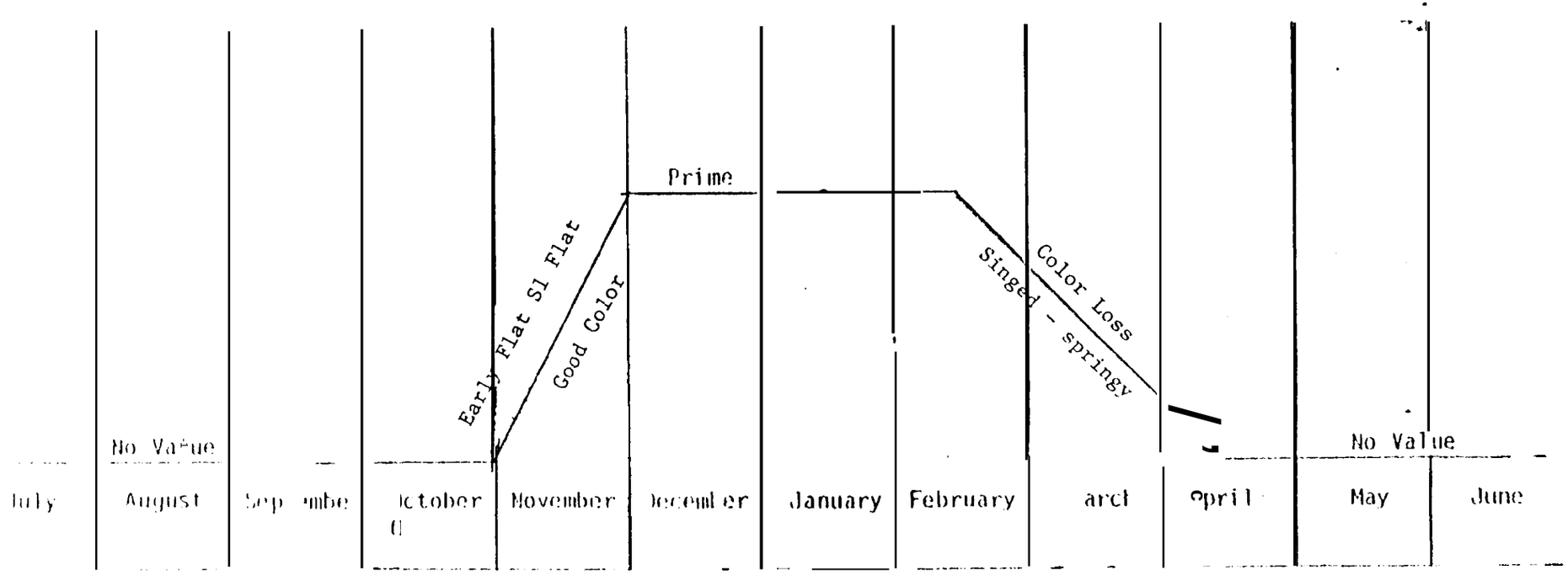




Source: Edmonton Fur Auction Sales .

FISHER

Size		Colours	Desirable Features	Value Discounts
Length		Dark	Clear color	Rusty
Small	25" or under	Brown	Silky	Coarse
Medium	25" - 28"	Pale	Clean	Beardy
Large	28" or over			Damaged



⊙TTER

Sizes

.eng h	
.arge	35" - 38"
x-Large	38" and over

Co ors

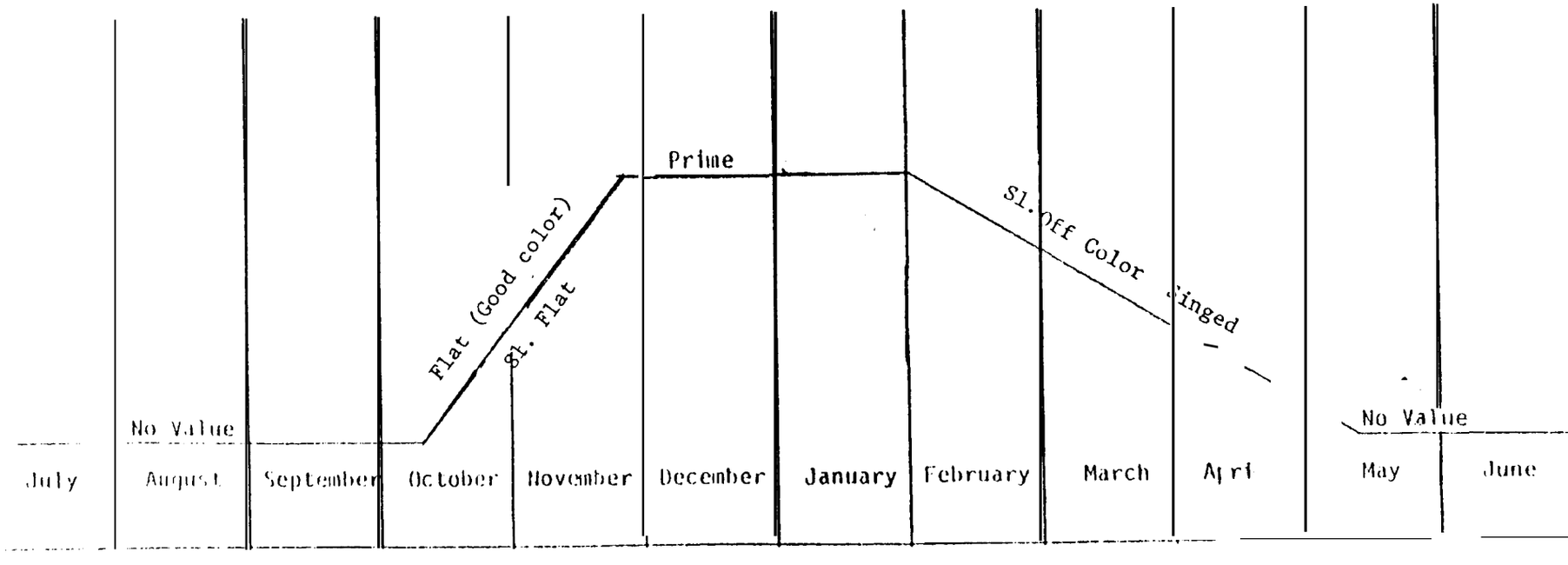
Dark

Dark Brown

Brown

Pelt Value Discount

Dark & II's	Basis
Dark Brown & I	-10%
Brown I &	-20
s	-25%
Flat	-25%
Spr ngy	-30%
Sl. Singed	-30%
Singed	-40%
Lo II's	-60%
s	-90%



RED OX

Sizes		Pelt Value Discounts	
		Heavy	Basis
[illegible]	72" or under	I - II's (5I Flat)	-10%
Medium	72" - 80"	5I Flat)	-20%
Large	80" - 85"	II - Weak	-40%
Extra Large	85" or over	Lo II	-60%
		III	-80%
		IV	-90%

Colour

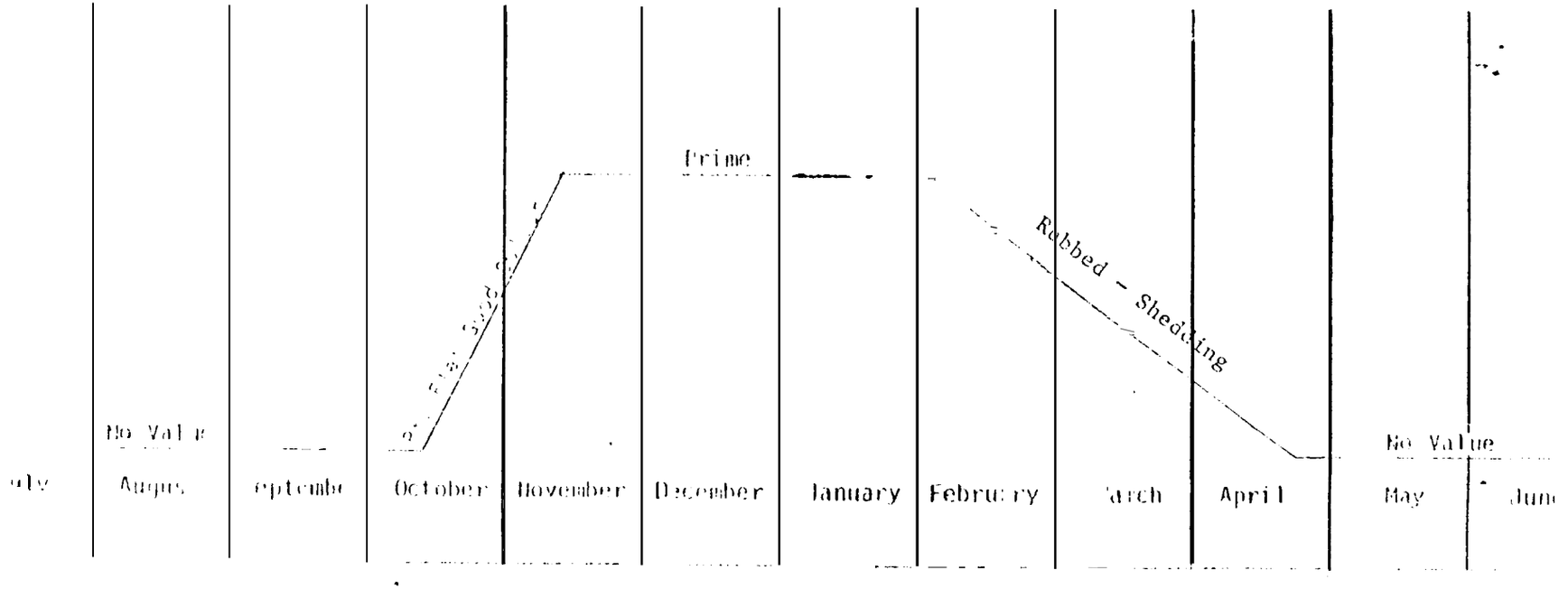
[illegible] Dark Red
[illegible] Red
Pale

COYOTE

Sizes		Pelt Value Discounts	
Small	36" and under	I & II	Basis
Medium	36" - 42"	I & II S [illegible]	-10%
Large	42" and over	Coarse	
		Coarse	-20%
		[illegible] s	-40%
		[illegible] I's	-60%
		[illegible] s'	-80%
		[illegible] s	-90%

Colours

A - Pale
B - Brown
C - Rde-Tawny
D - Dark



WOLVERINE

Size	Length
Medium and Small	under 2'
Large	35
Extra Large	35" - 38"
Extra, Extra Large	over 38"

Color

Dark

Long

Silky

Desirable Features

Large, darker type with long, silky fur and good contrast to the lighter marking on sides with claws on the feet

Pelt Value Discounts

Short fur

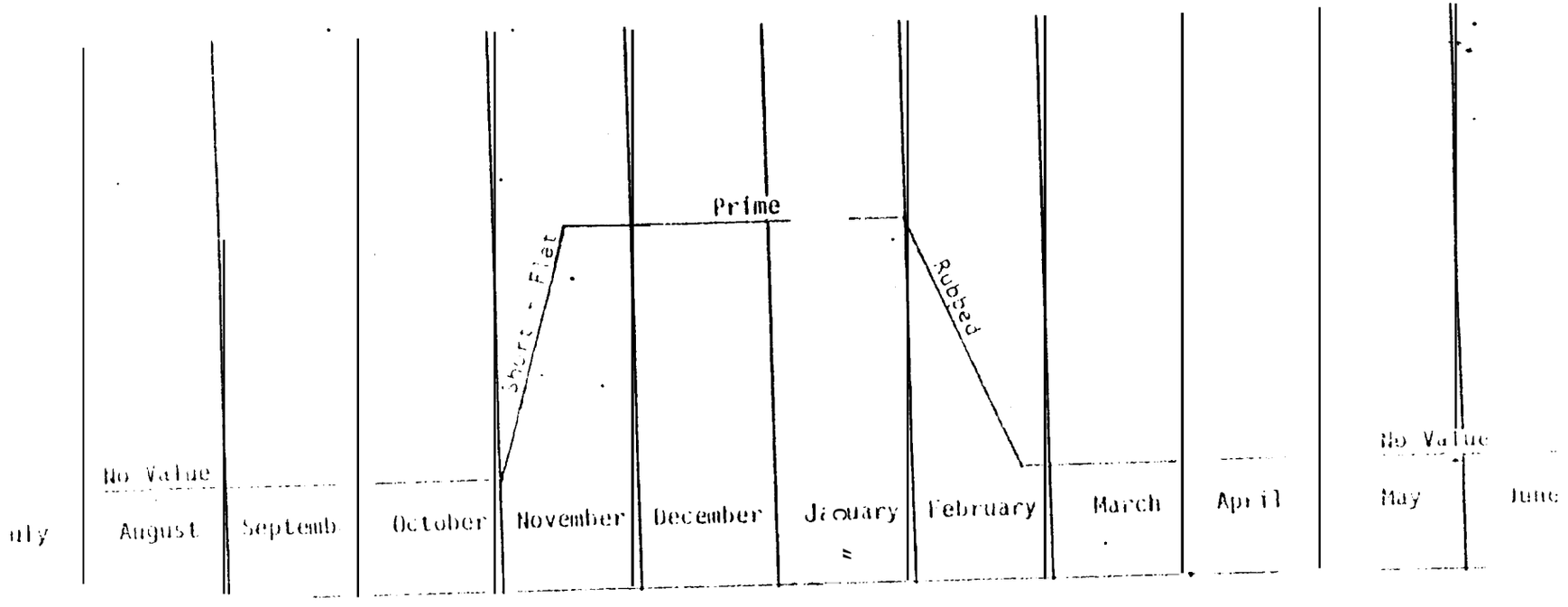
Rubbed

No claws

Coarse fur

Damaged

Pale color



TIMBER WOLF

Sizes

Extra Large over 60"

Pelt Value Discounts

Rubbed

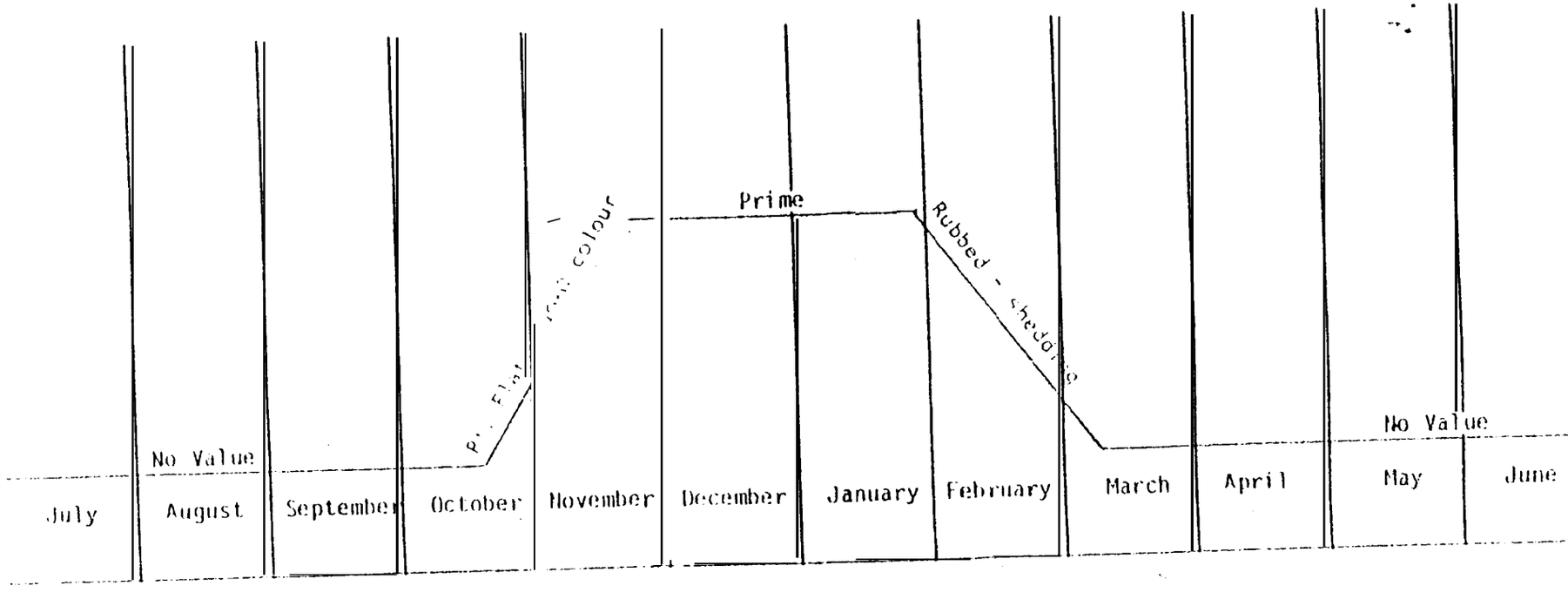
Damaged

Lips removed

Ear carti ege le t n

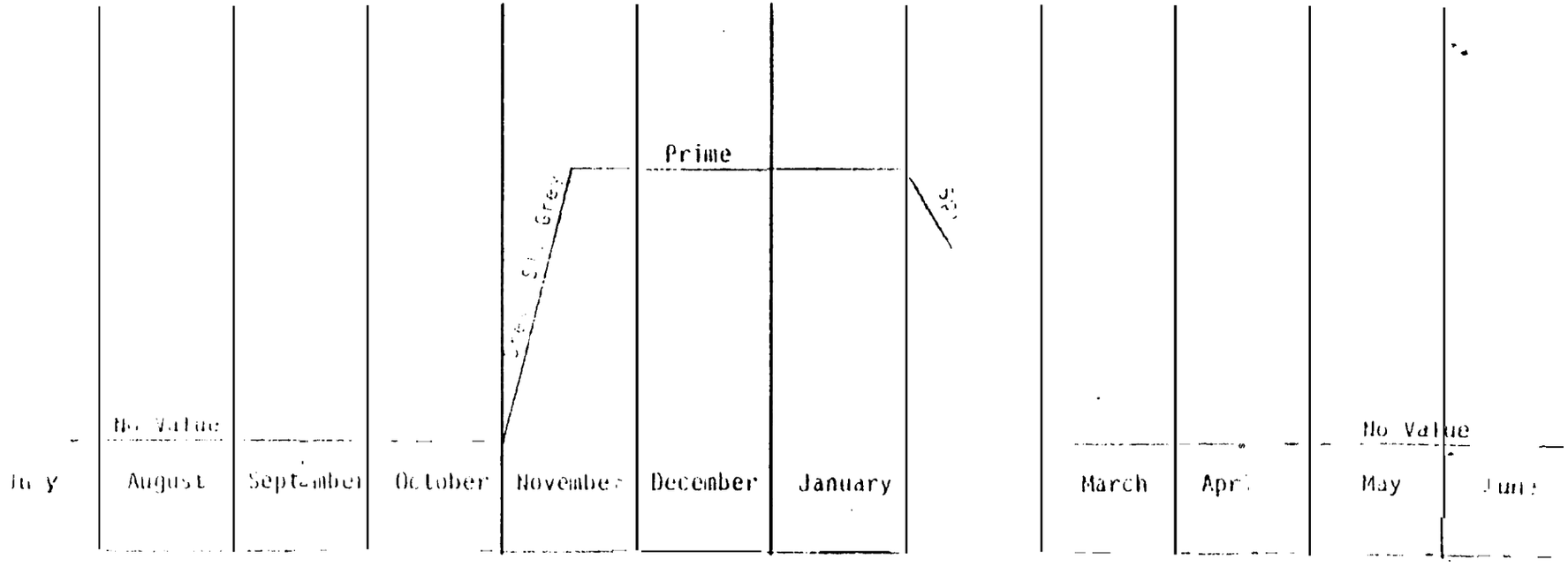
Desirable Features

Pale



ERMINE

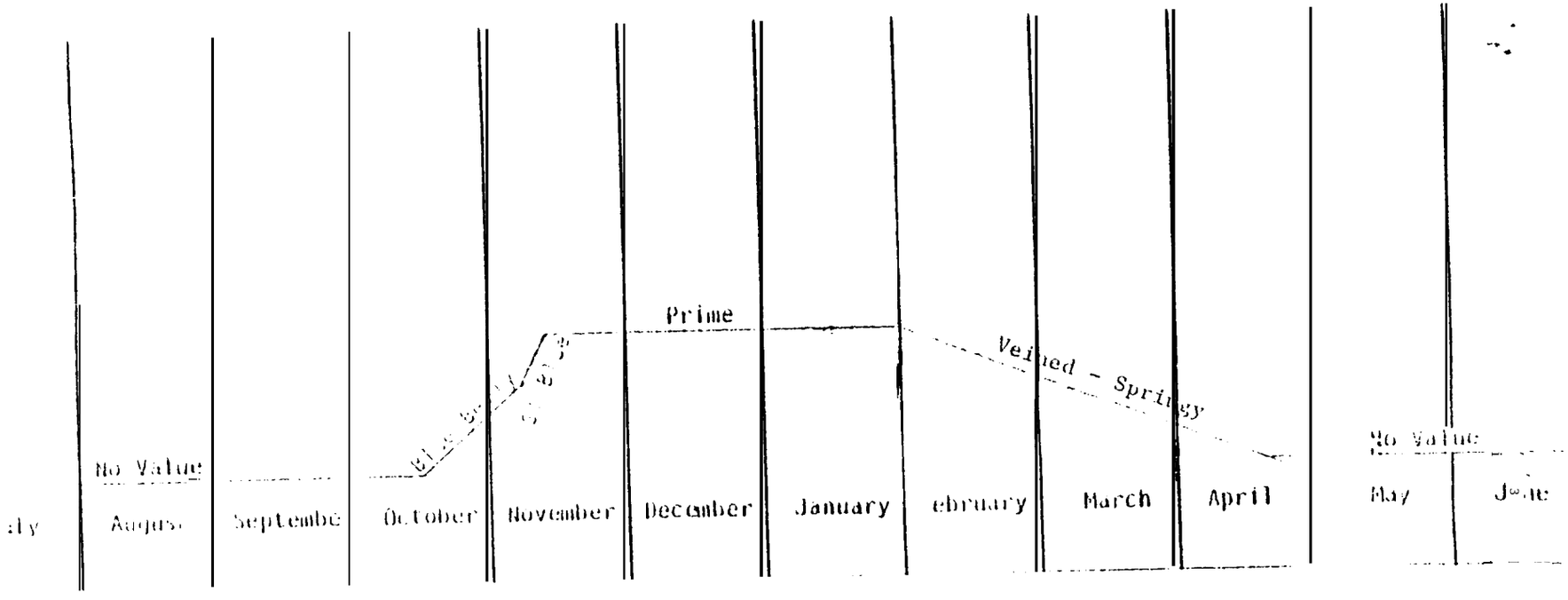
Sizes		Pelt Value Discounts	
Length		I &	Basis
Small	9 1/2" or under		-20%
Medium	9 1/2 - 10"	SI Damaged	40%
Large	10 - 13"	Damaged	90%
Extra Large	14 and over		



SQUIRRELS

'el Value Discounts

I & II	Basis
SI Damaged) SI Blue Belly)	-20%
II	-50%
Damaged	-60%
III	-80%
IV	-90%



WILD MINK

Sizes

Length

·ma	18" and under
fe· ma	18 - 21"
Large	21 - 24"
x'ra arge	24" and over

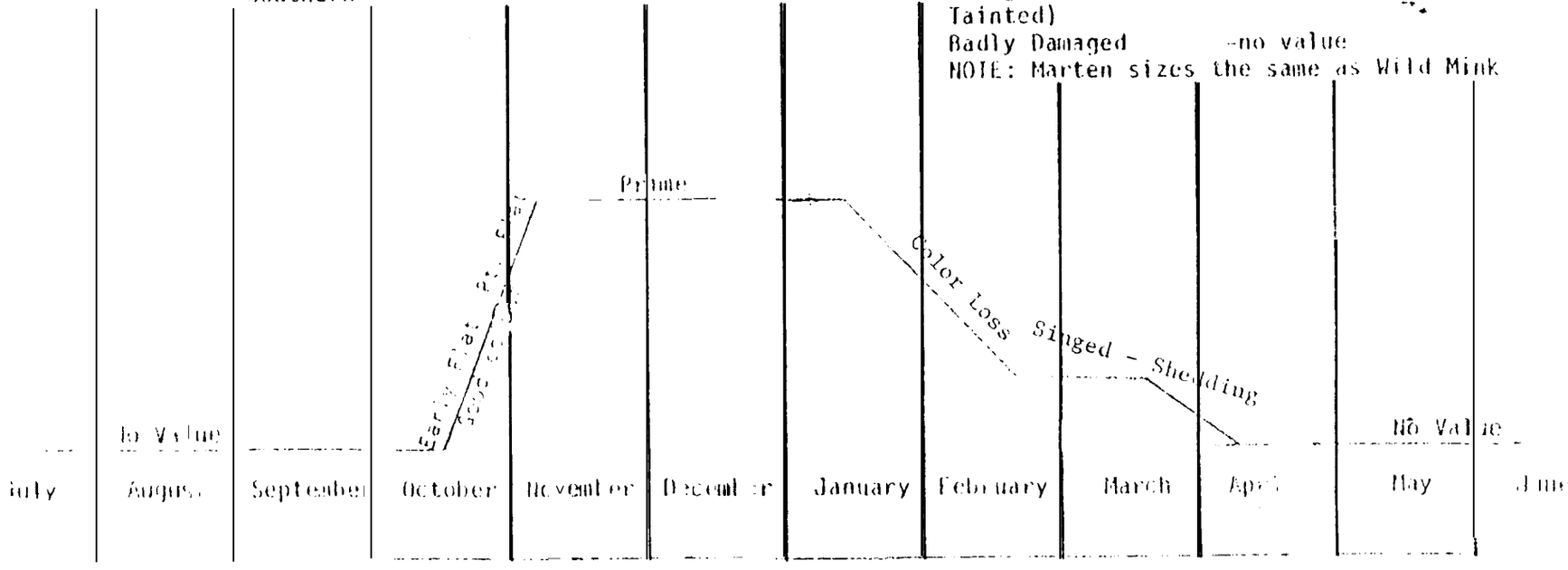
Sec°ions

Northern
Western
Southern

Pelt Value Discounts

D∃rk & 's	Basis
Dark Brown I & II's	-10%
Bro ! & I's	-30%
Redarsh & II's	-40%
Slight Blue)	
.I's)	-30%
Flat)	
Springy	-60%
Quality s	-50%
Low I.'s	-90%
	-no va ue
V)	
B tten	-50%
SI Damaged	-50%
Damaged	-80%
Tainted)	
Badly Damaged	-no value

NOTE: Marten sizes the same as Wild Mink



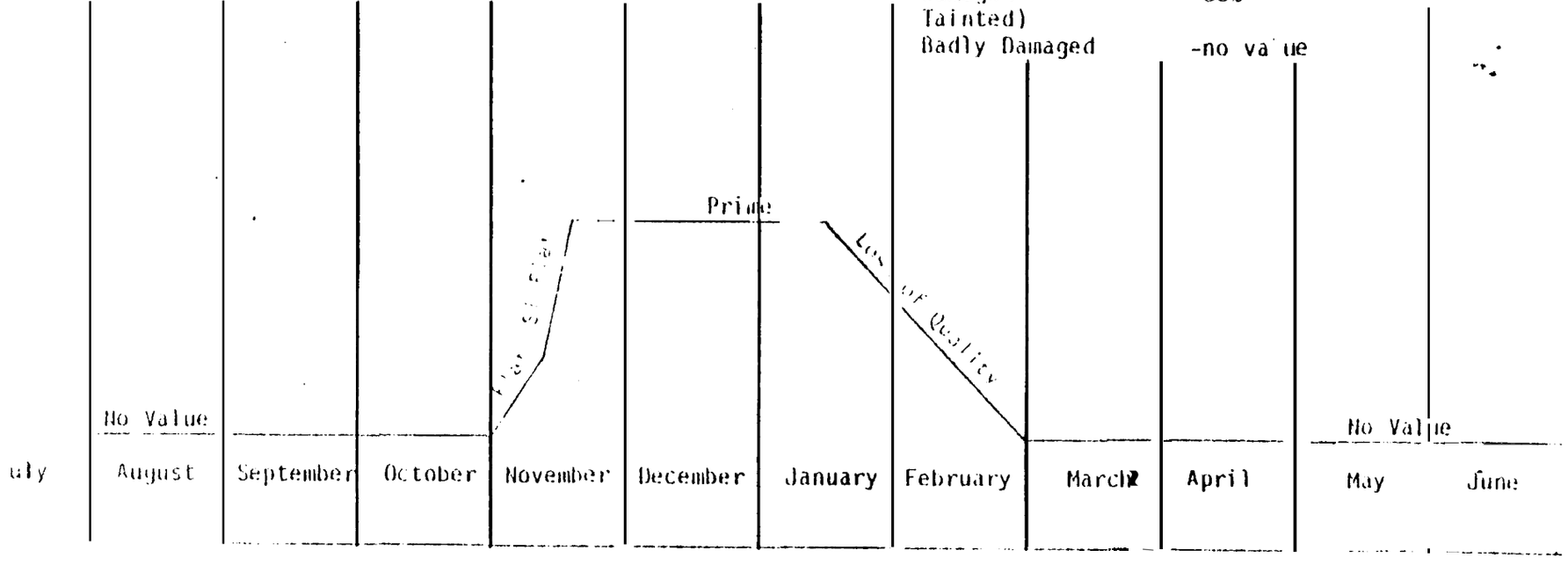
MARTEN

Sizes

Length	
Small	18" and under
Medium	18 - 21"
Large	21 - 24"
Extra Large	24" and over

Pelt Value Discounts

Dark I & II's	Basis
Dark Brown I & I s	-10%
Brown I & II s	-30%
Reddish I & I s	-40%
Slight Blue)	
II's)	-30%
Flat)	
Springy II	-60%
Quality II's	-50%
Low II's	-90%
III)	-no value
IV)	
Bitten	-50%
SI Damaged	-50%
Damaged	-80%
Tainted)	
Badly Damaged	-no value



MUSKRAT

Sizes (Length)

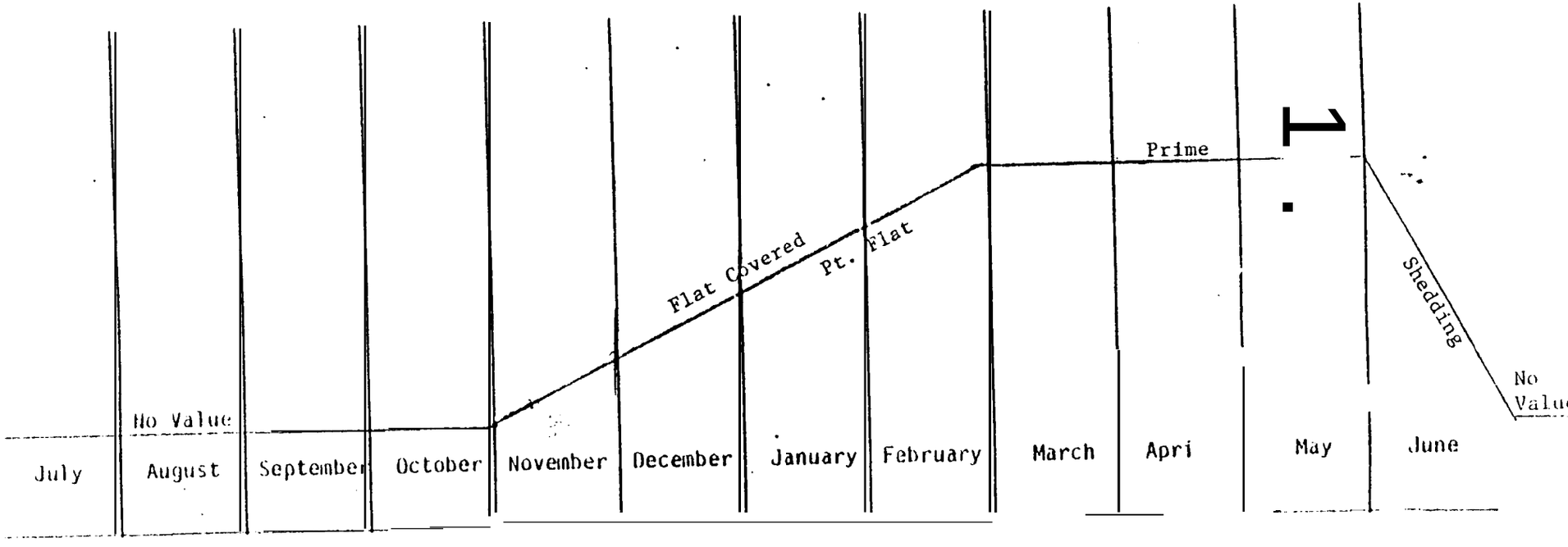
Small	14" and under
Medium	14 - 16"
Large	16 - 18"
Extra Large	18" and over

Desirable Features

Thick, heavy fur
Heavy, full pelt
Clear color

Value Discounts

Thin or papery pelt
Flat
Damaged
Scraped (too much flesh removed, no saddle)



LYNX

Size

Small	31" and under
Medium	31 - 35"
Large	35 - 39"
Extra Large	39" and over

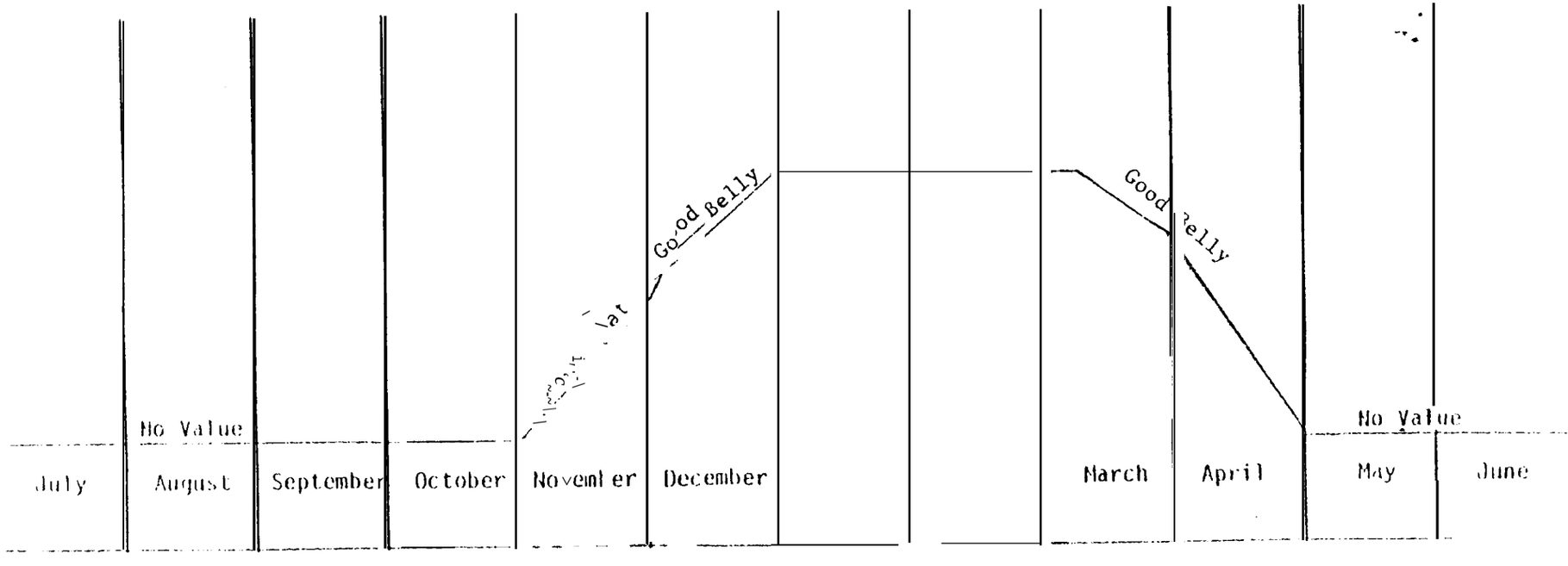
Pelt Value Discounts

Heavy	Base
Medium	-10%
Flat	-20%
II's	-30%
Early Flat	-30%
Spring Necks	-40%
Springy	-50%
Low II's	-75%
III's	-90%
IV's	-no value

Colours

Back:
- Pale
- Brownish
- Brown

Bellies:
- Clear
- Brownish
- Brown



BEAVER

Sizes	
Small	44" or under
Medium	44" - 48"
Medium-Large	48" - 52"
Large	52" - 60"
X Large	60" - 65"
Blanket	65" - 70"
Super-Blanket	70" or over

Pelt Value Discounts	Basis
I - II's	
Seconds	-10%
Flat II's	-25%
Sheddery II's	-40%
Low II's	-50%
III's	-75%
IV's	-no value
Slightly damaged	-25%
Damaged	-50 - 60%
Tainted	-90%
Badly damaged	-90%
Burnt	-no value

Colours

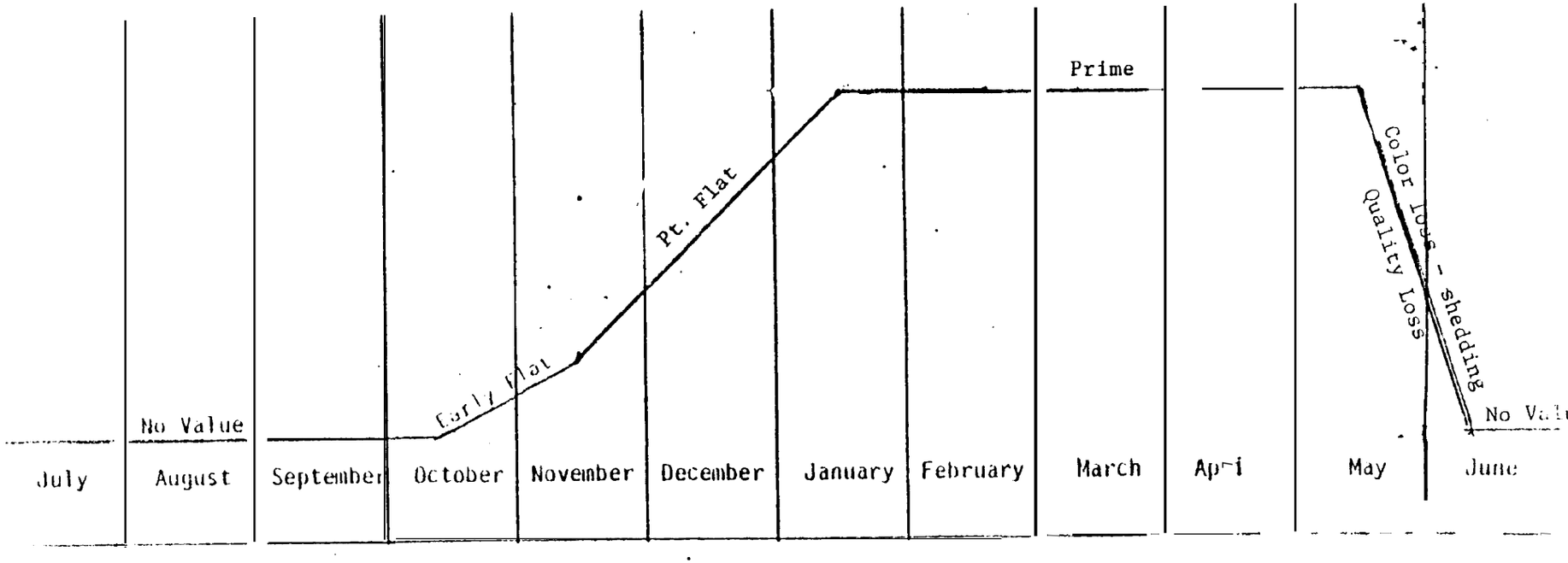
Dark

Dark Brown

Brown

Pale

Red



APPENDIX c

WATER ANALYSIS

DATE REPORTED : JUNE 30, 1987 LABORATORY REPORT NUMBER: E87-8079

HLA CONSULTANTS

SOURCE: TANNING PLANT WATER DATE RECEIVED: JUNE 24, 1987

ANALYST: R. COWDREY

pH:	7.5	
TOTAL ALKALINITY:	78.	Mg/l as $CaCO_3$
CALCIUM:	36.0	Mg/l as Ca
CHLORIDE:	6.5	Mg/l as Cl
COLOUR:	5	TCU
TURBIDITY:	2.3	NTU
TOTAL HARDNESS:	146.	Mg/l as $CaCO_3$
IRON:	0.172	Mg/l as Fe
MANGANESE:	0.02	Mg/l as Mn
SULPHATE:	96	Mg/l as SO_4

NOTE

The analysis meets recommended levels for water used in the leather industry (See attached guidelines).

GUIDELINES FOR LEATHER INDUSTRIES (GENERAL FINISHING AND TANNING)

PARAMETER		LEVEL		REFERENCE
ALKALINITY as $CaCO_3$	LE	130	mg/L	ONTARIO WATER RESOURCES COMMISSION 1970
CALCIUM as Ca	LE	60	mg/L	ONTARIO WATER RESOURCES COMMISSION 1970
CHLORIDE as Cl^-	LE	250	mg/L	ONTARIO WATER RESOURCES COMMISSION 1970
COLOUR	LE	5	TCU	ONTARIO WATER RESOURCES COMMISSION 1970
HARDNESS TOTAL as $CaCO_3$	LE	150	mg/L	ONTARIO WATER RESOURCES COMMISSION 1970
IRON as Fe	LE	0.3	mg/L	ONTARIO WATER RESOURCES COMMISSION 1970
MANGANESE as Mn	LE	0.2	mg/L	ONTARIO WATER RESOURCES COMMISSION 1970
pH	GE	6.0		ONTARIO WATER RESOURCES COMMISSION 1970
	LE	8.0		
SULPHATE as SO_4	LE	250	mg/L	ONTARIO WATER RESOURCES COMMISSION 1970
TURBIDITY		NO	JTU	ONTARIO WATER RESOURCES COMMISSION 1970

APPENDIX D

TANNERY HAZARDS

TANNING

WORK TASKS:

1) Loading and unloading of tubs
2) Operate paddles and wheelbarrels
3) Chemical handling
4) Loading anti unloading of extractors

CHEMICAL HAZARDS

CHEMICAL COMPOUND	TWAEC	HEALTH EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES
Ammonia	25ppm	Rapidly burns the skin. Vapours are harmful to eyes and lungs.	Local exhaust or respiratory protection. Eye protection, gloves, protective clothing, face shield.
Ammonium Chloride (Fume)	10mg/m^3	Sore throat, nausea. Irritating to skin and eyes.	Local exhaust or respiratory protection. Eye protection, gloves.
Benzene	10ppm	Suspected carcinogen above permissible levels. Headache, nausea, unconsciousness. Irritating to eyes and skin. Sore throat.	Strict hygiene. Local exhaust or respiratory protection. Eye protection, gloves, protective clothing, face shield in combination with breathing protection.
Formaldehyde	2ppm (CEC)[1]	Suspected carcinogen above permissible levels. Irritating to eyes, nose, throat; dermatitis by sensitization. Prolonged exposure may lead to heart problems.	Local exhaust or respiratory protection. Eye protection, gloves, protective clothing, face shield.
Hydrogen Peroxide		Corrosive to eyes, skin and throat. Exposure may cause sore throat, shortness of breath, nausea, abdominal pain.	Local exhaust or respiratory protection. Eye protectin, gloves, protective clothing, face shield.
Lead Acetate[2]	15mg/m^3	Irritating to eyes, nose and throat. Coughing, headache, nausea, cramps.	Strict hygiene. Prevent dispersal of dust. Local exhaust or respiratory protection. Eye protection, gloves. No eating, drinking or smoking.

CHEMICAL COMPOUND	TWAEC	HEALTH EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES
Lead Nitrate[3]	.15mg/m3	Corrosive if in contact with eyes or Ingested. Inhalation causes sore throat, shortness of breath and headache. Irritating to skin,	Strict hygiene. Prevent dispersal of dust. Local exhaust or respiratory protection. Eye protection, gloves. No eating, drinking or smoking.
Naphthalene	10ppm	Sore throat, coughing, headache, nausea. Irritating to eyes and throat.	Local exhaust or respiratory protection. Eye protection, gloves No eating, drinking or smoking.
Oxalic Acid	1mg/m^3	internal poisoning. Can cause burns to eyes, skin and nasal passages.	Local exhaust or respiratory protection. Eye protection, gloves. No eating, drinking or smoking.
Parapheny: enediamine	.1mg/m^3	Inhalation of dye/dusts may cause severe bronchial asthma. Skin contact may cause dermatitis.	Local exhaust or respiratory protection. Chemical goggles gloves, barrier creams apron. Proper housekeep. ng. Personal hygiene.
Sodium Bisulphite	5mg/m^3	Dust causes irritation to eyes, nose, throat and skin; can cause abdominal pain if swallowed.	Local exhaust or respiratory protection. Gloves, face shield. No eating, drinking or smoking.
Sodium Perborate	---	Irritating to eyes, throat and skin. May cause nausea and unconsciousness.	Local exhaust or respiratory protection. Eye protection, gloves.
Sodium Pyrophosphate	---	Sore throat, coughing, shortness of breath, nausea. Irritating to eyes and skin.	Local exhaust or respiratory protection. Eye protection, gloves.

[1]CEC - CEILING EXPOSURE CRITERIA

2,3 - LEAD HAS BEEN PRESCRIBED AS A DESIGNATED SUBSTANCE.

SOAKING / WASHING

WORK TASKS:

1) Loading and unloading of tubs
2) Operate paddles and wheel barrels
3) Chemical handling
4) Loading and unloading of extractors

CHEMICAL HAZARDS

CHEMICAL COMPOUND	TWAEC	HEALTH EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES
Formic Acid	5ppm	Burns and skin irritation. Vapours may cause nausea and vomiting.	Local exhaust or respiratory protection. Eye protection gloves, protective clothing, face shield.
Lactic Acid	---	Irritating to eyes, nose and throat. May cause nausea and burns.	Eye protection, gloves. Self contained breathing apparatus in high concentration mist.
Sulfuric Acid	1mg/m^3	Severe burns to skin and eyes. Fumes irritate nasal passages and lungs. Can cause fires when in contact with combustible materials.	Strict hygiene. Local exhaust or respiratory protection. Eye protection, gloves, protective clothing, face shield.

GREASE AND KICK

WORK TASKS:

1) Loading and unloading of drums
2) Leading and unloading of kicker
3) Loading and unloading for caging

CHEMICAL HAZARDS

CHEMICAL COMPOUND	TWAEC	HEALTH EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES
Oils	---	Problems are not common, but some forms of dermatitis may develop in those who have developed a high degree of sensitivity.	Wash frequently. Use barrier creams, protective clothing. Pre-employment medicals and periodic medical examinations.

FINISHING - FUR

WORK TASKS:

1) Drumming/degreasing
2) Caging
3) Stretching
4) Cleaning
5) Buffing
6) Brushing
7) Lusterizing
8) Shearing/plucking

CHEMICAL HAZARDS

CHEMICAL COMPOUND	TWAEC	HEALTH EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES
Solvents, Lacquers, Resins	Various	Inhalation may lead to drowsiness, impaired judgement and unconsciousness. Vapours irritate eyes, nose and throat. Skin contact may cause dermatitis. Repeated and/or prolonged inhalation may cause liver, kidney and central nervous system disorders. Highly flammable.	Local exhaust or adequate ventilation. Appropriate respiratory protection. Avoid using in a confined space. Wear chemical safety goggles and appropriate gloves. 'St-ore liquids in appropriate equipped containers and storage facil ities. Train in proper storage and handling procedures Post "NO SMOKING" signs. Use explosion-proof lighting, switches, motors, etc. Use proper grounding when pouring solvent. Strict personal hygiene practices.

ENVIRONMENTAL HAZARDS

HAZARD	TYPE AND EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES	PPE
Fur Dust	Inhalation of fur dust may lead to lung congestion or irritation.	Provide adequate exhaust ventilation and dust collection. Maintain proper housekeeping procedures - daily clean-up of floors and equipment. Use vacuum to remove accumulated dust; avoid dry sweeping. Wear appropriate respiratory protection (e.g., dust mask).	APPROPRIATE RESPIRATORY PROTECTION
Heat	Heat exhaustion or heat stroke may result from prolonged work in hot environment	Regular inspection and maintenance of ventilation system. Provide adequate exhaust of hot air and supply of fresh, cooler air. Limit or restrict exposure time of individuals exposed to high heat. Train individuals in recognizing signs of heat stroke or heat exhaustion and how to administer first aid. Do not allow a worker to work alone or without supervision for long periods of time in heated environment. Drinking water should be readily accessible.	SAFETY BOOTS

ENVIRONMENTAL HAZARDS

HAZARD	TYPE AND EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES	PPE
Confined Spaces (druns, paddles, pits)	Hazardous gases, vapours, dusts or fumes (fires and explosions, inhalation of toxic contaminants). Oxygen deficient atmosphere. (asphyxiation) Extremes of temperature and humidity. Caught in moving parts.	A confined space should be entered into only when: there is safe access to and egress from the confined space power source has been disconnected, all electrical, chemical and mechanical hazards locked out, all openings have been blanked off the atmosphere has been tested and evaluated by a competent person all sources of ignition have been eliminated - Lhe space has been purged and ventilated to provide a safe atmosphere. The space should be adequately ventilated by either mechanical or natural means to ensure the oxygen content is not less than 18 per cent or more than 23per cent. (If this is not possible, the person entering must wear suitable breathing apparatus.) Never allow anyone to enter a confined space without a safety line/harness and another person standing watch.	APPROPRIATE RESPIRATORY PROTECTION CHEMICAL GOGGLES COVERALLS SAFETY HAT SAFETY BOOTS SAFETY HARNESS SAFETY LINE

ENVIRONMENTAL HAZARDS

HAZARDS	TYPE AND EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES	PPE
Confined Spaces (Cent'd.)		Establish a work procedure (e.g., work permits) for entering into and conducting work in a confined space. Establish rescue procedures for removing person(s) from the confined space. There should be a person trained in artificial respiration available.	
Walking/Working Surfaces	Slips and falls can result if floor surfaces are made slippery from animal fat or flesh, oils, dust or shavings. Floors may be hazardous if obstructions are left in the aisle.	Walking surfaces should be kept free of excess water, foreign material and destructions. Squeegee mop all wet surfaces frequently to remove water, flesh, etc. Flush excess water and other liquids down drains. Drainage system should be regularly inspected and maintained. Provide training in good housekeeping skills. Where there is the possibility of a worker falling over an edge or open slide, erect guardrails. Cover or guard all floor openings through which an individual may fall.	SAFETY BOOTS

ENVIRONMENTAL HAZARDS

HAZARD	TYPE AND EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES	PPE
Noise (drums, combing, shearing and justerizing machines)	Possible hearing impairment from excessive noise levels.	Noise surveys should be carried out to establish noise levels. Consideration should be given to eliminating or reducing machine noise by: -isolating the machine from the worker. -increasing machine insulation -erecting Sound barriers -increasing the distance between worker and source. -limiting the time of exposure through job rotation. If engineering and administrative controls are not feasible then effective hearing protection such as ear plugs or muffs must be supplied and used. Training in the use and care of hearing protection equipment must be provided. Pre-placement and periodic audiometric testing should be carried out.	HEARING PROTECTION: EAR MUFFS - EAR PLUGS

ENVIRONMENTAL HAZARDS

HAZARD	TYPE AND EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES	PPE
Manual Lifting or Moving of Materials or Equipment	Strains and sprains of the arms, shoulder, back, knee, leg or ankle, due to overexertion when lifting or moving skins, loaded hand carts, horses, etc.	Where possible, eliminate tasks requiring the lifting, pushing or pulling of all heavy loads. Where possible, redesign the work task or work area to minimize the need to bend, stoop or twist the body when lifting, carrying or moving any load. Provide mechanical or automated devices to lift or move loads. Regular inspection and maintenance of all lifting devices by a competent person. Provide instruction to employees on safe and proper lifting procedures. Ensure employees understand and adhere to proper lifting procedures.	SAFETY BOOTS
Moving Vehicles (forklift trucks)	Struck by vehicle or material falling from vehicle.	Only competent and authorized personnel should be permitted to operate a vehicle. All vehicles should be regularly inspected and maintained by a competent person.	SAFETY HAT

ENVIRONMENTAL HAZARDS

HAZARD	TYPE AND EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES	PPE
Moving Vehicles (forklift trucks, Cent d.)		Only the operator should be allowed to ride on lift truck. When used for supporting, raising or lowering a worker, the lift truck must be properly equipped. Operator should always have an unobstructed view and face in the direction of travel. Vehicles should be equipped with automatic warning device for driving in reverse. When leaving a vehicle unattended, the forks, blades, buckets, etc., must be fully lowered, controls neutralized, power shut off, brakes set, keys removed, and the wheels blocked if parked on an incline. All loads handled should not exceed the rated capacity of the vehicle. Do not allow any person to stand or pass under the elevated portion of a vehicle at any time. Operators should never pass a load over the head of another worker. Where there is a hazard of falling objects, the vehicle should have a proper guard. Minimize the necessity for vehicles to cross areas of pedestrian traffic. Install mirrors at blind corners.	

MECHANICAL HAZARDS

HAZARD	TYPE AND EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES	PPE
Exposed Moving Machinery Parts (shaving and buffing machines)	Cut, scratched, crushed, or amputated fingers, hands, feet or other body parts caught in, between or under exposed moving parts.	All exposed moving machinery parts should be equipped with a guard which prevents access to the moving part. The emergency stop button should be readily identifiable and in an accessible location. Operators should be trained and understand procedures for safe machine operation. Allow only competent personnel to operate the machines. Da not wear loose clothing, gloves, rings, watches, other jewelry. Long hair should be confined. (Hair nets) Do not overload or exceed the rated capacity of the machine. Establish a Preventive Maintenance Program, providing for regular inspection and maintenance of al l mechanical equipment. Before any maintenance work is done on any machine, ensure that the machine is properly locked out and blocked from moving	

MECHANICAL HAZARDS

HAZARD	TYPE AND EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES	PPE
Knives; Snippers	Cuts, punctures or lacerations to fingers, hands, arms,	Provide training in the proper use of knives. Use the proper knife for the task. If in debt, ask. Keep knives properly sharpened and avoid excess use of force which increases cut hazard. Knife handles should have guards to prevent hand slipping onto blade. Points should be removed from knives when possible. Allow sufficient room to work safely without endangering nearby worker(s). Two individuals should not work on the same piece at the same time. Knives should be cleaned daily. Replace worn down knives. When not in use, knives should be stored in guarded scabbard. Use and maintain personal protective equipment: metal mesh/nylon gloves finger stalls. Report all cuts immediately to first aid for treatment to prevent infection.	METAL MESH/NYLON GLOVES FINGER STALLS

MECHANICAL HAZARDS

HAZARD	TYPE AND EFFECTS	SAFETY AND HEALTH PROGRAM ACTION MEASURES	PPE
Hand Carts	Strains and sprains of the arm, shoulder or back from over-exertion. Foot and leg injuries as a result of objects falling off the cart, being struck by the cart or wheels running over the foot. Hand injuries as a result of being scraped or crushed between cart and a fixed object (walls or equipment).	Do not overload the cart. Hand carts should have foot brakes to keep cart stable while being loaded. Carts should have hand guards. Push, do not pull, carts. Maintain cart in good condition - lubricate wheels as needed. Allow clearance for cart to pass easily between fixed objects and equipment. Operate cart in a proper and safe manner. Wear safety boots. Wear gloves.	SAFETY BOOTS GLOVES

Source: Tanning Industry, Safety and Health Guide, Industrial Accident Prevention Association, 1983.

APPENDIX E

EQUIPMENT SUPPLIERS

GUIDELINES FOR CHEMICALS - HANDLING AND STORAGE

- Ideally, all containers containing solvents or other flammable compounds should be stored in an area not used for any other purpose, separated from the immediate work area (eg. , separate enclosed storage area, another building) and remote from any means of egress, in approved cabinets or safety containers.

- Doors and walls of inside storage rooms should have a fire-resistance rating of at least one hour. All doors should be self-closing and hinged to open outwardly.

- Except for drains, the room should be liquid tight.

- More than one mans of egress should be provided where the distance of travel to a means of egress from any point in the roan is greater than 15 feet (4.5m) .

- Storage areas should have sufficient ventilation to prevent the accumulation of dangerous vapours or fumes inside the area. Mechanical ventilation (near floor level) must be provided if flammable liquids are dispensed within a room *or* building.

- All retainers when not in use, should remain sealed to prevent the release of any vapours or fumes.

- All containers, dispensing equipment and portable containers must be properly bonded and grounded.

- All portable containers used to dispense flammable compounds should have a spring-loaded cap and flame arrestor.

- All potential sources of ignition should be eliminated, removed or isolated, eg. , if required, use non-sparking tools only, explosion proof wiring and electrical connections.

- Before dispensing any compound into a portable container, proper personal protective equipment should be worn, eg., impervious gloves and clothing, chemical safety goggles and/or face shield, appropriate respiratory equipment if substance or other conditions require that such respiratory equipment be worn.

- Emergency eye wash and/or showers should be located in the irrtnediate area of the storage facility.

- A maximum of 2,000 gallons (9,400 litres) of flammable liquid in sealed containers may be stored in a room provided it is liquid tight and equipped with a drain terminating into a dry sump or holding tank. The maximum quantity may be doubled if the roan is also protected by an approved sprinkler system.

- Approved portable fire extinguishers of appropriate size, type and number should be provided. At least one fire extinguisher having a rating of not less than 20-B should be located outside of and not more than 10 feet (3 m) from the door opening into any such storage area.

- Empty containers should be removed fran the storage area and be drained and cleaned or otherwise rendered free from any explosive, flammable or harmful substance.

- Dispose of oily rags or paper towels in safety containers with tightly fitting covers.

- Handle, use, store, and dispose of all hazardous liquids or materials in accordance with the procedures specified by the manufacturer.

Source: Tanning Industry, Safety and Health Guide, Industrial Accident Prevention Association, 1983.

EQUIPMENT SUPPLIERS

WURTT. PELZMASCHINENFABRIK
RUDOLPH POHLANDT GMBH
P.O. Box 1124
Berliner Strasse 22
-7157 Murrhardt, West Germany
elephone: 07192/8034

ERCIER FRERES
P. 128
7104 Annonay
edex, France
lephone: (75) 33.47.22

LBECK AND CO.
SCHINENFABRIK
403 Ratingen Dusseldorf
lephone: 02102/44010

CINO RIVO
O. Box 93
029 S. Croce Sun arno
a, Italy
ephone: 0571/30312-30084

H. C. BLADES AND KNIVES INCORPORATED
. Box 149
Willow Street North
on, Ontario
ADA
phone: (519) 853-1772

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HANDLING AND STORAGE

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