2.0 PROJECT DESCRIPTION

2.1 BACKGROUND

Leather tanning is the process of converting raw hides or skins into leather. Hides and skins (e.g., from cows, sheep, pig, deer) have the ability to absorb tannic acid and other chemical substances that prevent them from decaying, make them resistant to wetting, and keep them supple and durable. Tanneries follow different methods of processing hides into leather depending in part by the end-use purpose of the hide (e.g., for soft leathers used to make shoe uppers and bags versus tougher, more durable leathers used to make belts, saddles and shoe soles) and/or the environmental regulations in which the tannery is governed.

Over the past few decades, environmental regulations have forced tanneries to alter tanning processes such that they reduce concentrations of chromium and salts in tannery wastewater. Animal hides shipped to tanneries are generally either packed in salt or are frozen in order to slow the process of hide decomposition. The use of salt packed hides involves repeated soaking and rinsing of hides in large quantities of clean water in order to remove as much salt as possible prior to the tanning process. Even following the precipitation of chromium and salts from wastewater produced using salted hides, concentrations of salt in tannery effluent can have harmful effects on the environment. For this reason, the Miami Colony proposes to use unsalted, frozen or "green" deer hides.

Once at the tannery, hides are soaked in water to replenish lost moisture. Soaking is followed by a number of processes that prepare the hide for tanning. Tanning involves the use of either vegetable tannins or trivalent chromium. Chrome-tanned leather tends to be softer and more pliable than vegetable-tanned leather, has higher thermal stability, is very stable in water, and takes less time to produce than vegetable-tanned leather. For these reasons, chrome tanning is the most widely used method in North America. In an effort to reduce the amount of trivalent chromium from entering the environment, the Miami Colony proposes to use a chrome-precipitation method to remove trivalent chromium from tannery wastewater.

2.2 CONCEPTUAL DESIGN

The proposed deer-hide tannery will be situated on the 13-km^2 parcel of land owned by the Colony (cf. "Colony Site" on Figure 1-2). The conceptual design for the facility was created by Tannery Run Sales of Winnipeg, and is detailed in the following subsections. The conceptual design was based on the following performance criteria specified by the Colony:

- Seasonal processing operations (i.e., October-March) of 10,000 (nominal) deer-hides.
- Deer hides received in the form of "green hides."
- Load sizes of 200 hides/load (nominal).

- Hides to be chrome tanned and processed through to drying and conditioning (i.e., no finishing [painting]).
- Liquid-effluent streams to be delivered to an on-site storage clay-lined lagoon (cf. Section 2.2.5).

Additionally, the conceptual design was based on bench-scale testing ("jar-tests"), conducted by Tannery Run Sales in March 2006, during a sample load of 60 hides that was produced by the Colony, upon request of Manitoba Conservation for such testing (cf. Section 2.4.2).

A process flow-chart outlining the proposed steps for the deer-hide tannery conceptual design is shown in Figure 2-1, based on current chrome-tanning technology. As with any tannery design, processes and formulas may have to be modified to suit specific operating and environmental conditions. Process and formula refinements would be undertaken during full system commissioning (i.e., batch processing of 200 hides; cf. Section 2.6)

A detailed process flow-chart outlining the required inputs for each process, and the types and estimated quantities of output waste streams (based on the bench-scale testing conducted in March 2006), is shown in Figure 2-2.

2.2.1 Tannery Equipment Requirements

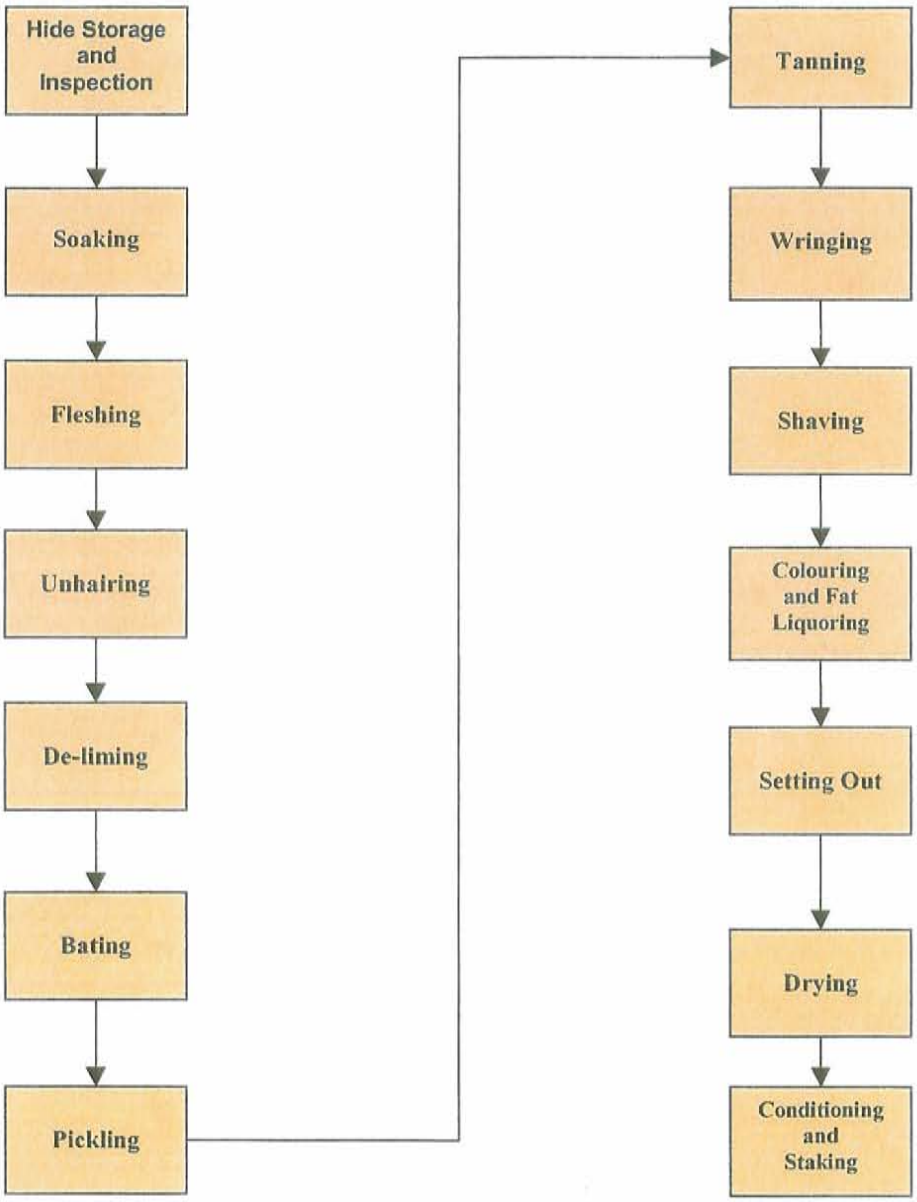
A listing of the equipment requirements, compiled by Tannery Run Sales and based on the tannery conceptual design, is provided in Table 2-1.

2.2.2 Tannery Chemical Requirements

A number of chemicals are required to complete the tannery process. A listing of the chemicals used in the bench-scale run and, according to the Colony, to be used during full production, is shown in Table 2-2. Based on utilization of 'green' hides (cf. Section 2.3.1) and chromium-recovery and salt-recycling procedures, the chemical utilization has been decreased by almost 50% of typical tannery requirements (B. McConnell, *pers. comm.* 2006). Bulk acidic or caustic materials being stored on site for use in tannery operations will be equipped with secondary containment (cf. Section 2.6.4). The active concentration of some formulations is proprietary and therefore not available to the Study Team.

2.2.3 Tannery Plant Layout

A scaled diagram illustrating the proposed tannery conceptual plant layout, provided by Tannery Run Sales, is shown in Figure 2-3.



Source: Tannery Run Sales

Macro Process-Flow Chart for Deer-Hide Tannery Conceptual Design

Figure 2-1

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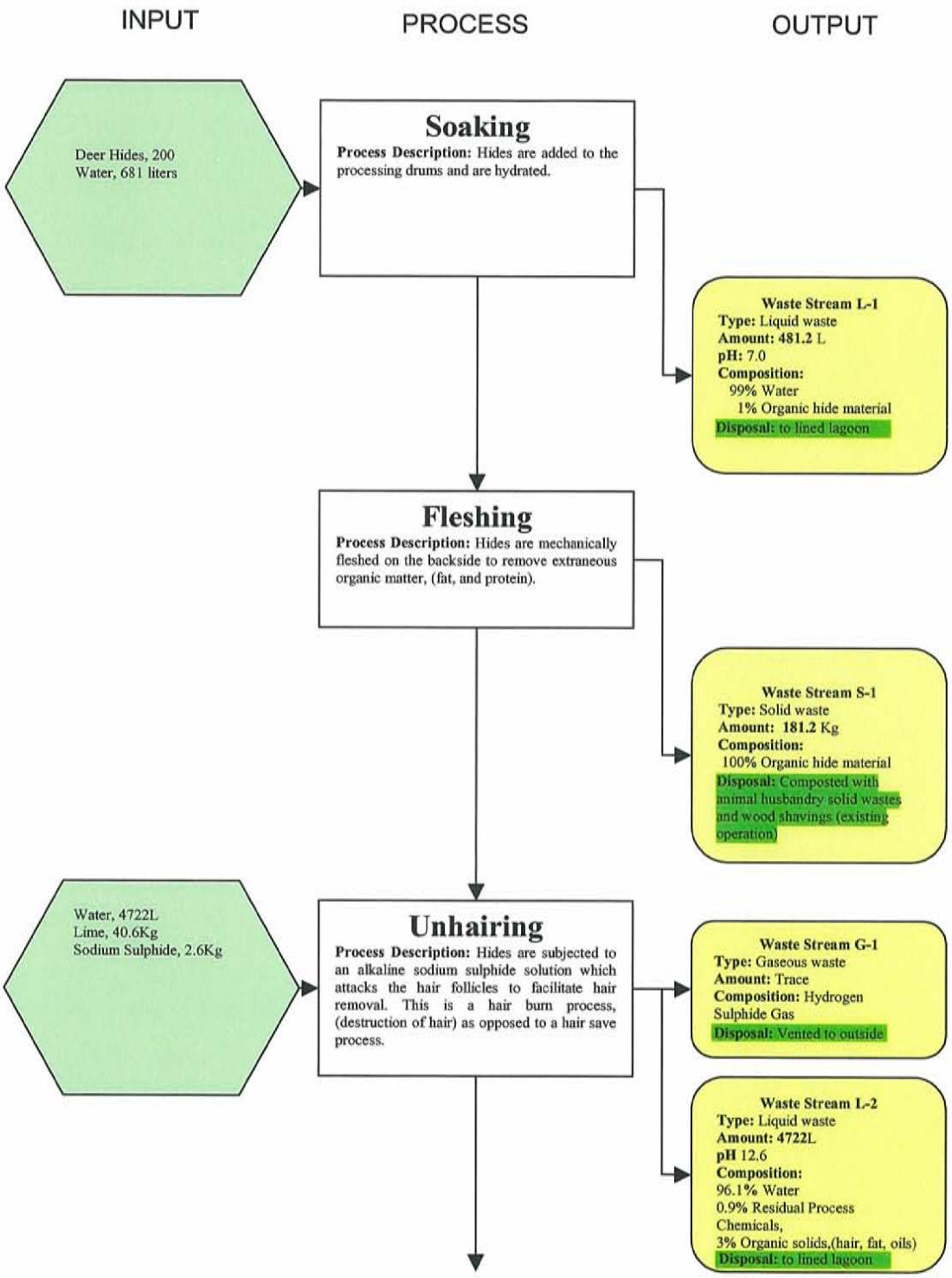

Source: Tannery Run Sales

Process Flow Chart for Deer Tannery Conceptual Design
Figure 2-2

Fig2_2
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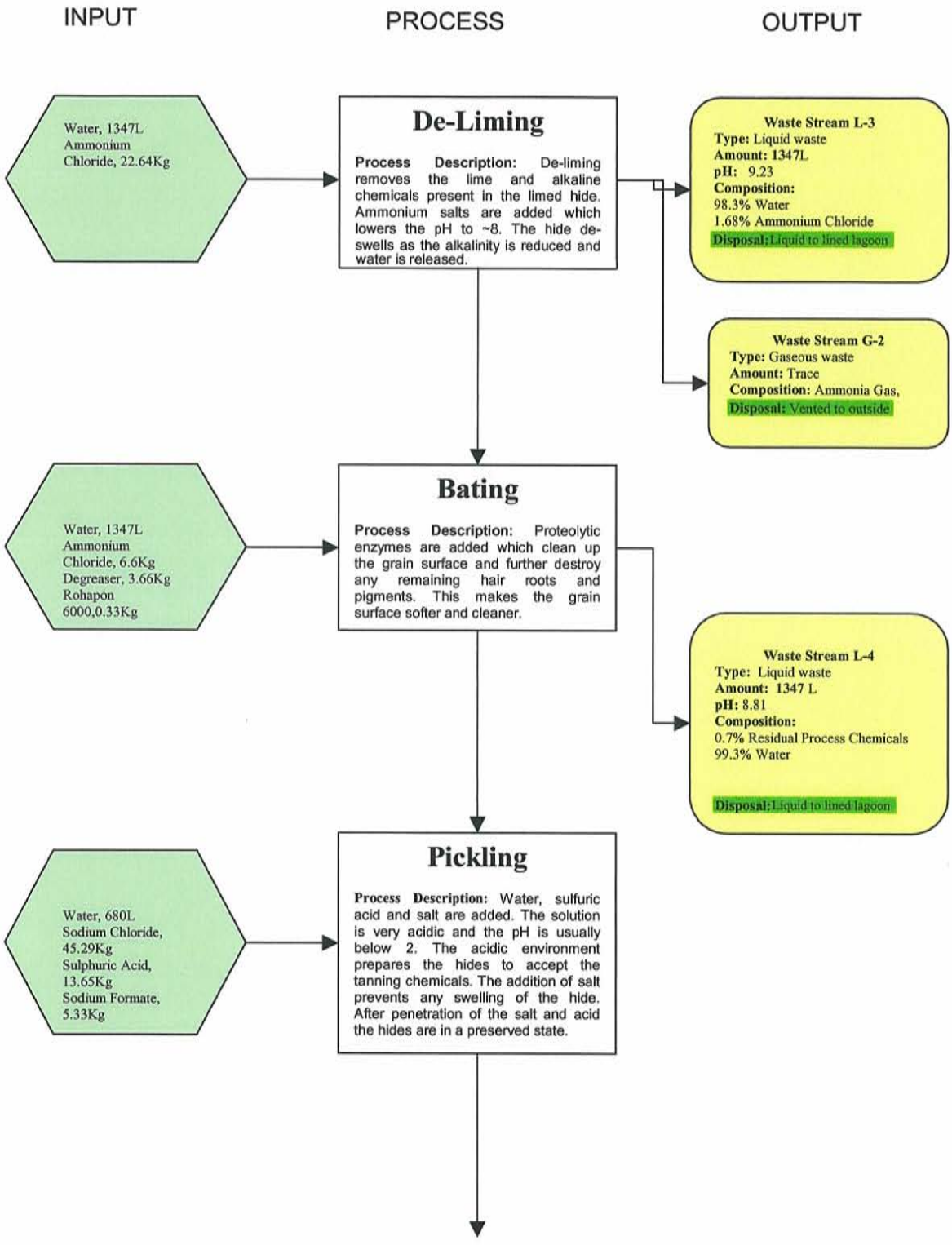

Source: Tannery Run Sales

Process Flow Chart for Deer Tannery Conceptual Design
Figure 2-2 cont'd

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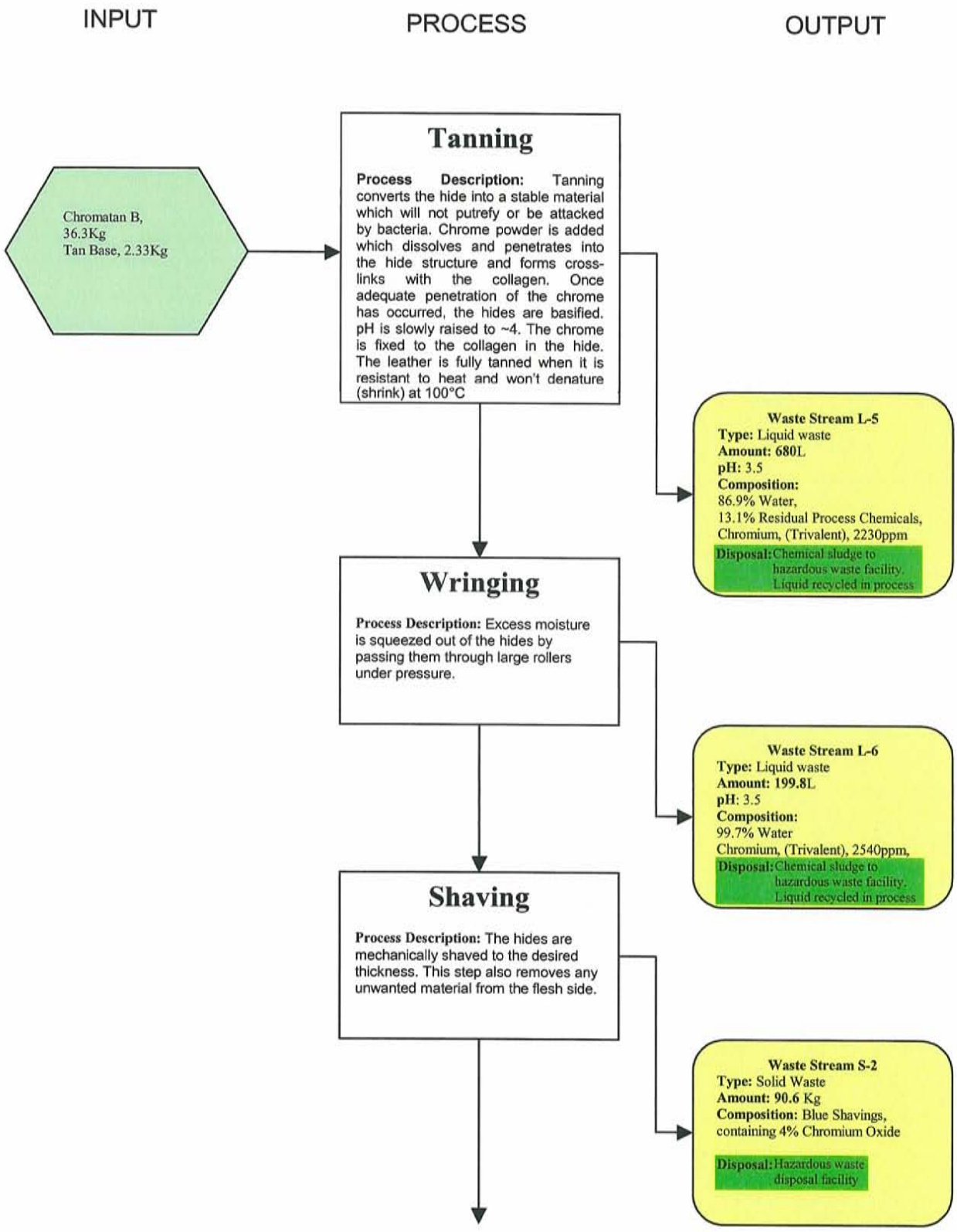

Source: Tannery Run Sales

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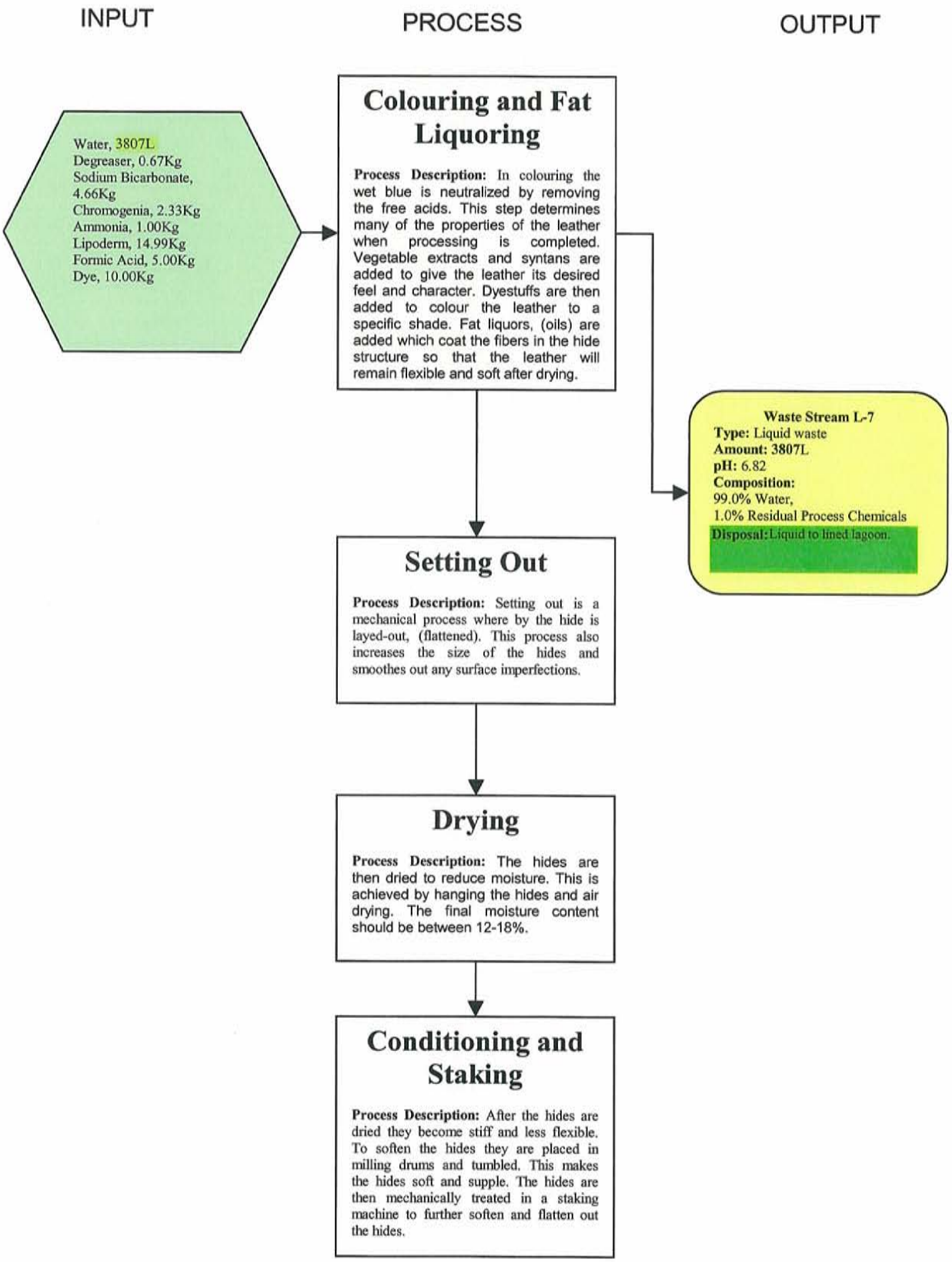
Process Flow Chart for Deer Tannery Conceptual Design
Figure 2-2 cont'd



Source: Tannery Run Sales

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Process Flow Chart for Deer Tannery Conceptual Design
Figure 2-2 cont'd

TABLE 2-1

MIAMI COLONY FARMS LTD.
EQUIPMENT LISTING FOR DEER-HIDE TANNERY CONCEPTUAL DESIGN

Process	Equipment	Comments
Hide Storage and Inspection	Wood pallets	60 pallets required for storage
Soaking	Fibreglass Mixer	600 gal minimum capacity
Soaking	Lab Test Equipment	pH meter, hydrometers, thermometers, moisture meter
Soaking	Weigh Scales	For hide and chemical additions
Soaking	Transfer Pump	Liquid transfer to evaporation tank
Fleshing	Fleshing Machine	Hides to be fleshed prior to unhairing
Fleshing	Waste Hoppers	For disposal of fleshing waste
Unhairing	Fibreglass Mixer	For primary unhairing
Unhairing	Enclosed suspended solids tank, 2500 gal	For sulphide oxidation
Unhairing	Transfer Pump	For transfer to oxidation tank
Unhairing	Air blower unit	For sulphide oxidation
Unhairing	Air diffuser pads	For sulphide oxidation
Unhairing	Lab Test Equipment	Sulphide oxidation test equipment
Unhairing	Ventilation Fan	For sulphide oxidation
Deliming/Tanning	Fibreglass Mixer	For de-liming/pickling/tanning
Tanning	Chromium Precipitation Suspended Solids Tank, 2500 gal	With mixer, open top
Tanning	Transfer Pump	From tanning to chromium tank
Tanning	Transfer Pump	From chromium tank to filter press
Tanning	Filter Press	Pre-coat may be necessary
Tanning	Filter Press Hopper	Collection of filter press cake
Wringing	Wringing Machine	For de-watering
Wringing	Pump/Lines	Collection of CR waste stream
Shaving	Shaving Machine	For levelling of hides
Shaving	Thickness Gauge	Test equipment
Colouring/Fat Liquoring	Fibreglass Mixer	For colouring/fat liquoring
Colouring/Fat Liquoring	Transfer Pump	For transfer of liquid waste
Colouring/Fat Liquoring	Line Screen	For course screening
Setting Out	Setting Out Machine	For de-watering/levelling
Drying	Drying Hooks	Ceiling-mounted
Conditioning and Staking	Milling Drum	To increase softness
Conditioning and Staking	Staking Machine	To increase softness/yield
pH Neutralization	Mixing Tank, Plastic 3000 gal	For pH adjustment
pH Neutralization	Electric Mixer	For pH adjustment

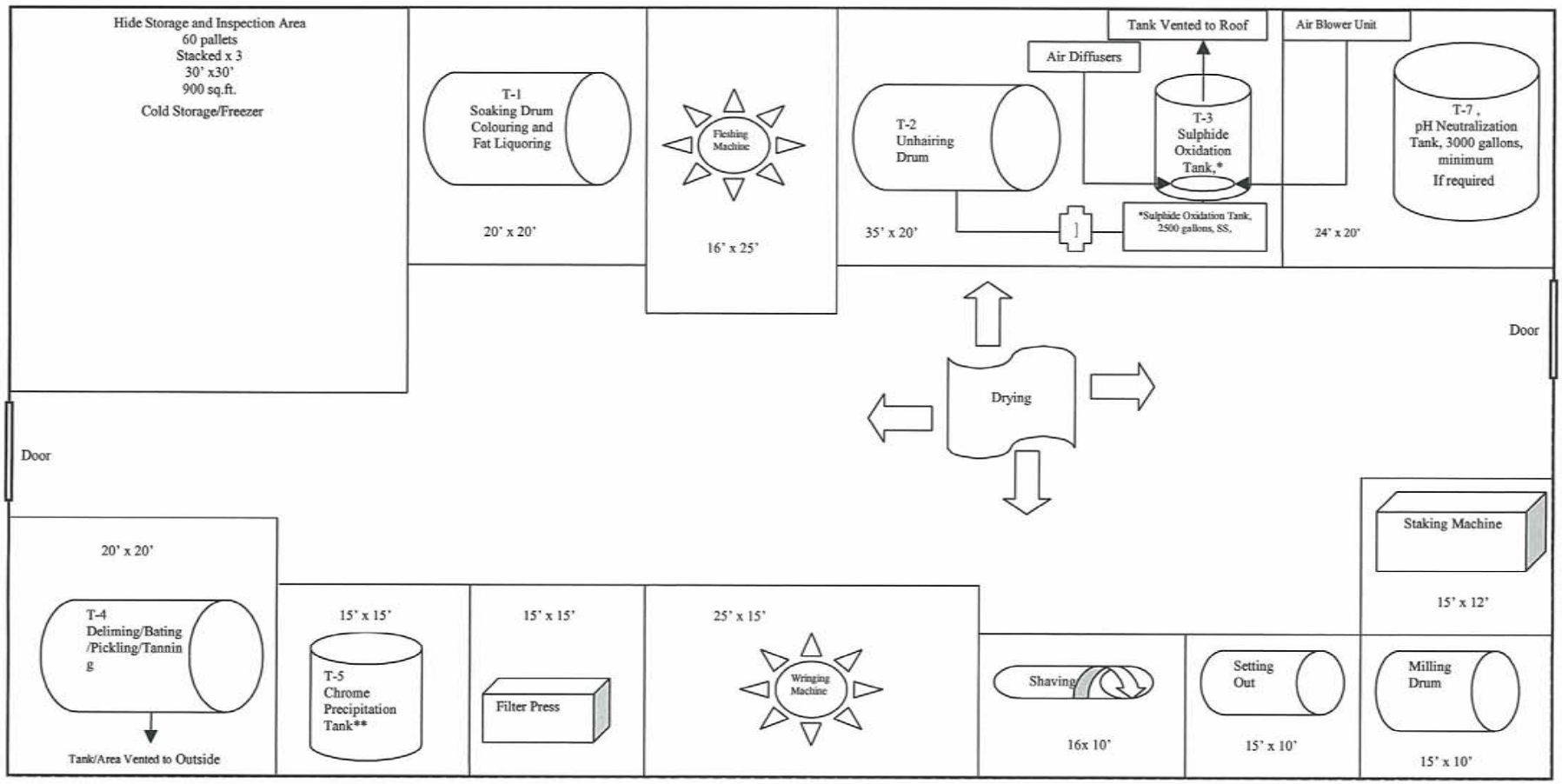
Source: Tannery Run Sales

TABLE 2-2

MIAMI COLONY FARMS LTD.
TANNERY CHEMICAL REQUIREMENTS LISTING

Process Stage	Chemicals Used	Active Concentration	Comments
Soaking/Unhairing	Hydrated Lime		Swelling agent
Soaking/Unhairing	Sodium Sulphide	Na_2S: 60-62%	Unhairing
Soaking/Unhairing	Manganese Sulphate		Sulphide Oxidation
Bait/Pickle/Tanning	Rohapon 6000	Inorganic acid salt: 85-95%	Pancreatic Bate
Bait/Pickle/Tanning	Sodium Chloride	NaCl: 99%	Table salt
Bait/Pickle/Tanning	Sulphuric Acid	H_2SO_4: 60-100%	60%
Bait/Pickle/Tanning	Ammonium Chloride	$(NH_4)CI0^3$, 98%	Deliming agent
Bait/Pickle/Tanning	Degreaser 98	Ethoxylated Alcohols	Surfactant
Bait/Pickle/Tanning	Sodium Formate	Mono-and-di-Pentaerythritol: 3%	Masking agent
Bait/Pickle/Tanning	Basochrome 33	$CrOHSO_4$	Tanning agent
Colouring/Fat Liquoring	Sodium Bicarbonate	$NaHCO_3$: 100%	Neutralization agent
Colouring/Fat Liquoring	Sodium Formate	Mono-and-di-Pentaerythritol: 3%	Masking agent
Colouring/Fat Liquoring	Retingan R7		Retannage
Colouring/Fat Liquoring	Baygennal Yellow M4G		Dye Stuff
Colouring/Fat Liquoring	Base Black NA	Acid Black 1: 10-15%	Dye Stuff
Colouring/Fat Liquoring	Formic Acid	85-98%	Fixing agent
Colouring/Fat Liquoring	Lipoderm Liquor	Oxidized Fish Oils, Sulphonated	Fish Oil

Source: Tannery Run Sales



Source: Tannery Run Sales

Scaled Diagram Illustrating Proposed Tannery Conceptual Plant Layout

Figure 2-3

plantlayout; mv\j01\j3760

2.2.4 Tannery Water Requirements

Approximately 12,000 L of water will be required per batch of 200 hides (cf. Section 2.3 and Figure 2-2), resulting in a total consumption of 600,000 L of water per processing season (i.e., October to March). This water consumption by the proposed development is small in comparison to other year-round tannery operations, which typically consume up to 2 million litres per day (McConnell pers. comm. 2005).

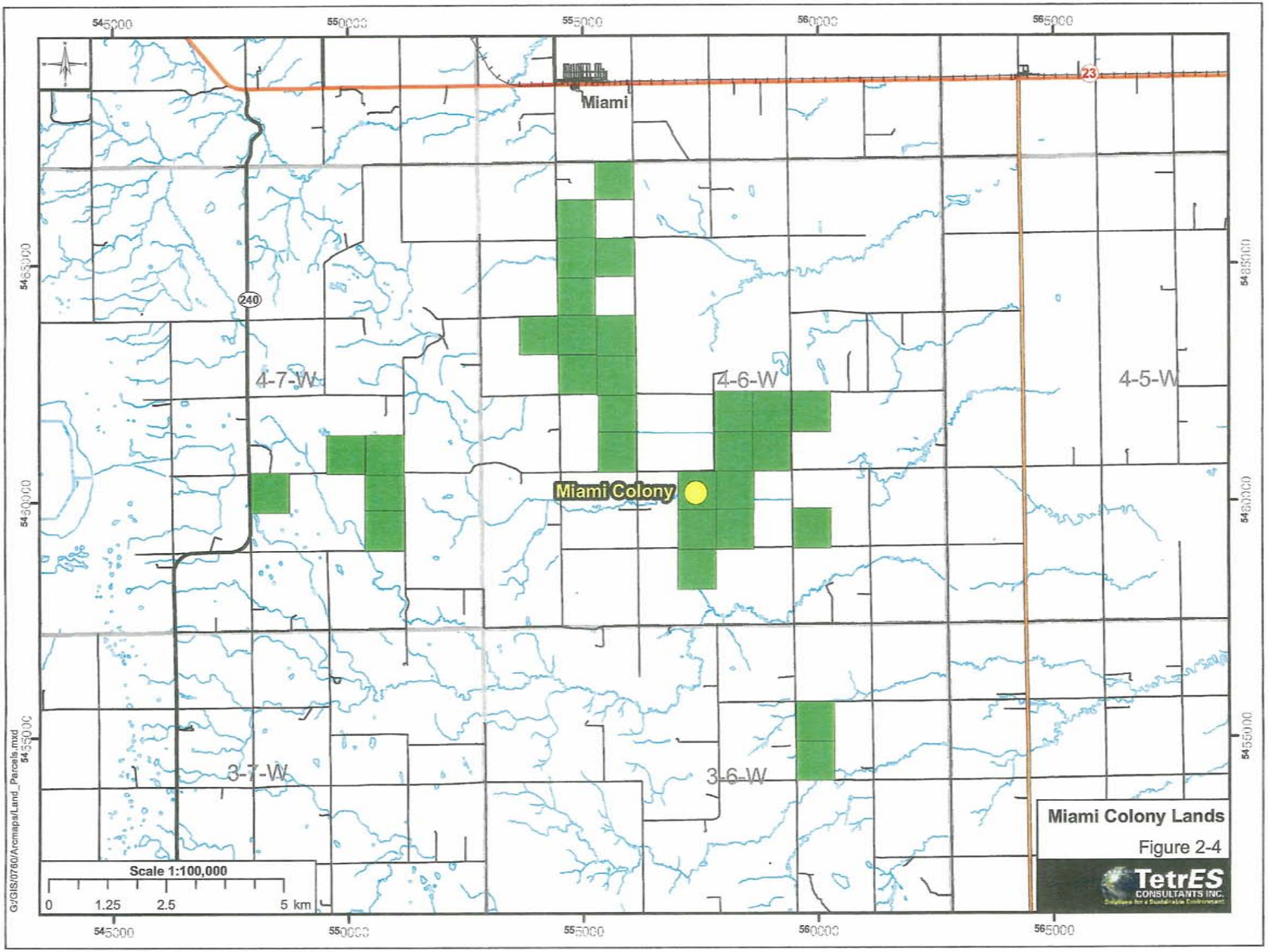
Water for the proposed tannery operations will be obtained directly from groundwater wells already installed on the Colony land (i.e., will not be treated [softened] prior to use).

2.2.5 Lined Lagoon

The Colony plans to construct a 37.8-million-litre (10-million-gallon) capacity clay-lined lagoon, with three non-aerated cells, to replace it's existing, failing glass-lined steel storage tank, which receives wastes from Colony animal-husbandry activities. A copy of the engineering design for the lagoon, as provided by the Colony, is provided in Appendix A. Liquid-waste streams from tannery operations (cf. Section 2.4.2.1) will enter this new lined lagoon as a minor seasonal component of the overall flow (cf. Section 4.2.1). If the Colony is granted a license to operate a hide tannery, the Colony advises that construction of this lagoon will be completed within a period of approximately seven days.

The location of this lagoon will avoid low-lying areas and areas adjacent to wetlands and/or streams (Appendix A). Monitoring wells will also be installed around the lagoon and around the proposed tannery facility to ensure no groundwater is being affected by either the proposed tannery or lagoon operations. These wells and any nearby water bodies (cf. Section 3.2) will be periodically tested after the facility is commissioned and the results compared to samples taken prior to tannery commissioning (cf. Section 2.6) to confirm that no impacts are occurring.

Liquid waste within the lagoon will be kept in an anoxic condition such that anaerobic micro-organisms in the activated sludge can maintain their normal metabolism and absorb the suspended and dissolved organic matter, providing treatment of organics and odour control (cf. Sections 4.2.4). To ensure complete mixing of tannery and animal-husbandry wastes, the Colony will utilize a hydraulic pump prior to the removal of waste for land application. On the basis of the bench-scale testing results, this sludge slurry should be appropriate for application on the Colony's substantial land base (4,400 acres; Figure 2-4 cf. Section 2.5) to recycle the organic material. The sludge slurry will, however, be tested before being spread on Colony fields (cf. Section 2.8.1).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Miami Colony Lands
Figure 2-4
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2.3 PROCESS

The process description for the proposed Miami Colony Farms Ltd. tannery facility was created by Tannery Run Sales of Winnipeg, Manitoba and is detailed in the following subsections.

2.3.1 Process Description

As noted in Section 2.2, the conceptual design of the tannery facility is based on the receipt of 'green' deer-hides (non-treated and fresh off the animal or frozen), which will then be chrome tanned, using current chrome-tanning technology, and processed through to drying and conditioning. There will be no finishing (i.e., painting) of the hides at this facility. A process mass balance is provided in Figure 2-5.

2.3.1.1 Hide Storage and Inspection

As indicated in Section 2.3.1, the Colony will receive deer-hides from suppliers in a 'green' form. Once the proposed facility receives the hides, they will be placed in a large storage area where they will be kept cool and/or frozen and well ventilated, prior to further processing.

2.3.1.2 Soaking

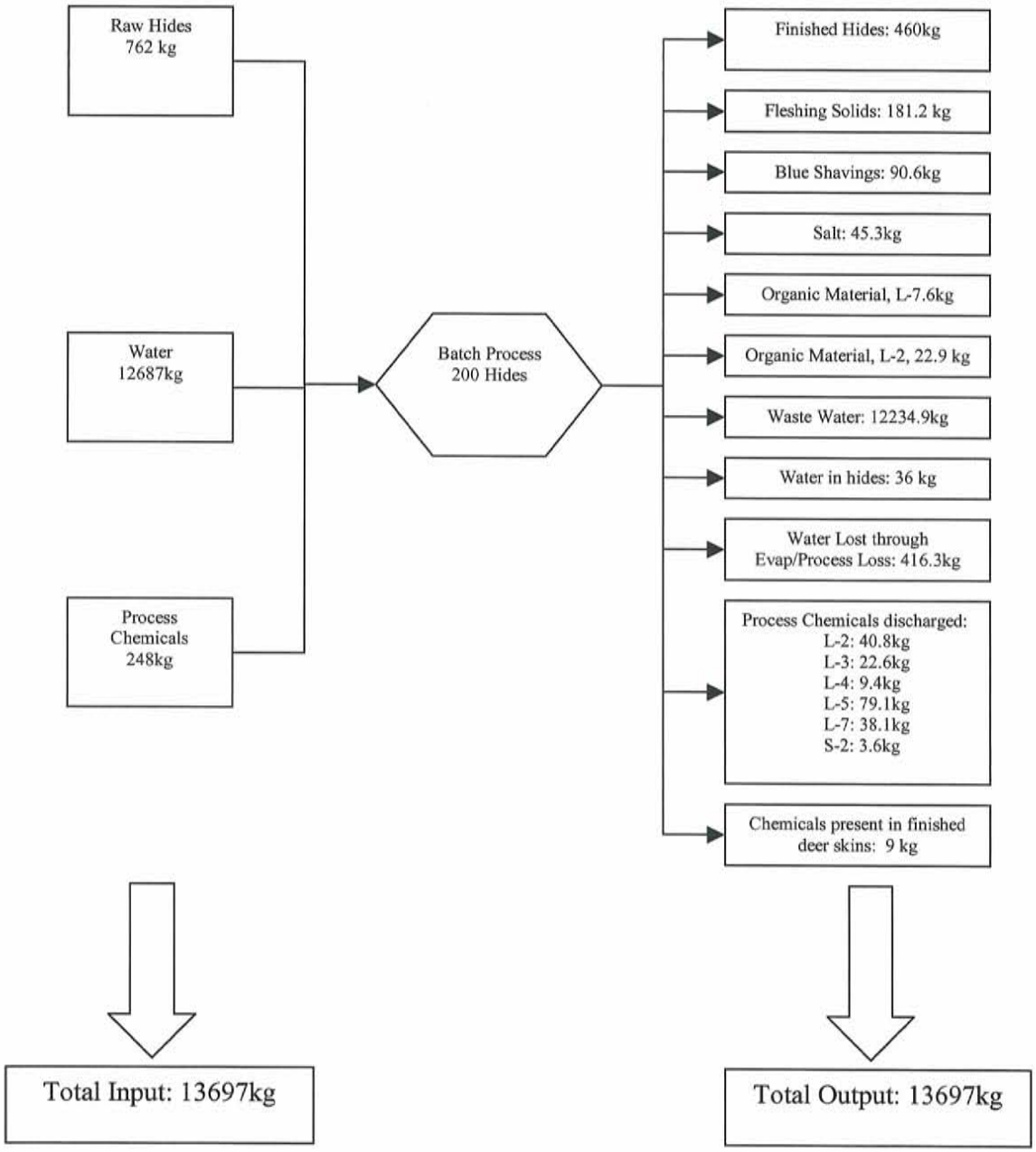
Soaking deer hides in water to restore lost moisture is the first step in the tanning process. Hides will be placed in large hide mixers containing a soaking solution. Gentle agitation will allow the hides to gradually flex and adsorb water. Water used in this step (and throughout the entire tanning process) will be from groundwater wells already installed on Colony land. During the soaking process, liquid waste is produced (cf. Section 2.4).

2.3.1.3 Fleshing

A fleshing machine will be used to remove extraneous organic matter such as fat and protein from the back side of the hides.

2.3.1.4 Unhairing

Immediately following soaking and fleshing, chemical depilatory agents will be added to the mixer, which remove the hair, loosen the epidermis, and remove specific soluble skin proteins without affecting the desirable leather-making fibres in the hides. The chemicals used in the unhairing process include sodium sulphide and hydrated lime. The hide fibres under these strong alkaline conditions absorb a large amount of moisture and swell, a condition known as "alkaline swelling". This is a "hair-burn" process (i.e., destruction of the hair [as opposed to a "hair-save" process; cf. Section 2.7]). The unhairing process usually takes about 7 hours.



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Tanning Process Mass Balance
Figure 2-5