

APPENDIX E

DESCRIPTION OF WATER TREATMENT PROCESS FOR EMERGENCY RAFFINATE TREATMENT

1.0 INTRODUCTION

During the initial 2 years of the mining and heap leaching operations there is sufficient capacity behind the confining embankment and events pond to retain any unusually high seasonal fluctuations in precipitation which fall onto the leach pad area. Only 55 to 60 percent of the ultimate pad area will be constructed and contributory to collection of precipitation, while 100 percent of the solution storage capacity would be available (124,000 m³). In the unlikely event that there is a need to bleed the system of excess water (ie. dispose of a portion of the raffinate solution), solutions will be routed to a treatment plant and neutralized/treated to a pH ranging between 7 and 9 with slurried milk-of-lime. The treatment process will result in the precipitation of contained metals as hydroxides and sulphates, and will produce a supernatant which will be within levels specified by the Metal Mine Liquid Effluent Regulations (MMLER) and will be non-toxic at 100 percent concentrations. The treated effluent will first be routed through the lined/concrete raffinate tank to remove any residual precipitates and then decanted to the events pond. From the events pond the effluent will be pumped into the sediment control pond below the leach pad where it will be diluted before release to the environment. As required, precipitates will be dried, bagged and trucked off site for disposal at a suitable site (ie. smelter).

The proposed water treatment plant will consist of a 270 m³/hr capacity milk-of-lime neutralization circuit for pH modification, metal precipitation and recovery. The process is illustrated on the attached drawing 400-03-10.

The plant will include the following major equipment and storage facilities:

- Three pregnant solution pumps (PLS) at the leach pad
- Two agitated neutralization tanks
- One lined concrete raffinate settling tank
- One sludge filter press
- One sludge dryer
- One events pond
- One sediment control pond complete with a spillway to Williams Creek
- Automatic controls and instrumentation to operate and monitor the process
- Utilities and ancillaries including a 75 t hydrated lime storage silo, a lime mixing tank, an agitated lime slurry storage tank, emergency power, drinking water, etc.
- Filter press, filter feed pump and sludge dryer
- Support facilities, including office, control room and maintenance area.

Most of the process equipment will be enclosed in buildings.

The plant will have a treatment capacity 270 m³/hr which is adequate to handle the entire through-put of the Solvent Extraction (SX) Plant.

2.0 PROCESS DESCRIPTION

2.1 Lime Storage System

Lime is delivered to the plant site by a Bulk Lime Delivery Truck. The hydrated lime is blown into the 75 tonne capacity Hydrated Lime Storage Silo which is vented through a bin vent dust collector to the atmosphere. A Lime Screw Feeder is provided to meter lime into the Lime Mix Tank. Make up water is supplied for lime mixing by the Fresh Water Pumps. The lime is mixed to approximately 25 percent solids in an agitated mix tank and then transferred to the Lime Slurry Storage Tank for storage and distribution. Lime is distributed through a loop system supplied by the Lime Distribution Pump.

2.2 Neutralization System

Excess raffinate solution will be removed from the leach circuit by means of a valved tee installed in the discharge of the mixer settlers. The solution will flow at a maximum design rate of 270 m³/h to two 2500 mm diameter by 2500 mm high agitated tanks in series providing approximately 10 minutes retention time. Milk of lime slurry will be added to the first tank and the pH will be controlled in the second tank. The neutralized slurry will flow to the lined concrete raffinate settling tank. The tank will provide an additional 1.7 hours retention time at the maximum flow rate for precipitation and settling of metal hydroxide precipitates. The clear overflow solution will then decant to the events pond. The precipitated solids will collect in the bottom of the tank.

2.3 Filter Area

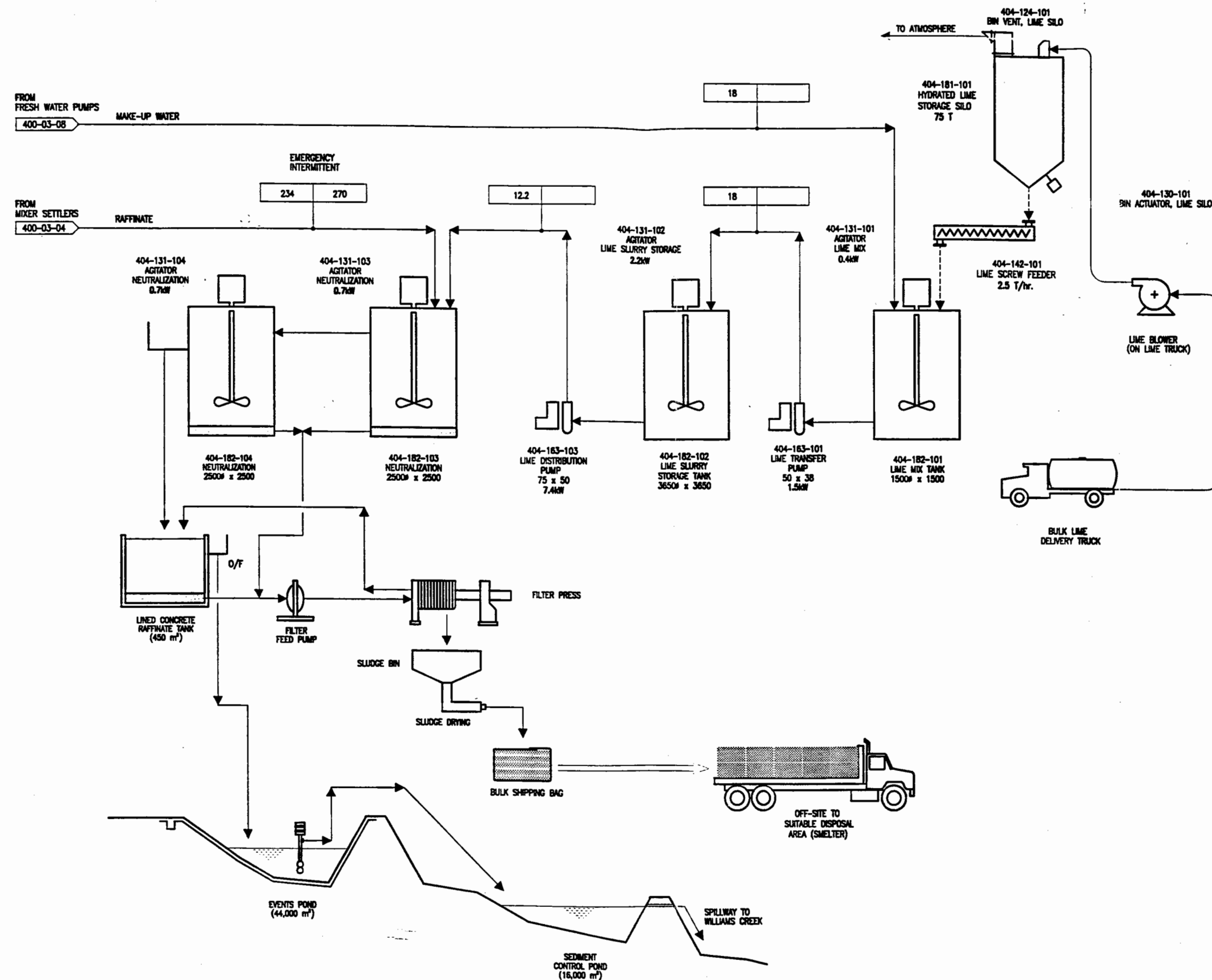
This filter area will include a sludge sump, storage pad for dried sludge, the filter press and the sludge dryer.

The precipitated sludge, at approximately 8 to 10 percent solids, will be pumped from the bottom of the raffinate tank through the sludge filter press. A competent filter cake will emerge at about 20 to 25 percent solids and the excess liquid will be returned to the lined concrete raffinate tank. The filter cake will drop into a dryer feed bin which will be equipped with paddles that will extrude the material onto a dryer feed belt. The dried sludge, at approximately 40 to 60 percent solids, will discharge from the dryer directly into large transport bags for handling and shipment. Until the sludge is shipped, it will be kept on the storage pad until a suitable load is accumulated.

2.4 Pond System

Neutralized solution overflowing from the lined concrete raffinate tank will flow by gravity to the events pond which will allow an additional 6.8 days retention time, at the maximum design flow rate. The liquid will then be pumped from the surface of the events pond to the Sediment Control Pond below the heap leach pad. The majority of the settleable solids will accumulate in the lined concrete raffinate tank which is inside the solvent extraction building. Any solids accumulation in the events pond will be removed by a vacuum tanker truck for dewatering at the raffinate tank. The pumped liquid from the events pond will mix with surface run-off and overflow through the spillway below the crest of the sediment control pond into Williams Creek.

Dilution rates of treated raffinate to surface runoff will depend on the time of year of release. It is anticipated that treatment would only occur during high precipitation/runoff periods of the year when dilution will be good.



Time: 10:27:14
Date: 9/13/1996
Scale:
Drawing File: 8555-25/CADD/03/400031D.DWG (J.FRAGUAS)

[illegible]

WESTERN COPPER HOLDINGS LIMITED
 CARMACKS COPPER PROJECT
 8555-25

Capital Cost Estimate
 Emergency Raffinate Treatment System
 Max Flow Rate = 270 m³/hr

	Size	Quantity	Unit Price	Cost
Hydrated Lime Storage Silo c/w Ve	75 T	1	97,100.00	97,100.00
Concrete for Silo & Lime Mix Tank		22	546.44	12,021.78
Lime Mix tank	1.5ø x1.5	1	2,570.00	2,570.00
Agitator Lime Mix	0.4 kW	1	3,785.00	3,785.00
Lime Transfer Pump	50 x 38 - 1.5kW	1	5,140.00	5,140.00
Lime Slurry Storage Tank	3.65ø x3.65	1	13,710.00	13,710.00
Agitator Lime Slurry Storage	2.2 kW	1	8,710.00	8,710.00
Lime Distribution Pump	75 x 50 - 7.4 kW	1	11,280.00	11,280.00
Neutralization Tank	2.5ø x 2.5	2	5,670.00	11,340.00
Agitator Neurtralization	0.7 kW	2	4,570.00	9,140.00
Filter Feed Pump		1	6,210.00	6,210.00
Filter Press & Sludge Bin				existing
Instrumentation				19,000.00
Electrical 12.2 kW		12.2	500.00	6,100.00
Total				\$ 206,106.78