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**Environment Canada
Conservation and Protection
Industrial Programs Branch
Ottawa, Ontario**

**Background Study of Proposed
Amendments to Pulp Industry
Regulations on Organochlorines
and Dioxins**

**Capital and Operating Cost
Estimate Calculation Sheets
for Primary and Secondary
Treatment Systems for
Individual Mills**

N. McCubbin Consultants Inc.

140 Fisher's Point
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Phone 514-243-6465
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March 27, 1990

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EFFLUENT TREATMENT SYSTEM COST ESTIMATES

The attached data sheets summarize the estimated capital and operating costs that each Canadian pulp, paper, or paperboard mill would have to incur to comply with the currently proposed Federal regulations under the Fisheries Act concerning BOD, TSS, and acute toxicity to fish.

In all cases, the costs are based on mills as they existed in late 1989, so that a mill which complies with all these regulations because of its inherent process and/or because of prior expenditure is shown as having zero cost, or is omitted. Mills which discharge all effluent to a municipal system are considered to be in compliance. Individual estimates were calculated for each mill. In most cases one or more of the individuals calculating the estimated has first hand knowledge of the mill site. In other cases drawings were obtained and/or telephone interviews were undertaken with engineers who are familiar with the site. All evaluations of site conditions were compared with Beak 1985 and all apparent anomalies verified.

Costs are generally based on Environment Canada file data on effluent quality and production rates for 1987 (the latest full year available). However, where the authors have knowledge of major changes since that time, these were incorporated as noted in individual sheets. Effluent treatment plants which are under of construction were considered to exist, while systems which are "announced" or "committed" but not yet under construction were ignored.

Appropriate processes were selected from one or more of the following widely proven alternatives, in accordance with mill site restrictions, local climate and existing effluent quality:

- Primary clarifier
- Aerated Stabilization Basin
- Activated Sludge
- Sludge dewatering by twin wire press
- Anaerobic (only where mill has indicated preference for this process)

The necessary main effluent pipelines, pump stations, roads, aeration equipment (including power supply), secondary clarifiers, sludge thickeners, and reaction vessels were sized using conventional engineering practice. The cost of installing an underwater outfall was calculated where none exists at present. The estimated capital costs of all major elements include allowances for the related auxiliary equipment, such as controls, lighting, engineering, contingencies, owner's overhead, etc. Costs for each element were calculated for an average central Canada, rural location on the basis of the capacity of each element. Some special site allowances were added for piles, restricted locations, etc.

The attached sheets are in West to East geographical order, so that each province is grouped.

Pulp and Paper companies who wish to present their own cost estimates based on detailed engineering studies are invited to submit them to:

David Halliburton
Environment Canada
351 Boul. St-Joseph, Place Vincent-Massey, 13th floor
Hull, Quebec, K1A 0H3
Tel.: 1-9-953-1128

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

MACMILLAN BLOEDEL LTD.

PORT ALBERNI

B.C.

Effluent data ----->		210,538	10,352	12,456	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS			
Gravity Pipeline 1	25,000 cu. m/day	0.1 km long	\$32,866	Bleach Plant Effluent		
Gravity Pipeline 2	106,000 cu. m/day	0.1 km long	\$84,050	Expanded ASB to existing ASB		
Gravity Pipeline 3	cu. m/day	0 km long	-----			
Forcemain 1	25,000 cu. m/day	0.3 km long	\$60,984	Bleach effluent to prim clarifier outlet		
Forcemain 2	106,000 cu. m/day	0.1 km long	\$60,065	Existing ASB to expanded ASB		
Pump Station 1	25,000 cu. m/day	1	\$912,871	Bleach effluent		
Pump Station 2	106,000 cu. m/day	1	\$1,879,716	Existing ASB to expansion		
Pump Station 3	0 cu. m/day	0	-----			
Lump Sum Piping	100,000 Dollars	----- Lump Sum	\$100,000	In mill sewer modifications		
Primary Clarifier	0 cu. m/day	0	-----	Use existing clarifier		
Aerated Stabilisation Basin	12,456 BOD kg/d	1	\$4,000,000	Load to additional ASB		
Activated Sludge Reactor	0 BOD kg/d	0	-----	(based on SSW estimate 1989)		
Aerators	12,456 BOD kg/d	1 Systems	\$1,419,950			
Nutrient Addition	-----	0 Systems	-----			
Neutralisation	-----	1 Systems	\$200,000	Present system inadequate		
Secondary Clarifier	0 cu. m/day	0	-----			
Secondary sludge thickener	Dollars	0	-----			
Sludge Dewatering	kg/day	0 Systems	-----	Existing is adequate		
Submerged Outfall	cu. m/day	0 km long	-----	Existing surface outfall is best for site		
Roads	-----	0 Kilometres	-----			
Site allowances	7,000,000 Dollars	----- Lump Sums	\$7,000,000	Modernise BSW and screens, + misc		
Capital cost (excluding inflation and regional factors)			\$15,750,502			
(Regional factor = 1.20)		Capital Cost =	\$18,901,000			
(Inflation factor = 1.00)				Inflation since Jan 1990		

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1089 kw	\$0.030 \$/kW hour	\$261,444	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	\$0.09 \$/kg Cao	\$189,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	62 kg/day	\$0.37 \$/kg	\$8,065	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$27.61 \$/man hour	\$38,658	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$60.75 \$/man hour	\$85,047	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	5 dry t/day	\$60.00 \$/dry tonne	\$105,000	
Maintenance	Total maintenance labour and materials =		\$472,525	2.5% of capital cost
		Annual Operating Cost =	\$1,189,000	

Description of System

600 metres of effluent piping, 2 Effluent Pump Stations.

Use existing primary clarifier, with BSW and screen room modernisation to reduce flow

Additional ASB in series with existing system, with 570 kW installed aeration

STONE-CONSOLIDATED INC.

VILLE DE LA BAIE

QUEBEC

Effluent data ----->	88,156	12,877	42,681	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	88,156	cu. m/day	0.1	km long	\$74,560 Clarifier to Act Sludge reactor
Gravity Pipeline 2	88,156	cu. m/day	0.5	km long	\$372,798 Secondary clarifier to outfall
Gravity Pipeline 3		cu. m/day	0	km long	-----
Forcemain 1	88,156	cu. m/day	0.5	km long	\$261,547 To primary clarifier
Forcemain 2		cu. m/day	0	km long	-----
Pump Station 1	88,156	cu. m/day	1		\$1,714,218 To primary clarifier
Pump Station 2	0	cu. m/day	0		-----
Pump Station 3	0	cu. m/day	0		-----
Lump Sum Piping	0	Dollars	----- Lump Sum		-----

Primary Clarifier	88,156	cu. m/day	1		\$2,988,028
Aerated Stabilisation Basin		BOD kg/d	0		-----
Activated Sludge Reactor	42,681	BOD kg/d	1		\$11,144,311
Aerators	42,681	BOD kg/d	1	Systems	\$4,865,650
Nutrient Addition	-----		1	Systems	\$400,000
Neutralisation	-----		1	Systems	\$200,000
Secondary Clarifier	44,078	cu. m/day	2		\$6,252,534
Secondary sludge thicken	1,100,000	Dollars	1		\$1,100,000
Sludge Dewatering	22,000	kg/day	1	Systems	\$2,720,000
Submerged Outfall	88,156	cu. m/day	0.5	km long	\$3,763,869
Roads	-----		0	Kilometres	-----
Site allowances (arbitrary)	900,000	Dollars	----- Lump Sums		\$900,000
Capital cost (excluding inflation and regional factors)					<u>\$36,757,516</u>
(Regional factor = 1.05)					Capital Cost = \$38,595,000
(Inflation factor = 1.00)					

Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	2786 kw	\$0.022 \$/kW hour	\$490,314	Pumping + aeration + misc
Lime for neutralisation	7000 kg/day	\$0.09 \$/kg Cao	\$220,500	
Ammonia	2591 kg/day	\$0.40 \$/kg NH3	\$362,790	For Activated Sludge
Phosphoric Acid	1349 kg/day	\$1.03 \$/kg H3PO4	\$486,414	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	171 kg/day	\$14.00 \$/kg	\$836,550	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =			\$964,875 2.5% of capital cost
Annual Operating Cost =				\$4,125,000

Description of System

1100 metres of effluent piping, 1 Effluent Pump Stations.
 61 meter dia. Primary Clarifier, 2 x 55 meter dia. Secondary Clarifiers
 53400 cu. meter Activated Sludge Reactor with 2430 kW installed aeration
 Submerged Outfall 500 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

WESTERN PULP LTD. PARTNERSHIP

PORT ALICE

B.C.

Effluent data ———> 158,506 4,066 103,725 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS
Gravity Pipeline 1	cu. m/day	0 km long	-----
Gravity Pipeline 2	cu. m/day	0 km long	-----
Gravity Pipeline 3	cu. m/day	0 km long	-----
Forcemain 1	158,506 cu. m/day	0.5 km long	\$406,112 From pump station to activated sludge reactor, distance from Beak 1985
Forcemain 2	cu. m/day	0 km long	-----
Pump Station 1	60,000 cu. m/day	2	\$2,828,427 One from Clarifier, one from bleach pla to activated sludge reactor
Pump Station 2	0 cu. m/day	0	-----
Pump Station 3	0 cu. m/day	0	-----
Lump Sum Piping	0 Dollars	----- Lump Sum	-----
Primary Clarifier	cu. m/day	0	----- Existing unit is adequate
Aerated Stabilisation Basin	BOD kg/d	0	-----
Activated Sludge Reactor	103,725 BOD kg/d	1	\$40,749,961
Aerators	103,725 BOD kg/d	1 Systems	\$11,824,600
Nutrient Addition	-----	1 Systems	\$400,000
Neutralisation	-----	1 Systems	\$200,000
Secondary Clarifier	79,253 cu. m/day	2	\$8,023,119
Secondary sludge thicken	1,100,000 Dollars	1	\$1,100,000
Sludge Dewatering	36,000 kg/day	1 Systems	\$5,600,000 Addition to existing primary sludge dewatering system to process biosludge
Submerged Outfall	cu. m/day	0 km long	-----
Roads	-----	0 Kilometres	-----
Site allowances (arbitrary)	3,000,000 Dollars	----- Lump Sums	\$3,000,000
Capital cost (excluding inflation and regional factors)			\$74,132,218
(Regional factor = 1.20)		Capital Cost =	\$88,959,000
(Inflation factor = 1.00)			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	6365 kw	\$0.030 \$/kW hour	\$1,527,700	Pumping + aeration + misc
Lime for neutralisation	5000 kg/day	\$0.09 \$/kg Cao	\$157,500	
Ammonia	6298 kg/day	\$0.40 \$/kg NH3	\$881,659	For Activated Sludge
Phosphoric Acid	3279 kg/day	\$1.03 \$/kg H3PO4	\$1,182,092	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	415 kg/day	\$14.00 \$/kg	\$2,033,001	
Operators	48 man hrs/d	\$27.61 \$/man hour	\$463,890	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$60.75 \$/man hour	\$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$2,223,975	2.5% of capital cost
	Annual Operating Cost =		\$8,900,000	

Description of System

500 metres of effluent piping, 2 Effluent Pump Stations.

2 x 73 meter dia. Secondary Clarifiers

259300 cu. meter Activated Sludge Reactor with 5910 kW installed aeration

ABITIBI PRICE INC.

ALMA

QUEBEC

Effluent data ———>	91,141	6,864	34,032	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day		0	km long	-----
Gravity Pipeline 2	cu. m/day		0	km long	-----
Gravity Pipeline 3	cu. m/day		0	km long	-----
Forcemain 1	91,141 cu. m/day		6	km long	\$3,217,941 Two by 3km, distances from Beak 1985
Forcemain 2	cu. m/day		0	km long	-----
Pump Station 1	91,141 cu. m/day		2		\$3,485,996
Pump Station 2	0 cu. m/day		0		-----
Pump Station 3	0 cu. m/day		0		-----
Lump Sum Piping	0 Dollars	-----		Lump Sum	-----
Primary Clarifier	cu. m/day		0		----- Existing 225 ft dia unit is adequate
Aerated Stabilisation Basin	34,032 BOD kg/d		1		\$11,075,406
Activated Sludge Reactor	BOD kg/d		0		-----
Aerators	34,032 BOD kg/d		1	Systems	\$3,879,637
Nutrient Addition	-----		1	Systems	\$400,000
Neutralisation	-----		1	Systems	\$200,000
Secondary Clarifier	cu. m/day		0		-----
Secondary sludge thickener	Dollars		0		-----
Sludge Dewatering	0 kg/day		0	Systems	-----
Submerged Outfall	91,141 cu. m/day		0.5	km long	\$3,814,339
Roads	-----		2	Kilometres	\$50,000
Site allowances (arbitrary)	900,000 Dollars	-----		Lump Sums	\$900,000
Capital cost (excluding inflation and regional factors)					\$27,023,318
(Regional factor = 1.05)			Capital Cost =		\$28,374,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	2276 kw	\$0.022 \$/kW hour	\$400,586	Pumping + aeration + misc
Lime for neutralisation	7000 kg/day	\$0.09 \$/kg Cao	\$220,500	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	170 kg/day	\$0.37 \$/kg	\$22,036	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =			\$709,350 2.5% of capital cost
	Annual Operating Cost =			\$1,486,000

Description of System

6000 metres of effluent piping, 2 Effluent Pump Stations.

9.3 day retention Aerated Stabilisation Basin with 1940 kW installed aeration
Submerged Outfall 500 metres long

DONOHUE NORMICK INC.

AMOS

QUEBEC

Effluent data →	26,304	3,813	9,592	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	26,304 cu. m/day		0.2 km long	\$67,941	To extend existing ASB
Gravity Pipeline 2	cu. m/day		0 km long	----	
Gravity Pipeline 3	cu. m/day		0 km long	----	
Forcemain 1	cu. m/day		0 km long	----	
Forcemain 2	cu. m/day		0 km long	----	
Pump Station 1	cu. m/day		0	----	
Pump Station 2	0 cu. m/day		0	----	
Pump Station 3	0 cu. m/day		0	----	
Lump Sum Piping	100,000 Dollars		----- Lump Sum	\$100,000	
Primary Clarifier	cu. m/day		0	----	
Aerated Stabilisation Basin	9,592 BOD kg/d		1	\$3,970,730	Upgrade of existing ASB
Activated Sludge Reactor	BOD kg/d		0	----	
Aerators	9,592 BOD kg/d		1 Systems	\$1,093,464	
Nutrient Addition	-----		0 Systems	----	
Neutralisation	-----		0 Systems	----	
Secondary Clarifier	cu. m/day		0	----	
Secondary sludge thickener	Dollars		0	----	
Sludge Dewatering	0 kg/day		0 Systems	----	
Submerged Outfall	cu. m/day		0 km long	----	Use existing
Roads	-----		0 Kilometres	----	
Site allowances (arbitrary)	500,000 Dollars		----- Lump Sums	\$500,000	
Capital cost (excluding inflation and regional factors)				\$5,732,135	
(Regional factor = 1.05)			Capital Cost =	\$6,019,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	574 kw	\$0.022 \$/kW hour	\$101,036	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	----	
Ammonia	---- kg/day	\$0.40 \$/kg NH3	----	For Activated Sludge
Phosphoric Acid	---- kg/day	\$1.03 \$/kg H3PO4	----	For Activated Sludge
Fertiliser for Nutrient	48 kg/day	\$0.37 \$/kg	\$6,211	For aerated Stabilisation basins
Polymer for biosludge	---- kg/day	\$14.00 \$/kg	----	
Operators	0 man hrs/d	\$23.13 \$/man hour	----	Inc Fringes and Overhead
Technicians	0 man hrs/d	\$50.88 \$/man hour	----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.00 person	\$90,000 \$/year	----	NO ADDITIONAL LABOUR, because this
Sludge disposal	---- dry t/day	\$60.00 \$/dry tonne	----	is a simple upgrade
Maintenance	Total maintenance labour and materials =		\$150,475	2.5% of capital cost
		Annual Operating Cost =	\$258,000	

Description of System

200 metres of effluent piping,

9.1 day retention Aerated Stabilisation Basin with 550 kW installed aeration

ATHOLVILLE PULP INC.

ATHOLVILLE

N.B.

Effluent data ----->	74,553	3,231	22,651	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	74,553 cu. m/day		1 km long	\$668,636	To outfall, distance from Beak 1985
Gravity Pipeline 2	cu. m/day		0 km long	-----	
Gravity Pipeline 3	cu. m/day		0 km long	-----	
Forcemain 1	74,553 cu. m/day		2 km long	\$922,608	To ASB, distance from Beak 1985
Forcemain 2	cu. m/day		0 km long	-----	
Pump Station 1	74,553 cu. m/day		1	\$1,576,415	
Pump Station 2	0 cu. m/day		0	-----	
Pump Station 3	0 cu. m/day		0	-----	
Lump Sum Piping	0 Dollars		----- Lump Sum	-----	
Primary Clarifier	cu. m/day		0	-----	
Aerated Stabilisation Basin	22,651 BOD kg/d		1	\$7,964,467	High cost due to site
Activated Sludge Reactor	BOD kg/d		0	-----	
Aerators	22,651 BOD kg/d		1 Systems	\$2,582,245	
Nutrient Addition	-----		0 Systems	-----	
Neutralisation	-----		1 Systems	\$200,000	
Secondary Clarifier	cu. m/day		0	-----	
Secondary sludge thickener	Dollars		0	-----	
Sludge Dewatering	kg/day		0 Systems	-----	
Submerged Outfall	74,553 cu. m/day		0.3 km long	\$2,111,881	
Roads	-----		0 Kilometres	-----	
Site allowances (arbitrary)	700,000 Dollars		----- Lump Sums	\$700,000	
Capital cost (excluding inflation and regional factors)				\$16,726,252	
(Regional factor = 1.15)			Capital Cost =	\$19,235,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	1551 kw	\$0.044 \$/kW hour	\$546,085	Pumping + aeration + misc
Lime for neutralisation	3000 kg/day	\$0.09 \$/kg Cao	\$94,500	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	113 kg/day	\$0.37 \$/kg	\$14,667	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$480,875	2.5% of capital cost
		Annual Operating Cost =	\$1,269,000	

Description of System

3000 metres of effluent piping, 1 Effluent Pump Stations.

7.6 day retention Aerated Stabilisation Basin with 1290 kW installed aeration
Submerged Outfall 300 metres long

QUEBEC & ONTARIO PAPER CO. LTD. BAIE COMEAU

QUEBEC

Effluent data -----> 145,641 14,782 70,164 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS
Gravity Pipeline 1	145,641 cu. m/day	0 km long	-----
Gravity Pipeline 2	cu. m/day	0 km long	-----
Gravity Pipeline 3	cu. m/day	0 km long	-----
Forcemain 1	145,641 cu. m/day	8 km long	\$6,098,090 Mill to ASB, distance from Beak 1985
Forcemain 2	145,641 cu. m/day	1 km long	\$762,261 ASB to outfall, distance from Beak 1985
Pump Station 1	145,641 cu. m/day	1	\$2,203,340 Mill to ASB
Pump Station 2	145,641 cu. m/day	1	\$2,203,340 ASB to outfall
Pump Station 3	0 cu. m/day	0	-----
Lump Sum Piping	0 Dollars	----- Lump Sum	-----
Primary Clarifier	cu. m/day	0	-----
Aerated Stabilisation Basin	70,164 BOD kg/d	1	\$19,901,419
Activated Sludge Reactor	BOD kg/d	0	-----
Aerators	70,164 BOD kg/d	1 Systems	\$7,998,688
Nutrient Addition	-----	0 Systems	-----
Neutralisation	-----	0 Systems	-----
Secondary Clarifier	cu. m/day	0	-----
Secondary sludge thickener	Dollars	0	-----
Sludge Dewatering	0 kg/day	0 Systems	-----
Submerged Outfall	145,641 cu. m/day	0.5 km long	\$4,600,945 Length from Beak 1985
Roads	-----	3 Kilometres	\$75,000
Site allowances (arbitrary)	1,500,000 Dollars	----- Lump Sums	\$1,500,000
Capital cost (excluding inflation and regional factors)			<u>\$45,343,083</u>
(Regional factor = 1.05)		Capital Cost =	<u>\$47,610,000</u>
(inflation factor = 1.00)			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	4964 kw	\$0.022 \$/kW hour	\$873,651	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	351 kg/day	\$0.37 \$/kg	\$45,431	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$1,190,250	2.5% of capital cost
		Annual Operating Cost =	<u>\$2,243,000</u>	

Description of System

9000 metres of effluent piping, 2 Effluent Pump Stations.

12 day retention Aerated Stabilisation Basin with 4000 kW installed aeration
Submerged Outfall 500 metres long

STONE-CONSOLIDATED INC.

BATHURST

N.B.

Effluent data ----->	54,990	7,889	46,308	(Flow cu. m/day TSS kg/d BOD kg/d)
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----
Gravity Pipeline 2	cu. m/day	0	km long	-----
Gravity Pipeline 3	cu. m/day	0	km long	-----
Forcemain 1	cu. m/day	0	km long	-----
Forcemain 2	cu. m/day	0	km long	-----
Pump Station 1	cu. m/day	0		-----
Pump Station 2	cu. m/day	0		-----
Pump Station 3	cu. m/day	0		-----
Lump Sum Piping	Dollars	-----	Lump Sum	-----
Primary Clarifier	cu. m/day	0		-----
Aerated Stabilisation Basin	BOD kg/d	0		-----
Activated Sludge Reactor	BOD kg/d	0		-----
Aerators	BOD kg/d	0	Systems	-----
Nutrient Addition		0	Systems	-----
Neutralisation		0	Systems	-----
Secondary Clarifier	cu. m/day	0		-----
Secondary sludge thickener	Dollars	0		-----
Sludge Dewatering	kg/day	0	Systems	-----
Submerged Outfall	cu. m/day	0	km long	-----
Roads		0	Kilometres	-----
Site allowances (arbitrary)	Dollars	-----	Lump Sums	-----
Capital cost (excluding inflation and regional factors)				<u>\$0</u>
(Regional factor =	1.15)	Capital Cost =		<u>\$0</u>
(Inflation factor =	1.00)			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	kw	\$0.044 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	kg/day	\$0.37 \$/kg	-----	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =			\$0 2.5% of capital cost
	Annual Operating Cost =			<u>\$0</u>

Description of System

Although the 1987 effluent data that this report is based on shows a significant effluent discharge, it is known that the company has installed an anaerobic/aerobic treatment system which is expected to comply with the proposed regulations.

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

DOMTAR FINE PAPERS INC.

BEAUHARNOIS

QUEBEC

Effluent data ----->	10,940	256	1,220	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----	
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	cu. m/day	0	km long	-----	
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	cu. m/day	0		-----	
Pump Station 2	cu. m/day	0		-----	
Pump Station 3	cu. m/day	0		-----	
Lump Sum Piping	Dollars	-----	Lump Sum	-----	
Primary Clarifier	cu. m/day	0		-----	
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	BOD kg/d	0	Systems	-----	
Nutrient Addition		0	Systems	-----	
Neutralisation		0	Systems	-----	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0	Systems	-----	
Submerged Outfall	cu. m/day	0	km long	-----	
Roads		0	Kilometres	-----	
Site allowances (arbitrary)	1,000,000	Dollars	-----	Lump Sums	\$1,000,000 Allowance for liquor disposal
Capital cost (excluding inflation and regional factors)					<u>\$1,000,000</u>
(Regional factor = 1.05)			Capital Cost =		\$1,050,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	kw	\$0.022 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$26,250	2.5% of capital cost
	Annual Operating Cost =		\$26,000	

Description of System

Traditional treatment not required, since municipality accepts most of effluent

Allowed for spent cooking liquor disposal according to company estimate, published PP Canada 1989-1990 Capital expenditures re Presuming liquor is trucked to Domtar mill at Windsor, Quebec, chemical saving should cover trucking cost

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

ABITIBI PRICE INC.

BEAUPRE

QUEBEC

Effluent data	43,035	9,987	15,561	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	43,035	cu. m/day	1	km long	\$467,815 ASB to outfall, distance from Beak 1985
Gravity Pipeline 2		cu. m/day	0	km long	-----
Gravity Pipeline 3		cu. m/day	0	km long	-----
Forcemain 1	43,035	cu. m/day	2	km long	\$610,994 Mill to ASB, distance from Beak 1985
Forcemain 2		cu. m/day	0	km long	-----
Pump Station 1	43,035	cu. m/day	1		\$1,197,706 Mill to ASB
Pump Station 2	0	cu. m/day	0		-----
Pump Station 3	0	cu. m/day	0		-----
Lump Sum Piping	100,000	Dollars	Lump Sum		\$100,000 Misc collection
Primary Clarifier		cu. m/day	0		-----
Aerated Stabilisation Basin	15,561	BOD kg/d	1		\$5,875,966
Activated Sludge Reactor		BOD kg/d	0		-----
Aerators	15,561	BOD kg/d	1	Systems	\$1,773,939
Nutrient Addition	-----		0	Systems	-----
Neutralisation	-----		1	Systems	\$200,000
Secondary Clarifier		cu. m/day	0		-----
Secondary sludge thickener		Dollars	0		-----
Sludge Dewatering		kg/day	0	Systems	-----
Submerged Outfall	43,035	cu. m/day	0.5	km long	\$2,825,283 Length from Beak 1985
Roads	-----		2	Kilometres	\$50,000
Site allowances (arbitrary)	400,000	Dollars	Lump Sums		\$400,000
Capital cost (excluding inflation and regional factors)					\$13,501,703
(Regional factor = 1.05)					Capital Cost = \$14,177,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1044 kw	\$0.022 \$/kW hour	\$183,794	Pumping + aeration + misc
Lime for neutralisation	5000 kg/day	\$0.09 \$/kg Cao	\$157,500	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	78 kg/day	\$0.37 \$/kg	\$10,076	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$354,425	2.5% of capital cost
Annual Operating Cost =			\$839,000	

Description of System

3000 metres of effluent piping, 1 Effluent Pump Stations.

9 day retention Aerated Stabilisation Basin with 890 kW installed aeration
Submerged Outfall 500 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

CPPF INC.

GATINEAU

QUEBEC

Effluent data —>	191,270	13,937	37,902	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	191,270	cu. m/day	0.2	km long	\$246,712 ASB to river
Gravity Pipeline 2		cu. m/day	0	km long	---
Gravity Pipeline 3		cu. m/day	0	km long	---
Forcemain 1	191,270	cu. m/day	3	km long	\$2,805,414 Mill to ASB
Forcemain 2		cu. m/day	0	km long	---
Pump Station 1	191,270	cu. m/day	1		\$2,525,008 Mill to ASB
Pump Station 2	0	cu. m/day	0		---
Pump Station 3	0	cu. m/day	0		---
Bridge for road and pipe	2,000,000	Dollars	----- Lump Sum		\$2,000,000
Primary Clarifier		cu. m/day	0		----- Existing unit is adequate
Aerated Stabilisation Basin	37,902	BOD kg/d	1		\$15,710,594 High cost due to water table
Activated Sludge Reactor		BOD kg/d	0		-----
Aerators	37,902	BOD kg/d	1	Systems	\$4,320,842
Nutrient Addition	-----		0	Systems	-----
Neutralisation	-----		1	Systems	\$200,000
Secondary Clarifier		cu. m/day	0		-----
Secondary sludge thickener		Dollars	0		-----
Sludge Dewatering		kg/day	0	Systems	-----
Submerged Outfall	191,270	cu. m/day	0.2	km long	\$2,052,353
Roads	-----		0	Kilometres	-----
Site allowances (arbitrary)	1,900,000	Dollars	----- Lump Sums		\$1,900,000
Capital cost (excluding inflation and regional factors)					<u>\$31,760,922</u>
(Regional factor = 1.05)					Capital Cost = \$33,349,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	2771 kw	\$0.022 \$/kW hour	\$487,613	Pumping + aeration + misc
Lime for neutralisation	14000 kg/day	\$0.09 \$/kg Cao	\$441,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	190 kg/day	\$0.37 \$/kg	\$24,542	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$833,725	2.5% of capital cost
			<u>Annual Operating Cost = \$1,920,000</u>	

Description of System

3200 metres of effluent piping, 1 Effluent Pump Stations.

5 day retention Aerated Stabilisation Basin with 2160 kW installed aeration
Submerged Outfall 200 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

ABITIBI PRICE INC.

GRAND FALLS

NFLD.

Effluent data —>	157,023	12,295	32,212	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS		
Gravity Pipeline 1	157,023 cu. m/day	0.5 km long	\$542,544		
Gravity Pipeline 2	157,023 cu. m/day	2 km long	\$2,170,175	ASB to shore	
Gravity Pipeline 3	cu. m/day	0 km long	---		
Forcemain 1	157,023 cu. m/day	0.1 km long	\$80,651	To primary clarifier	
Forcemain 2	157,023 cu. m/day	4 km long	\$3,226,056	Mill to ASB	
Pump Station 1	157,023 cu. m/day	1	\$2,287,812	To primary clarifier	
Pump Station 2	157,023 cu. m/day	1	\$2,287,812	Mill to ASB	
Pump Station 3	0 cu. m/day	0	---		
Lump Sum Piping	1,000,000 Dollars	----- Lump Sum	\$1,000,000	Collection of existing outfalls	
Primary Clarifier	157,023 cu. m/day	1	\$3,930,714		
Aerated Stabilisation Basin	32,212 BOD kg/d	1	\$10,593,122		
Activated Sludge Reactor	BOD kg/d	0	---		
Aerators	32,212 BOD kg/d	1 Systems	\$3,672,146		
Nutrient Addition	-----	0 Systems	---		
Neutralisation	-----	1 Systems	\$200,000		
Secondary Clarifier	cu. m/day	0	---		
Secondary sludge thickener	Dollars	0	---		
Sludge Dewatering	1,000 kg/day	1 Systems	\$2,510,000		
Submerged Outfall	157,023 cu. m/day	0.1 km long	\$948,305	In Exploits river	
Roads	-----	3 Kilometres	\$75,000		
Site allowances (arbitrary)	1,600,000 Dollars	----- Lump Sums	\$1,600,000		
Capital cost (excluding inflation and regional factors)			<u>\$35,124,336</u>		
(Regional factor = 1.15)		Capital Cost =	\$40,393,000		
(Inflation factor = 1.00)				Inflation since Jan 1990	

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	2752 kw	\$0.044 \$/kW hour	\$968,790	Pumping + aeration + misc
Lime for neutralisation	7000 kg/day	\$0.09 \$/kg Cao	\$220,500	
Ammonia	--- kg/day	\$0.40 \$/kg NH3	---	For Activated Sludge
Phosphoric Acid	--- kg/day	\$1.03 \$/kg H3PO4	---	For Activated Sludge
Fertiliser for Nutrient	161 kg/day	\$0.37 \$/kg	\$20,857	For aerated Stabilisation basins
Polymer for biosludge	--- kg/day	\$14.00 \$/kg	---	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	---	
Maintenance	Total maintenance labour and materials =		\$1,009,825	2.5% of capital cost
		Annual Operating Cost =	\$2,353,000	

Description of System

6600 metres of effluent piping, 2 Effluent Pump Stations.
 81 meter dia. Primary Clarifier,
 5.1 day retention Aerated Stabilisation Basin with 1840 kW installed aeration
 Submerged Outfall 100 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

PROCTER & GAMBLE CELLULOSE GRANDE PRAIRIE ALBERTA

Effluent data ———>	69,750	3,353	6,470	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	69,750 cu. m/day	0.5 km long		\$320,157	For ASB extension
Gravity Pipeline 2	cu. m/day	0 km long		—	
Gravity Pipeline 3	cu. m/day	0 km long		—	
Forcemain 1	cu. m/day	0 km long		—	
Forcemain 2	cu. m/day	0 km long		—	
Pump Station 1	cu. m/day	0		—	
Pump Station 2	cu. m/day	0		—	
Pump Station 3	cu. m/day	0		—	
Lump Sum Piping	Dollars	———— Lump Sum		—	
Primary Clarifier	cu. m/day	0		—	
Aerated Stabilisation Basin	12,000 BOD kg/d	1		\$4,760,676	Nominal Capacity for ASB extension
Activated Sludge Reactor	BOD kg/d	0		—	
Aerators	12,000 BOD kg/d	1 Systems		\$1,368,000	Nominal Capacity for ASB extension
Nutrient Addition		0 Systems		—	
Neutralisation		0 Systems		—	
Secondary Clarifier	cu. m/day	0		—	
Secondary sludge thickener	Dollars	0		—	
Sludge Dewatering	kg/day	0 Systems		—	
Submerged Outfall	cu. m/day	0 km long		—	
Roads		0 Kilometres		—	
Site allowances (arbitrary)	Dollars	———— Lump Sums		—	
Capital cost (excluding inflation and regional factors)				<u>\$6,448,833</u>	
(Regional factor = 1.10)		Capital Cost =		<u>\$7,094,000</u>	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	718 kw	\$0.039 \$/kW hour	\$224,078	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	—	
Ammonia	kg/day	\$0.40 \$/kg NH3	—	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	—	For Activated Sludge
Fertiliser for Nutrient	32 kg/day	\$0.37 \$/kg	\$4,190	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	—	
Operators	man hrs/d	\$23.13 \$/man hour	—	No additional labour required
Technicians	man hrs/d	\$50.88 \$/man hour	—	No additional labour required
Process Engineer	person	\$90,000 \$/year	—	No additional labour required
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	—	
Maintenance	Total maintenance labour and materials	=	\$177,350	2.5% of capital cost
	Annual Operating Cost =		<u>\$406,000</u>	

Description of System

500 metres of effluent piping,

2.3 day retention Aerated Stabilisation Basin with 680 kW installed aeration
(Extend existing ASB)

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

KRUGER INC.

BROMPTONVILLE

QUEBEC

Effluent data ----->	45,051	6,834	12,433	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	45,051	cu. m/day	1.3	km long	\$626,531 ASB to river
Gravity Pipeline 2		cu. m/day	0	km long	-----
Gravity Pipeline 3		cu. m/day	0	km long	-----
Forcemain 1	45,051	cu. m/day	0.3	km long	\$94,851 To Primary clarifier
Forcemain 2	45,051	cu. m/day	1.3	km long	\$411,021 To ASB
Pump Station 1	30,000	cu. m/day	1		\$1,000,000
Pump Station 2	6,000	cu. m/day	1		\$447,214
Pump Station 3	45,051	cu. m/day	1		\$1,225,442 Mill to ASB
Lump Sum Piping	100,000	Dollars	-----	Lump Sum	\$100,000 In mill collection
Primary Clarifier	45,051	cu. m/day	1		\$2,172,202
Aerated Stabilisation Basin	12,433	BOD kg/d	1		\$4,899,411
Activated Sludge Reactor		BOD kg/d	0		-----
Aerators	12,433	BOD kg/d	1	Systems	\$1,417,384
Nutrient Addition	-----		0	Systems	-----
Neutralisation	-----		0	Systems	-----
Secondary Clarifier		cu. m/day	0		-----
Secondary sludge thickener		Dollars	0		-----
Sludge Dewatering	5,000	kg/day	1	Systems	\$2,550,000
Submerged Outfall	45,051	cu. m/day	0.2	km long	\$1,151,002
Roads	-----		0.5	Kilometres	\$12,500
Site allowances (arbitrary)	500,000	Dollars	-----	Lump Sums	\$500,000
Capital cost (excluding inflation and regional factors)					\$16,607,557
(Regional factor = 1.05)				Capital Cost =	\$17,438,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	957 kw	\$0.022 \$/kW hour	\$168,412	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	62 kg/day	\$0.37 \$/kg	\$8,050	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$435,950	2.5% of capital cost
		Annual Operating Cost =	\$746,000	

Description of System

2900 metres of effluent piping, 3 Effluent Pump Stations.
 44 meter dia. Primary Clarifier,
 6.9 day retention Aerated Stabilisation Basin with 710 kW installed aeration
 Submerged Outfall 200 metres long

FLETCHER CHALLENGE CANADA LTD CAMPBELL RIVER

B.C.

Effluent data ———>	257,034	25,242	65,436	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	257,034 cu. m/day	0.5 km long		\$747,400	Secondary treatment to outfall
Gravity Pipeline 2	cu. m/day	0 km long		-----	
Gravity Pipeline 3	cu. m/day	0 km long		-----	
Forcemain 1	150,000 cu. m/day	1 km long		\$779,308	For high solids streams
Forcemain 2	55,000 cu. m/day	1.3 km long		\$477,371	Bleach plant to activated sludge reactor
Pump Station 1	150,000 cu. m/day	1		\$2,236,068	For high solids streams
Pump Station 2	55,000 cu. m/day	1		\$1,354,006	Bleach plant to activated sludge reactor
Pump Station 3	0 cu. m/day	0		-----	(by-passing clarifier)
Lump Sum Piping	1,000,000 Dollars	----- Lump Sum		\$1,000,000	Sewer modifications and collection
Primary Clarifier	150,000 cu. m/day	1		\$3,846,209	
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	65,436 BOD kg/d	1		\$27,930,256	
Aerators	65,436 BOD kg/d	1 Systems		\$7,459,723	
Nutrient Addition	-----	1 Systems		\$400,000	
Neutralisation	-----	1 Systems		\$200,000	
Secondary Clarifier	128,517 cu. m/day	2		\$9,853,019	
Secondary sludge thickeners	1,100,000 Dollars	1		\$1,100,000	
Sludge Dewatering	50,000 kg/day	1 Systems		\$3,000,000	
Submerged Outfall	cu. m/day	0 km long		-----	Use existing outfall
Roads	-----	0 Kilometres		-----	
Site allowances (arbitrary)	2,600,000 Dollars	----- Lump Sums		\$2,600,000	
Capital cost (excluding inflation and regional factors)				\$62,983,359	
(Regional factor = 1.20)		Capital Cost =		\$75,580,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	4454 kw	\$0.030 \$/kW hour	\$1,069,075	Pumping + aeration + misc
Lime for neutralisation	10000 kg/day	\$0.09 \$/kg Cao	\$315,000	
Ammonia	3973 kg/day	\$0.40 \$/kg NH3	\$556,207	For Activated Sludge
Phosphoric Acid	2069 kg/day	\$1.03 \$/kg H3PO4	\$745,740	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	262 kg/day	\$14.00 \$/kg	\$1,282,549	
Operators	48 man hrs/d	\$27.61 \$/man hour	\$463,890	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$60.75 \$/man hour	\$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$1,889,500	2.5% of capital cost
		Annual Operating Cost =	\$6,752,000	

Description of System

2800 metres of effluent piping, 2 Effluent Pump Stations.
 80 meter dia. Primary Clarifier, 2 x 93 meter dia. Secondary Clarifiers
 163600 cu. meter Activated Sludge Reactor with 3730 kW installed aeration
 (Company is currently building oxygen activated sludge)

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

CELGAR PULP CO.

CASTLEGAR

B.C.

Effluent data	148,933	7,865	40,083	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS		
Gravity Pipeline 1	148,933 cu. m/day	0.3 km long	\$314,524	ASB to river	
Gravity Pipeline 2	50,000 cu. m/day	0.5 km long	\$257,864	Bleach plant to pumphouse	
Gravity Pipeline 3	cu. m/day	0 km long	-----		
Forcemain 1	148,933 cu. m/day	3 km long	\$2,325,433	Mill to ASB	
Forcemain 2	cu. m/day	0 km long	-----		
Pump Station 1	148,933 cu. m/day	1	\$2,228,097	Mill to ASB	
Pump Station 2	0 cu. m/day	0	-----		
Pump Station 3	0 cu. m/day	0	-----		
Lump Sum Piping	0 Dollars	----- Lump Sum	-----		
Primary Clarifier	cu. m/day	0	-----	Exists	
Aerated Stabilisation Basin	40,083 BOD kg/d	1	\$12,645,439		
Activated Sludge Reactor	BOD kg/d	0	-----		
Aerators	40,083 BOD kg/d	1 Systems	\$4,569,518		
Nutrient Addition	-----	0 Systems	-----		
Neutralisation	-----	1 Systems	\$200,000		
Secondary Clarifier	cu. m/day	0	-----		
Secondary sludge thickener	Dollars	0	-----		
Sludge Dewatering	kg/day	0 Systems	-----		
Submerged Outfall	148,933 cu. m/day	0.2 km long	\$1,856,902		
Roads	-----	3 Kilometres	\$75,000		
Site allowances (arbitrary)	1,500,000 Dollars	----- Lump Sums	\$1,500,000		
Capital cost (excluding inflation and regional factors)			\$25,972,777		
(Regional factor = 1.20)		Capital Cost =	\$31,167,000		
(Inflation factor = 1.00)				Inflation since Jan 1990	

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	2790 kw	\$0.030 \$/kW hour	\$669,587	Pumping + aeration + misc
Lime for neutralisation	10000 kg/day	\$0.09 \$/kg Cao	\$315,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	200 kg/day	\$0.37 \$/kg	\$25,954	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$27.61 \$/man hour	\$38,658	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$60.75 \$/man hour	\$85,047	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$779,175	2.5% of capital cost
		Annual Operating Cost =	\$1,943,000	

Description of System

3800 metres of effluent piping, 1 Effluent Pump Stations.

6.7 day retention Aerated Stabilisation Basin with 2280 kW installed aeration

Major mill rebuild probable

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

GASPESIA PULP & PAPER CO.

CHANDLER

QUEBEC

Effluent data ———>	53,903	4,725	21,447	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS	
Gravity Pipeline 1	53,903 cu. m/day	1	km long	\$541,546	From ASB to sea, distance from Beak 8
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	53,903 cu. m/day	2	km long	\$723,398	From mill to ASB, distance from Beak 1
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	53,903 cu. m/day	1		\$1,340,429	
Pump Station 2	0 cu. m/day	0		-----	
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	100,000 Dollars	-----	Lump Sum	\$100,000	Miscellaneous collection
Primary Clarifier	cu. m/day	0		-----	Exists
Aerated Stabilisation Basin	21,447 BOD kg/d	1		\$7,619,844	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	21,447 BOD kg/d	1	Systems	\$2,445,009	
Nutrient Addition	-----	0	Systems	-----	
Neutralisation	-----	1	Systems	\$200,000	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0	Systems	-----	
Submerged Outfall	53,903 cu. m/day	1	km long	\$6,183,108	
Roads	-----	2	Kilometres	\$50,000	
Site allowances (arbitrary)	500,000 Dollars	-----	Lump Sums	\$500,000	
Capital cost (excluding inflation and regional factors)				\$19,703,334	
(Regional factor = 1.05)			Capital Cost =	\$20,689,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	1425 kw	\$0.022 \$/kW hour	\$250,822	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	\$0.09 \$/kg Cao	\$189,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	107 kg/day	\$0.37 \$/kg	\$13,887	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$517,225	2.5% of capital cost
	Annual Operating Cost =		\$1,104,000	

Description of System

3000 metres of effluent piping, 1 Effluent Pump Stations.

9.9 day retention Aerated Stabilisation Basin with 1220 kW installed aeration
Submerged Outfall 1000 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

DONOHUE INC.

CLERMONT

QUEBEC

Effluent data ———>

65,729 11,882 34,909 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS
Gravity Pipeline 1	65,729 cu. m/day	2 km long	\$1,232,141 ASB to river, length from Beak 1985
Gravity Pipeline 2	cu. m/day	0 km long	-----
Gravity Pipeline 3	cu. m/day	0 km long	-----
Forcemain 1	65,729 cu. m/day	6 km long	\$3,100,000 Mill to ASB, length from Beak 1985
Forcemain 2	cu. m/day	0 km long	-----
Pump Station 1	65,729 cu. m/day	1	\$1,480,189 Mill to ASB
Pump Station 2	0 cu. m/day	0	-----
Pump Station 3	0 cu. m/day	0	-----
Lump Sum Piping	500,000 Dollars	----- Lump Sum	\$500,000 Company estimate to segregate sewerx
Primary Clarifier	cu. m/day	0	----- Existing 150 ft dia unit adequate
Aerated Stabilisation Basin	34,909 BOD kg/d	1	\$11,306,174
Activated Sludge Reactor	BOD kg/d	0	-----
Aerators	34,909 BOD kg/d	1 Systems	\$3,979,678
Nutrient Addition	-----	0 Systems	-----
Neutralisation	-----	1 Systems	\$200,000
Secondary Clarifier	cu. m/day	0	-----
Secondary sludge thickener	Dollars	0	-----
Sludge Dewatering	kg/day	0 Systems	-----
Submerged Outfall	65,729 cu. m/day	1 km long	\$6,693,687 Length from Beak 1985
Roads	-----	6 Kilometres	\$150,000
Site allowances (arbitrary)	1,500,000 Dollars	----- Lump Sums	\$1,500,000 Difficult location
Capital cost (excluding inflation and regional factors)			\$30,141,869
(Regional factor = 1.05)		Capital Cost =	\$31,649,000
(Inflation factor = 1.00)			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	2262 kw	\$0.022 \$/kW hour	\$398,089	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	175 kg/day	\$0.37 \$/kg	\$22,604	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$791,225	2.5% of capital cost
	Annual Operating Cost =		\$1,345,000	

Description of System

8000 metres of effluent piping, 1 Effluent Pump Stations.

13.3 day retention Aerated Stabilisation Basin with 1990 kW installed aeration

Submerged Outfall 1000 metres long

CORNER BROOK P&P

CORNER BROOK

NFLD.

Effluent data ----->	101,159	44,929	35,301	(Flow cu. m/day TSS kg/d BOD kg/d)		
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS	
Gravity Pipeline 1	101,159	cu. m/day	0.3	km long	\$244,604	Misc collection
Gravity Pipeline 2	101,159	cu. m/day	0.5	km long	\$407,673	To outfall
Gravity Pipeline 3		cu. m/day	0	km long	-----	
Forcemain 1	101,159	cu. m/day	0.1	km long	\$57,995	To primary clarifier
Forcemain 2	101,159	cu. m/day	5	km long	\$2,899,767	To ASB
Pump Station 1	101,159	cu. m/day	1		\$1,836,289	To primary clarifier
Pump Station 2	101,159	cu. m/day	1		\$1,836,289	To ASB
Pump Station 3	0	cu. m/day	0		-----	
Lump Sum Piping	0	Dollars	-----	Lump Sum	-----	
Primary Clarifier	101,159	cu. m/day	1		\$3,189,820	
Aerated Stabilisation Basin	35,301	BOD kg/d	1		\$17,113,065	Special construction
Activated Sludge Reactor		BOD kg/d	0		-----	
Aerators	35,301	BOD kg/d	1	Systems	\$4,024,283	
Nutrient Addition	-----		0	Systems	-----	
Neutralisation	-----		1	Systems	\$200,000	
Secondary Clarifier		cu. m/day	0		-----	
Secondary sludge thickener		Dollars	0		-----	
Sludge Dewatering	40,000	kg/day	1	Systems	\$2,900,000	
Submerged Outfall	101,159	cu. m/day	0.3	km long	\$2,386,085	
Roads	-----		0	Kilometres	-----	
Site allowances (arbitrary)	1,000,000	Dollars	-----	Lump Sums	\$1,000,000	
Capital cost (excluding inflation and regional factors)					\$38,095,870	
(Regional factor = 1.15)				Capital Cost =	\$43,810,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	2644 kw	\$0.044 \$/kW hour	\$930,629	Pumping + aeration + misc
Lime for neutralisation	10000 kg/day	\$0.09 \$/kg Cao	\$315,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	177 kg/day	\$0.37 \$/kg	\$22,857	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	8 man hrs/d	\$23.13 \$/man hour	\$64,750	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$1,095,250	2.5% of capital cost
	Annual Operating Cost =		\$2,529,000	

Description of System

5900 metres of effluent piping, 2 Effluent Pump Stations.
 65 meter dia. Primary Clarifier,
 8.7 day retention Aerated Stabilisation Basin with 2010 kW installed aeration
 Submerged Outfall 300 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

DOMTAR INC.

CORNWALL

ONTARIO

Effluent data ----->

120,000 7,052 28,000 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS
Gravity Pipeline 1	120,000 cu. m/day	0.3 km long	\$273,325 Secondary Clarifiers to River
Gravity Pipeline 2	cu. m/day	0 km long	-----
Gravity Pipeline 3	cu. m/day	0 km long	-----
Forcemain 1	120,000 cu. m/day	0.5 km long	\$329,607 Primary clarifier to act sludge reactor
Forcemain 2	120,000 cu. m/day	0.5 km long	\$329,607 Low solids to activated sludge reactor
Pump Station 1	90,000 cu. m/day	1	\$1,732,051 Primary clarifier to act sludge reactor
Pump Station 2	30,000 cu. m/day	1	\$1,000,000 Low solids to activated sludge reactor
Pump Station 3	0 cu. m/day	0	-----
Lump Sum Piping	200,000 Dollars	----- Lump Sum	\$200,000 Misc collection
Primary Clarifier	cu. m/day	0	----- Exists
Aerated Stabilisation Basin	BOD kg/d	0	-----
Activated Sludge Reactor	28,000 BOD kg/d	1	\$7,887,317
Aerators	28,000 BOD kg/d	1 Systems	\$3,192,000
Nutrient Addition	-----	1 Systems	\$400,000
Neutralisation	-----	1 Systems	\$200,000
Secondary Clarifier	60,000 cu. m/day	2	\$7,128,129
Secondary sludge thicken	1,100,000 Dollars	1	\$1,100,000
Sludge Dewatering	5,000 kg/day	1 Systems	\$2,550,000 Addition to existing system
Submerged Outfall	120,000 cu. m/day	0 km long	----- Exists
Roads	-----	0 Kilometres	-----
Site allowances (arbitrary)	8,000,000 Dollars	----- Lump Sums	\$8,000,000 Piling required
Capital cost (excluding inflation and regional factors)			<u>\$34,322,035</u>
(Regional factor = 1.05)		Capital Cost =	\$36,038,000
(Inflation factor = 1.00)			Flow and BOD estimated
			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	1991 kw	\$0.038 \$/kW hour	\$605,203	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	\$0.09 \$/kg Cao	\$189,000	
Ammonia	1700 kg/day	\$0.40 \$/kg NH3	\$238,000	For Activated Sludge
Phosphoric Acid	885 kg/day	\$1.03 \$/kg H3PO4	\$319,101	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	112 kg/day	\$14.00 \$/kg	\$548,800	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$900,950	2.5% of capital cost
		Annual Operating Cost =	\$3,564,000	

Description of System

1300 metres of effluent piping, 2 Effluent Pump Stations.
 2 x 64 meter dia. Secondary Clarifiers
 35000 cu. meter Activated Sludge Reactor with 1600 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

SCOTT PAPER LTD.

CRABTREE

QUEBEC

Effluent data ———>	21,195	2,104	3,165	(Flow cu. m/day TSS kg/d BOD kg/d)
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----
Gravity Pipeline 2	cu. m/day	0	km long	-----
Gravity Pipeline 3	cu. m/day	0	km long	-----
Forcemain 1	cu. m/day	0	km long	-----
Forcemain 2	cu. m/day	0	km long	-----
Pump Station 1	cu. m/day	0		-----
Pump Station 2	cu. m/day	0		-----
Pump Station 3	cu. m/day	0		-----
Lump Sum Piping	Dollars	-----	Lump Sum	-----
Primary Clarifier	cu. m/day	0		-----
Aerated Stabilisation Basin	BOD kg/d	0		-----
Activated Sludge Reactor	BOD kg/d	0		-----
Aerators	BOD kg/d	0	Systems	-----
Nutrient Addition		0	Systems	-----
Neutralisation		0	Systems	-----
Secondary Clarifier	cu. m/day	0		-----
Secondary sludge thickener	Dollars	0		-----
Sludge Dewatering	kg/day	0	Systems	-----
Submerged Outfall	cu. m/day	0	km long	-----
Roads		0	Kilometres	-----
Site allowances (arbitrary)	Dollars	-----	Lump Sums	-----
Capital cost (excluding inflation and regional factors)				<u>\$0</u>
(Regional factor = 1.05)		Capital Cost =		<u>\$0</u>
(Inflation factor = 1.00)				Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	kw	\$0.022 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$0	2.5% of capital cost
	Annual Operating Cost =		<u>\$0</u>	

Description of System

Company is currently connecting to municipal system

FLETCHER CHALLENGE CANADA LTD CROFTON

B.C.

Effluent data ----->	224,228	19,291	56,109	(Flow cu. m/day TSS kg/d BOD kg/d)		
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS		
Gravity Pipeline 1	40,000 cu. m/day	0.5	km long	\$223,048	To new clarifier	
Gravity Pipeline 2	224,228 cu. m/day	0.5	km long	\$683,923	To existing outfall	
Gravity Pipeline 3	cu. m/day	0	km long	-----		
Forcemain 1	224,228 cu. m/day	0.5	km long	\$526,777	To activated sludge reactor	
Forcemain 2	cu. m/day	0	km long	-----		
Pump Station 1	224,228 cu. m/day	1		\$2,733,907	To activated sludge reactor	
Pump Station 2	0 cu. m/day	0		-----		
Pump Station 3	0 cu. m/day	0		-----		
Lump Sum Piping	500,000 Dollars	----- Lump Sum		\$500,000	Collection and sewer modifications	
Primary Clarifier	40,000 cu. m/day	1		\$2,052,901	Additional clarifier	
Aerated Stabilisation Basin	BOD kg/d	0		-----		
Activated Sludge Reactor	56,109 BOD kg/d	1		\$20,504,408		
Aerators	56,109 BOD kg/d	1	Systems	\$6,396,471		
Nutrient Addition	-----	1	Systems	\$400,000		
Neutralisation	-----	1	Systems	\$200,000		
Secondary Clarifier	112,114 cu. m/day	2		\$9,297,502		
Secondary sludge thickeners	1,100,000 Dollars	1		\$1,100,000	Integrate with existing primary solids	
Sludge Dewatering	20,000 kg/day	1	Systems	\$5,000,000	dewatering system	
Submerged Outfall	224,228 cu. m/day	0	km long	-----	Exists	
Roads	-----	0	Kilometres	-----		
Site allowances (arbitrary)	2,200,000 Dollars	----- Lump Sums		\$2,200,000		
Capital cost (excluding inflation and regional factors)				<u>\$51,818,938</u>		
(Regional factor = 1.20)				Capital Cost =	\$62,183,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	3947 kw	\$0.030 \$/kW hour	\$947,219	Pumping + aeration + misc
Lime for neutralisation	16000 kg/day	\$0.09 \$/kg Cao	\$504,000	
Ammonia	3407 kg/day	\$0.40 \$/kg NH3	\$476,930	For Activated Sludge
Phosphoric Acid	1774 kg/day	\$1.03 \$/kg H3PO4	\$639,448	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	224 kg/day	\$14.00 \$/kg	\$1,099,744	
Operators	48 man hrs/d	\$27.61 \$/man hour	\$463,890	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$60.75 \$/man hour	\$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$1,554,575	2.5% of capital cost
			<u>Annual Operating Cost =</u>	<u>\$6,116,000</u>

Description of System

1500 metres of effluent piping, 1 Effluent Pump Stations.
 41 meter dia. Primary Clarifier, 2 x 87 meter dia. Secondary Clarifiers
 112200 cu. meter Activated Sludge Reactor with 3200 kW installed aeration
 (Company currently proposing an activated sludge system)

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

NBIP FOREST PRODUCTS INC.

DALHOUSIE

N.B.

Effluent data	75,934	21,154	28,549	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	75,934 cu. m/day	0.5 km	long	\$338,331	From ASB to shore
Gravity Pipeline 2	cu. m/day	0 km	long	-----	
Gravity Pipeline 3	cu. m/day	0 km	long	-----	
Forcemain 1	75,934 cu. m/day	2 km	long	\$935,398	From mill to ASB
Forcemain 2	cu. m/day	0 km	long	-----	
Pump Station 1	75,934 cu. m/day	1		\$1,590,951	From mill to ASB
Pump Station 2	0 cu. m/day	0		-----	
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	0 Dollars	-----	Lump Sum	-----	
Primary Clarifier	cu. m/day	0		-----	Existing unit adequate
Aerated Stabilisation Basin	28,549 BOD kg/d	1		\$9,606,421	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	28,549 BOD kg/d	1	Systems	\$3,254,597	
Nutrient Addition	-----	0	Systems	-----	
Neutralisation	-----	1	Systems	\$200,000	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0	Systems	-----	
Submerged Outfall	75,934 cu. m/day	1	km long	\$7,091,485	
Roads	-----	1	Kilometres	\$25,000	
Site allowances (arbitrary)	800,000 Dollars	-----	Lump Sums	\$800,000	
Capital cost (excluding inflation and regional factors)				\$23,842,184	
(Regional factor = 1.15)			Capital Cost =	\$27,419,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	1908 kw	\$0.044 \$/kW hour	\$671,612	Pumping + aeration + misc
Lime for neutralisation	9000 kg/day	\$0.09 \$/kg Cao	\$283,500	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	143 kg/day	\$0.37 \$/kg	\$18,486	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$685,475	2.5% of capital cost
		Annual Operating Cost =	\$1,792,000	

Description of System

2500 metres of effluent piping, 1 Effluent Pump Stations.

9.4 day retention Aerated Stabilisation Basin with 1630 kW installed aeration
Submerged Outfall 1000 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

DOMTAR INC.

DOLBEAU

QUEBEC

Effluent data →	67,900	3,641	51,014	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	67,900 cu. m/day	1 km long		\$629,223	Secondary clarifier to shore
Gravity Pipeline 2	cu. m/day	0 km long		-----	
Gravity Pipeline 3	cu. m/day	0 km long		-----	
Forcemain 1	67,900 cu. m/day	0.5 km long		\$215,037	Prim clarifier to activated sludge reactor
Forcemain 2	cu. m/day	0 km long		-----	
Pump Station 1	67,900 cu. m/day	1		\$1,504,438	Prim clarifier to activated sludge reactor
Pump Station 2	0 cu. m/day	0		-----	
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	0 Dollars	----- Lump Sum		-----	
Primary Clarifier	cu. m/day	0		-----	Existing unit adequate
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	51,014 BOD kg/d	1		\$16,331,102	
Aerators	51,014 BOD kg/d	1 Systems		\$5,815,608	
Nutrient Addition	-----	1 Systems		\$400,000	
Neutralisation	-----	1 Systems		\$200,000	
Secondary Clarifier	33,950 cu. m/day	2		\$5,595,877	
Secondary sludge thicken	1,100,000 Dollars	1		\$1,100,000	
Sludge Dewatering	20,000 kg/day	1 Systems		\$2,700,000	
Submerged Outfall	67,900 cu. m/day	0.5 km long		\$3,390,636	
Roads	-----	0 Kilometres		-----	
Site allowances (arbitrary)	700,000 Dollars	----- Lump Sums		\$700,000	
Capital cost (excluding inflation and regional factors)				\$38,581,921	
(Regional factor = 1.05)		Capital Cost =		\$40,511,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	3231 kw	\$0.022 \$/kW hour	\$568,732	Pumping + aeration + misc
Lime for neutralisation	4000 kg/day	\$0.09 \$/kg Cao	\$126,000	
Ammonia	3097 kg/day	\$0.40 \$/kg NH3	\$433,620	For Activated Sludge
Phosphoric Acid	1613 kg/day	\$1.03 \$/kg H3PO4	\$581,380	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	204 kg/day	\$14.00 \$/kg	\$999,876	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	20 dry t/day	\$60.00 \$/dry tonne	\$420,000	
Maintenance	Total maintenance labour and materials =		\$1,012,775	2.5% of capital cost
		Annual Operating Cost =	\$4,906,000	

Description of System

1500 metres of effluent piping, 1 Effluent Pump Stations.
 2 x 48 meter dia. Secondary Clarifiers
 85000 cu. meter Activated Sludge Reactor with 2910 kW installed aeration
 Submerged Outfall 500 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

DOMTAR INC.

DONNACONA

QUEBEC

Effluent data ———>	46,054	15,670	22,864	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	46,054 cu. m/day		2 km long	\$977,781	ASB to shore, length from Beak 1985
Gravity Pipeline 2	cu. m/day		0 km long	-----	
Gravity Pipeline 3	cu. m/day		0 km long	-----	
Forcemain 1	46,054 cu. m/day		4 km long	\$1,285,728	Mill to ASB, length from Beak 1985
Forcemain 2	cu. m/day		0 km long	-----	
Pump Station 1	46,054 cu. m/day		0	-----	Mill to ASB
Pump Station 2	0 cu. m/day		0	-----	
Pump Station 3	0 cu. m/day		0	-----	
Lump Sum Piping	0 Dollars		----- Lump Sum	-----	
Primary Clarifier	46,054 cu. m/day		1	\$2,195,030	
Aerated Stabilisation Basin	22,864 BOD kg/d		1	\$8,827,432	Special cost due to site conditions
Activated Sludge Reactor	BOD kg/d		0	-----	
Aerators	22,864 BOD kg/d		1 Systems	\$2,606,471	
Nutrient Addition	-----		0 Systems	-----	
Neutralisation	-----		1 Systems	\$200,000	
Secondary Clarifier	cu. m/day		0	-----	
Secondary sludge thickener	Dollars		0	-----	
Sludge Dewatering	12,000 kg/day		1 Systems	\$2,620,000	
Submerged Outfall	46,054 cu. m/day		0.3 km long	\$1,741,769	
Roads	-----		0 Kilometres	-----	
Site allowances (arbitrary)	500,000 Dollars		----- Lump Sums	\$500,000	
Capital cost (excluding inflation and regional factors)				\$20,954,211	
(Regional factor = 1.05)			Capital Cost =	\$22,002,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1489 kw	\$0.022 \$/kW hour	\$262,115	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	\$0.09 \$/kg Cao	\$189,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	114 kg/day	\$0.37 \$/kg	\$14,804	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$550,050	2.5% of capital cost
	Annual Operating Cost =		\$1,149,000	

Description of System

6000 metres of effluent piping,
 44 meter dia. Primary Clarifier,
 12.4 day retention Aerated Stabilisation Basin with 1300 kW installed aeration
 Submerged Outfall 300 metres long

CASCADES (EAST ANGUS) INC. EAST ANGUS QUEBEC

Effluent data -----> 37,930 5,702 6,134 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS
Gravity Pipeline 1	37,930 cu. m/day	2 km long	\$861,903 ASB to river
Gravity Pipeline 2	cu. m/day	0 km long	-----
Gravity Pipeline 3	cu. m/day	0 km long	-----
Forcemain 1	37,930 cu. m/day	4 km long	\$1,111,572 Mill to ASB
Forcemain 2	cu. m/day	0 km long	-----
Pump Station 1	37,930 cu. m/day	1	\$1,124,426 Mill to ASB
Pump Station 2	0 cu. m/day	0	-----
Pump Station 3	0 cu. m/day	0	-----
Lump Sum Piping	1,200,000 Dollars	----- Lump Sum	\$1,200,000 Collection system, Beak 1985 + Inflation
Primary Clarifier	37,930 cu. m/day	1	\$2,001,734
Aerated Stabilisation Basin	6,134 BOD kg/d	1	\$2,764,455
Activated Sludge Reactor	BOD kg/d	0	-----
Aerators	6,134 BOD kg/d	1 Systems	\$699,287
Nutrient Addition	-----	0 Systems	-----
Neutralisation	-----	1 Systems	\$200,000
Secondary Clarifier	cu. m/day	0	-----
Secondary sludge thickener	Dollars	0	-----
Sludge Dewatering	5,000 kg/day	0 Systems	-----
Submerged Outfall	37,930 cu. m/day	0.2 km long	\$1,074,450
Roads	-----	0 Kilometres	-----
Site allowances (arbitrary)	400,000 Dollars	----- Lump Sums	\$400,000
Capital cost (excluding inflation and regional factors)			<u>\$11,437,827</u>
(Regional factor = 1.05)		Capital Cost =	\$12,010,000
(Inflation factor = 1.00)			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	467 kw	\$0.022 \$/kW hour	\$82,138	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	31 kg/day	\$0.37 \$/kg	\$3,972	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$300,250	2.5% of capital cost
		Annual Operating Cost =	\$520,000	

Description of System

6000 metres of effluent piping, 1 Effluent Pump Stations.
 40 meter dia. Primary Clarifier,
 4 day retention Aerated Stabilisation Basin with 350 kW installed aeration
 Submerged Outfall 200 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

FRASER INC.

EDMUNSTON

N.B.

Effluent data	120,834	9,476	15,863	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS		
Gravity Pipeline 1	120,834 cu. m/day	0.2 km long	\$183,038	To connect to new cell for ASB	
Gravity Pipeline 2	cu. m/day	0 km long	-----		
Gravity Pipeline 3	cu. m/day	0 km long	-----		
Forcemain 1	120,834 cu. m/day	0 km long	-----		
Forcemain 2	cu. m/day	0 km long	-----		
Pump Station 1	120,834 cu. m/day	0	-----		
Pump Station 2	0 cu. m/day	0	-----		
Pump Station 3	0 cu. m/day	0	-----		
Lump Sum Piping	100,000 Dollars	Lump Sum	\$100,000		
Primary Clarifier	cu. m/day	0	-----	Exists	
Aerated Stabilisation Basin	15,863 BOD kg/d	1	\$5,968,326	Additional cell for existing ASB	
Activated Sludge Reactor	BOD kg/d	0	-----		
Aerators	15,863 BOD kg/d	1 Systems	\$1,808,426		
Nutrient Addition	-----	0 Systems	-----		
Neutralisation	-----	0 Systems	-----		
Secondary Clarifier	cu. m/day	0	-----		
Secondary sludge thickener	Dollars	0	-----		
Sludge Dewatering	kg/day	0 Systems	-----		
Submerged Outfall	120,834 cu. m/day	0 km long	-----		
Roads	-----	0 Kilometres	-----		
Site allowances (arbitrary)	Dollars	Lump Sums	-----		
Capital cost (excluding inflation and regional factors)			\$8,059,790		
(Regional factor = 1.15)		Capital Cost =	\$9,269,000		
(Inflation factor = 1.00)				Inflation since Jan 1990	

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1267 kw	\$0.044 \$/kW hour	\$445,848	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	79 kg/day	\$0.37 \$/kg	\$10,272	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	No additional labour, since there is an
Technicians	man hrs/d	\$50.88 \$/man hour	-----	existing system that requires only reativ
Process Engineer	person	\$90,000 \$/year	-----	simple expansion
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$231,725	2.5% of capital cost
		Annual Operating Cost =	\$688,000	

Description of System

200 metres of effluent piping,

3.3 day retention Aerated Stabilisation Basin with 900 kW installed aeration
(Additional cell for existing ASB)

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

BOISE CASCADE CANADA LTD.

FORT FRANCES

ONTARIO

Effluent data	92,259	4,510	12,101	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	92,259	cu. m/day	0.2	km long	\$153,594 To extend existing ASB
Gravity Pipeline 2	92,259	cu. m/day	0.3	km long	\$230,391 To extend existing ASB
Gravity Pipeline 3		cu. m/day	0	km long	-----
Forcemain 1		cu. m/day	0	km long	-----
Forcemain 2		cu. m/day	0	km long	-----
Pump Station 1		cu. m/day	0		-----
Pump Station 2	0	cu. m/day	0		-----
Pump Station 3	0	cu. m/day	0		-----
Lump Sum Piping	0	Dollars	Lump Sum		-----
Primary Clarifier		cu. m/day	0		-----
Aerated Stabilisation Basin	15,000	BOD kg/d	1		\$5,703,819 Nominal capacity for ASB extension
Activated Sludge Reactor		BOD kg/d	0		-----
Aerators	10,000	BOD kg/d	1	Systems	\$1,140,000
Nutrient Addition	-----		0	Systems	-----
Neutralisation	-----		0	Systems	-----
Secondary Clarifier		cu. m/day	0		-----
Secondary sludge thickener		Dollars	0		-----
Sludge Dewatering		kg/day	0	Systems	-----
Submerged Outfall		cu. m/day	0	km long	-----
Roads			0	Kilometres	-----
Site allowances (arbitrary)	250,000	Dollars	Lump Sums		\$250,000
Capital cost (excluding inflation and regional factors)					\$7,477,804
(Regional factor = 1.05)				Capital Cost =	\$7,852,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	599 kw	\$0.038 \$/kW hour	\$181,944	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	61 kg/day	\$0.37 \$/kg	\$7,835	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	No additional labour
Technicians	man hrs/d	\$50.88 \$/man hour	-----	No additional labour
Process Engineer	person	\$90,000 \$/year	-----	No additional labour
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$196,300	2.5% of capital cost
			Annual Operating Cost =	\$386,000

Description of System

500 metres of effluent piping,

3.3 day retention Aerated Stabilisation Basin with 570 kW installed aeration (Additional cell for existing ASB)

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

CPFP INC.

GOLD RIVER

B.C.

Effluent data	170,625	6,780	17,213	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	170,625	cu. m/day	0.5	km long	\$572,647 Miscellaneous collection
Gravity Pipeline 2		cu. m/day	0	km long	-----
Gravity Pipeline 3		cu. m/day	0	km long	-----
Forcemain 1	170,625	cu. m/day	0.5	km long	\$429,183 to activated sludge reactor
Forcemain 2		cu. m/day	0	km long	-----
Pump Station 1	170,625	cu. m/day	1		\$2,384,848 To activated sludge reactor
Pump Station 2	0	cu. m/day	0		-----
Pump Station 3	0	cu. m/day	0		-----
Lump Sum Piping	0	Dollars	----- Lump Sum		-----
Primary Clarifier		cu. m/day	0		----- Existing system is adequate for feed to
Aerated Stabilisation Basin		BOD kg/d	0		----- activated sludge system
Activated Sludge Reactor	17,213	BOD kg/d	1		\$9,343,644
Aerators	17,213	BOD kg/d	1	Systems	\$1,962,335
Nutrient Addition	-----		1	Systems	\$400,000
Neutralisation	-----		1	Systems	\$200,000
Secondary Clarifier	85,313	cu. m/day	2		\$8,278,309
Secondary sludge thickener		Dollars	0		-----
Sludge Dewatering	0	kg/day	0	Systems	-----
Submerged Outfall		cu. m/day	0	km long	----- Existing outfall is adequate
Roads	-----		0	Kilometres	-----
Site allowances (arbitrary)	500,000	Dollars	----- Lump Sums		\$500,000
Capital cost (excluding inflation and regional factors)					\$24,070,966
(Regional factor = 1.20)					Capital Cost = \$28,885,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1478 kw	\$0.030 \$/kW hour	\$354,748	Pumping + aeration + misc
Lime for neutralisation	13000 kg/day	\$0.09 \$/kg Cao	\$409,500	
Ammonia	1045 kg/day	\$0.40 \$/kg NH3	\$146,314	For Activated Sludge
Phosphoric Acid	544 kg/day	\$1.03 \$/kg H3PO4	\$196,172	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	69 kg/day	\$14.00 \$/kg	\$337,384	
Operators	48 man hrs/d	\$27.61 \$/man hour	\$463,890	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$60.75 \$/man hour	\$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	6 dry t/day	\$60.00 \$/dry tonne	\$126,000	
Maintenance	Total maintenance labour and materials =		\$722,125	2.5% of capital cost
Annual Operating Cost =			\$3,186,000	

Description of System

1000 metres of effluent piping, 1 Effluent Pump Stations.
 2 x 76 meter dia. Secondary Clarifiers
 43000 cu. meter Activated Sludge Reactor with 980 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

STONE-CONSOLIDATED INC.

GRAND MERE

QUEBEC

Effluent data	42,826	5,798	20,362	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	42,826 cu. m/day	2 km long		\$932,677	ASB to St Maurice river
Gravity Pipeline 2	cu. m/day	0 km long		-----	
Gravity Pipeline 3	cu. m/day	0 km long		-----	
Forcemain 1	42,826 cu. m/day	6 km long		\$1,826,309	Mill to ASB
Forcemain 2	cu. m/day	0 km long		-----	
Pump Station 1	42,826 cu. m/day	2		\$2,389,596	One pump station into primary clarifier,
Pump Station 2	0 cu. m/day	0		-----	and one from clarifier to ASB
Pump Station 3	10,000 cu. m/day	1		\$577,350	Aux pum,p station
Collection and segregation	2,000,000 Dollars	----- Lump Sum		\$2,000,000	
Primary Clarifier	42,826 cu. m/day	1		\$2,120,566	
Aerated Stabilisation Basin	20,362 BOD kg/d	1		\$12,000,000	Difficult terrain
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	20,362 BOD kg/d	1 Systems		\$2,321,312	
Nutrient Addition	-----	0 Systems		-----	
Neutralisation	-----	1 Systems		\$200,000	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	5,000 kg/day	1 Systems		\$2,550,000	
Submerged Outfall	42,826 cu. m/day	0.1 km long		\$563,959	
Roads	-----	5 Kilometres		\$125,000	
Site allowances (arbitrary)	600,000 Dollars	----- Lump Sums		\$600,000	
Capital cost (excluding inflation and regional factors)				\$28,206,769	
(Regional factor = 1.05)		Capital Cost =		\$29,617,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	1357 kw	\$0.022 \$/kW hour	\$238,895	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	\$0.09 \$/kg Cao	\$189,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	102 kg/day	\$0.37 \$/kg	\$13,185	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$740,425	2.5% of capital cost
	Annual Operating Cost =		\$1,315,000	

Description of System

8000 metres of effluent piping, 3 Effluent Pump Stations.
 43 meter dia. Primary Clarifier,
 11.9 day retention Aerated Stabilisation Basin with 1160 kW installed aeration
 Submerged Outfall 100 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

STORA FOREST INDUSTRIES LTD. PORT HAWKESBURY N.S.

Effluent data —>	104,004	20,196	60,526	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	104,004 cu. m/day		2 km long	\$1,660,357	ASB to existing outfall
Gravity Pipeline 2	cu. m/day		0 km long	-----	
Gravity Pipeline 3	cu. m/day		0 km long	-----	
Forcemain 1	104,004 cu. m/day		3 km long	\$1,776,432	Mill to ASB, distance from Beak 1985
Forcemain 2	cu. m/day		0 km long	-----	
Pump Station 1	104,004 cu. m/day		1	\$1,861,932	Mill to ASB
Pump Station 2	0 cu. m/day		0	-----	
Pump Station 3	0 cu. m/day		0	-----	
Lump Sum Piping	0 Dollars		----- Lump Sum	-----	
Primary Clarifier	104,004 cu. m/day		1	\$3,232,122	Existing 2 units are adequate
Aerated Stabilisation Basin	60,526 BOD kg/d		1	\$17,656,480	
Activated Sludge Reactor	BOD kg/d		0	-----	
Aerators	60,526 BOD kg/d		1 Systems	\$6,899,951	
Nutrient Addition	-----		0 Systems	-----	
Neutralisation	-----		1 Systems	\$200,000	
Secondary Clarifier	cu. m/day		0	-----	
Secondary sludge thickener	Dollars		0	-----	
Sludge Dewatering	kg/day		0 Systems	-----	
Submerged Outfall	cu. m/day		0 km long	-----	
Roads	-----		3 Kilometres	\$75,000	
Site allowances (arbitrary)	1,000,000 Dollars		----- Lump Sums	\$1,000,000	
Capital cost (excluding inflation and regional factors)				<u>\$34,362,275</u>	
(Regional factor = 1.15)			Capital Cost =	\$39,517,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	3895 kw	\$0.044 \$/kW hour	\$1,371,210	Pumping + aeration + misc
Lime for neutralisation	10000 kg/day	\$0.09 \$/kg Cao	\$315,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	303 kg/day	\$0.37 \$/kg	\$39,191	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$987,925	2.5% of capital cost
		Annual Operating Cost =	\$2,847,000	

Description of System

5000 metres of effluent piping, 1 Effluent Pump Stations.
 66 meter dia. Primary Clarifier,
 14.5 day retention Aerated Stabilisation Basin with 3450 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

WELDWOOD OF CANADA LTD.

HINTON

ALBERTA

Effluent data ———>	110,375	9,379	4,919	(Flow cu. m/day TSS kg/d BOD kg/d)
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----
Gravity Pipeline 2	cu. m/day	0	km long	-----
Gravity Pipeline 3	cu. m/day	0	km long	-----
Forcemain 1	cu. m/day	0	km long	-----
Forcemain 2	cu. m/day	0	km long	-----
Pump Station 1	cu. m/day	0		-----
Pump Station 2	cu. m/day	0		-----
Pump Station 3	cu. m/day	0		-----
Lump Sum Piping	Dollars	-----	Lump Sum	-----
Primary Clarifier	cu. m/day	0		-----
Aerated Stabilisation Basin	BOD kg/d	0		-----
Activated Sludge Reactor	BOD kg/d	0		-----
Aerators	BOD kg/d	0	Systems	-----
Nutrient Addition		0	Systems	-----
Neutralisation		0	Systems	-----
Secondary Clarifier	cu. m/day	0		-----
Secondary sludge thickener	Dollars	0		-----
Sludge Dewatering	kg/day	0	Systems	-----
Submerged Outfall	cu. m/day	0	km long	-----
Roads		0	Kilometres	-----
Site allowances (arbitrary)	Dollars	-----	Lump Sums	-----
Capital cost (excluding inflation and regional factors)				\$0
(Regional factor = 1.10)		Capital Cost =		\$0
(Inflation factor = 1.00)				Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	kw	\$0.039 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =			\$0 2.5% of capital cost
	Annual Operating Cost =			\$0

Description of System

Mill was rebuilt 1988/1990, and will comply with proposed Federal regulations without any additional expenditure

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

CPFP INC.

HUBBARDS

N.S.

Effluent data -----> 4,029 7,472 3,406 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS
Gravity Pipeline 1	cu. m/day	0 km long	-----
Gravity Pipeline 2	cu. m/day	0 km long	-----
Gravity Pipeline 3	cu. m/day	0 km long	-----
Forcemain 1	cu. m/day	0 km long	-----
Forcemain 2	cu. m/day	0 km long	-----
Pump Station 1	cu. m/day	0	-----
Pump Station 2	cu. m/day	0	-----
Pump Station 3	cu. m/day	0	-----
Lump Sum Piping	Dollars	----- Lump Sum	-----
Primary Clarifier	cu. m/day	0	-----
Aerated Stabilisation Basin	BOD kg/d	0	-----
Activated Sludge Reactor	BOD kg/d	0	-----
Aerators	BOD kg/d	0 Systems	-----
Nutrient Addition		0 Systems	-----
Neutralisation		0 Systems	-----
Secondary Clarifier	cu. m/day	0	-----
Secondary sludge thickener	Dollars	0	-----
Sludge Dewatering	kg/day	0 Systems	-----
Submerged Outfall	cu. m/day	0 km long	-----
Roads		0 Kilometres	-----
Site allowances (arbitrary)	100,000 Dollars	----- Lump Sums	\$100,000 Allowance to upgrade existing system
Capital cost (excluding inflation and regional factors)			\$100,000
(Regional factor = 1.15)		Capital Cost =	\$115,000
(Inflation factor = 1.00)			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	50 kw	\$0.044 \$/kW hour	\$17,600	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	8 man hrs/d	\$50.88 \$/man hour	\$142,450	Additional labour required to optimise
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	system
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$2,875	2.5% of capital cost
		Annual Operating Cost =	\$193,000	

Description of System

Minor upgrades to existing system

E.B. EDDY FOREST PRODUCTS LTD.

HULL

QUEBEC

Effluent data ———>	45,975	2,044	3,611	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----	
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	cu. m/day	0	km long	-----	
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	cu. m/day	0		-----	
Pump Station 2	cu. m/day	0		-----	
Pump Station 3	cu. m/day	0		-----	
Lump Sum Piping	50,000 Dollars	-----	Lump Sum		\$50,000
Primary Clarifier	cu. m/day	0		-----	Add polymer to existing clarifier
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	BOD kg/d	0	Systems	-----	
Polymer system		1	Systems		\$100,000
Neutralisation		0	Systems	-----	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0	Systems	-----	
Submerged Outfall	cu. m/day	0	km long	-----	
Roads		0	Kilometres	-----	
Site allowances (arbitrary)	100,000 Dollars	-----	Lump Sums		\$100,000
Capital cost (excluding inflation and regional factors)					\$250,000
(Regional factor = 1.05)			Capital Cost =		\$263,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	50 kw	\$0.022 \$/kW hour	\$8,800	Misc addition
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer	50 kg/day	\$8.00 \$/kg	\$140,000	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$6,575	2.5% of capital cost
		Annual Operating Cost =	\$155,000	

Description of System

Improve existing clarifier by polymer addition

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

ABITIBI PRICE INC.

IROQUOIS FALLS

ONTARIO

Effluent data ----->	67,788	6,209	52,738	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	67,788 cu. m/day	0.5 km long		\$314,273	Secondary clarifiers to river
Gravity Pipeline 2	cu. m/day	0 km long		-----	
Gravity Pipeline 3	cu. m/day	0 km long		-----	
Forcemain 1	67,788 cu. m/day	0.3 km long		\$128,862	Primary clarifier to activated sludge
Forcemain 2	cu. m/day	0 km long		-----	
Pump Station 1	67,788 cu. m/day	1		\$1,503,191	Primary clarifier to activated sludge
Pump Station 2	0 cu. m/day	0		-----	
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	0 Dollars	----- Lump Sum		-----	
Primary Clarifier	cu. m/day	0		-----	
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	52,738 BOD kg/d	1		\$16,782,263	
Aerators	52,738 BOD kg/d	1 Systems		\$6,012,127	
Nutrient Addition	-----	1 Systems		\$400,000	
Neutralisation	-----	1 Systems		\$200,000	
Secondary Clarifier	33,894 cu. m/day	2		\$5,591,935	
Secondary sludge thicken	1,200,000 Dollars	1		\$1,200,000	
Sludge Dewatering	20,000 kg/day	1 Systems		\$2,700,000	
Submerged Outfall	67,788 cu. m/day	0.1 km long		\$677,678	
Roads	-----	0 Kilometres		-----	
Site allowances (arbitrary)	1,000,000 Dollars	----- Lump Sums		\$1,000,000	
Capital cost (excluding inflation and regional factors)				<u>\$36,510,328</u>	
(Regional factor = 1.05)		Capital Cost =		\$38,336,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	3334 kw	\$0.038 \$/kW hour	\$1,013,630	Pumping + aeration + misc
Lime for neutralisation	8000 kg/day	\$0.09 \$/kg Cao	\$252,000	
Ammonia	3202 kg/day	\$0.40 \$/kg NH3	\$448,273	For Activated Sludge
Phosphoric Acid	1667 kg/day	\$1.03 \$/kg H3PO4	\$601,026	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	211 kg/day	\$14.00 \$/kg	\$1,033,664	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	20 dry t/day	\$60.00 \$/dry tonne	\$420,000	
Maintenance	Total maintenance labour and materials	=	\$958,400	2.5% of capital cost
		Annual Operating Cost =	\$5,490,000	

Description of System

800 metres of effluent piping, 1 Effluent Pump Stations.
 2 x 48 meter dia. Secondary Clarifiers
 87900 cu. meter Activated Sludge Reactor with 3010 kW Installed aeration
 Submerged Outfall 100 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

CASCADES INC.

JOLIETTE

QUEBEC

Effluent data —>	2,834	616	780	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	----	
Gravity Pipeline 2	cu. m/day	0	km long	----	
Gravity Pipeline 3	cu. m/day	0	km long	----	
Forcemain 1	cu. m/day	0	km long	----	
Forcemain 2	cu. m/day	0	km long	----	
Pump Station 1	cu. m/day	0		----	
Pump Station 2	0 cu. m/day	0		----	
Pump Station 3	0 cu. m/day	0		----	
Lump Sum Piping	0 Dollars	-----	Lump Sum	----	
Primary Clarifier	cu. m/day	0		----	
Aerated Stabilisation Basin	BOD kg/d	0		----	
Activated Sludge Reactor	BOD kg/d	0		----	
Aerators	BOD kg/d	0	Systems	----	
Nutrient Addition		0	Systems	----	
Neutralisation		0	Systems	----	
Secondary Clarifier	cu. m/day	0		----	
Secondary sludge thickener	Dollars	0		----	
Sludge Dewatering	kg/day	0	Systems	----	
Submerged Outfall	cu. m/day	0	km long	----	
Roads		0	Kilometres	----	
Site allowances (arbitrary)	Dollars	-----	Lump Sums	----	
Capital cost (excluding inflation and regional factors)					\$0
(Regional factor = 1.05)			Capital Cost =		\$0
(inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	kw	\$0.022 \$/kW hour	----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	----	
Ammonia	---- kg/day	\$0.40 \$/kg NH3	----	For Activated Sludge
Phosphoric Acid	---- kg/day	\$1.03 \$/kg H3PO4	----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	---- kg/day	\$14.00 \$/kg	----	
Operators	man hrs/d	\$23.13 \$/man hour	----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	----	
Maintenance	Total maintenance labour and materials =		\$0	2.5% of capital cost
		Annual Operating Cost =	\$0	

Description of System

Municipal discharge, no effluent treatment required

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

ABITIBI PRICE INC.

JONQUIERE

QUEBEC

Effluent data ———>	119,799	7,161	14,000	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	119,799 cu. m/day	0	km long	-----	
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	119,799 cu. m/day	0.5	km long	\$329,192	From clarifiers to act sludge reactor
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	119,799 cu. m/day	1		\$1,998,322	From clarifiers to act sludge reactor
Pump Station 2	0 cu. m/day	0		-----	
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	0 Dollars	-----	Lump Sum	-----	
Primary Clarifier	cu. m/day	0		-----	Exists
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	14,000 BOD kg/d	1		\$5,656,326	
Aerators	14,000 BOD kg/d	1	Systems	\$1,596,000	
Nutrient Addition	-----	1	Systems	\$400,000	
Neutralisation	-----	1	Systems	\$200,000	
Secondary Clarifier	59,899 cu. m/day	2		\$7,123,046	
Secondary sludge thickeners	1,100,000 Dollars	0		-----	
Sludge Dewatering	5,000 kg/day	1	Systems	\$2,550,000	Extension to existing system
Submerged Outfall	119,799 cu. m/day	0.5	km long	\$4,255,143	
Roads	-----	0	Kilometres	-----	
Site allowances (arbitrary)	1,200,000 Dollars	-----	Lump Sums	\$1,200,000	
Capital cost (excluding inflation and regional factors)				<u>\$25,308,030</u>	
(Regional factor = 1.05)			Capital Cost =	<u>\$26,573,000</u>	BOD estim. from production
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	1152 kw	\$0.022 \$/kW hour	\$202,817	Pumping + aeration + misc
Lime for neutralisation	8000 kg/day	\$0.09 \$/kg Cao	\$252,000	
Ammonia	850 kg/day	\$0.40 \$/kg NH3	\$119,000	For Activated Sludge
Phosphoric Acid	443 kg/day	\$1.03 \$/kg H3PO4	\$159,550	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	56 kg/day	\$14.00 \$/kg	\$274,400	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$664,325	2.5% of capital cost
	Annual Operating Cost =		<u>\$2,435,000</u>	

Description of System

500 metres of effluent piping, 1 Effluent Pump Stations.
 2 x 64 meter dia. Secondary Clarifiers
 23300 cu. meter Activated Sludge Reactor with 800 kW installed aeration
 Submerged Outfall 500 metres long

CASCADES (JONQUIERE) INC.

JONQUIERE

QUEBEC

Effluent data ----->	46,683	5,287	13,200	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	46,683	cu. m/day	5	km long	\$2,466,095 ASB to river
Gravity Pipeline 2		cu. m/day	0	km long	-----
Gravity Pipeline 3		cu. m/day	0	km long	-----
Forcemain 1	46,683	cu. m/day	3	km long	\$974,153 Mill to primary clarifier
Forcemain 2		cu. m/day	0	km long	-----
Pump Station 1	46,683	cu. m/day	1		\$1,247,431 Mill to primary clarifier
Pump Station 2	0	cu. m/day	0		-----
Pump Station 3	0	cu. m/day	0		-----
Lump Sum Piping	600,000	Dollars	-----	Lump Sum	\$600,000 Collection of existing outfalls

Primary Clarifier	46,683	cu. m/day	1		\$2,209,214
Aerated Stabilisation Basin	13,200	BOD kg/d	1		\$5,142,765
Activated Sludge Reactor		BOD kg/d	0		-----
Aerators	13,200	BOD kg/d	1	Systems	\$1,504,800
Nutrient Addition	-----		0	Systems	-----
Neutralisation	-----		1	Systems	\$200,000
Secondary Clarifier		cu. m/day	0		-----
Secondary sludge thickener		Dollars	0		-----
Sludge Dewatering	5,000	kg/day	1	Systems	\$2,550,000
Submerged Outfall	46,683	cu. m/day	0.1	km long	\$583,747
Roads	-----		3	Kilometres	\$75,000
Site allowances (arbitrary)	500,000	Dollars	-----	Lump Sums	\$500,000
Capital cost (excluding inflation and regional factors)					\$18,053,204

(Regional factor = 1.05)

Capital Cost = \$18,956,000 BOD estim. from production

(Inflation factor = 1.00)

Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	913 kw	\$0.022 \$/kW hour	\$160,611	Pumping + aeration + misc
Lime for neutralisation	3000 kg/day	\$0.09 \$/kg Cao	\$94,500	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	66 kg/day	\$0.37 \$/kg	\$8,547	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	16 man hrs/d	\$23.13 \$/man hour	\$129,500	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	Extra operator time due to distance fro
Sludge disposal	5 dry t/day	\$60.00 \$/dry tonne	\$105,000	mill
Maintenance	Total maintenance labour and materials =		\$568,680	3% of capital cost
Annual Operating Cost =			\$1,168,000	

Description of System

8000 metres of effluent piping, 1 Effluent Pump Stations.

44 meter dia. Primary Clarifier,

7.1 day retention Aerated Stabilisation Basin with 750 kW installed aeration

Submerged Outfall 100 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

WEYERHAEUSER CANADA LTD.

KAMLOOPS

B.C.

Effluent data ———> 178,608 12,943 3,510 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS
Gravity Pipeline 1	cu. m/day	0 km long	-----
Gravity Pipeline 2	cu. m/day	0 km long	-----
Gravity Pipeline 3	cu. m/day	0 km long	-----
Forcemain 1	cu. m/day	0 km long	-----
Forcemain 2	cu. m/day	0 km long	-----
Pump Station 1	cu. m/day	0	-----
Pump Station 2	0 cu. m/day	0	-----
Pump Station 3	0 cu. m/day	0	-----
Lump Sum Piping	0 Dollars	----- Lump Sum	-----
Primary Clarifier	cu. m/day	0	-----
Aerated Stabilisation Basin	5,000 BOD kg/d	1	\$2,342,596 Nominal BOD load for additional cell
Activated Sludge Reactor	BOD kg/d	0	-----
Aerators	5,000 BOD kg/d	1 Systems	\$500,000 Additional HP
Nutrient Addition	-----	0 Systems	-----
Neutralisation	-----	0 Systems	-----
Secondary Clarifier	cu. m/day	0	-----
Secondary sludge thickener	Dollars	0	-----
Sludge Dewatering	kg/day	0 Systems	-----
Submerged Outfall	cu. m/day	0 km long	-----
Roads		0 Kilometres	-----
Site allowances (arbitrary)	Dollars	----- Lump Sums	-----
Capital cost (excluding inflation and regional factors)			\$2,842,596
(Regional factor = 1.20)		Capital Cost =	\$3,411,000
(Inflation factor = 1.00)			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	300 kw	\$0.030 \$/kW hour	\$72,000	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	500 kg/day	\$0.37 \$/kg	\$64,750	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$27.61 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$60.75 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$85,275	2.5% of capital cost
	Annual Operating Cost =		\$222,000	In addition to current costs

Description of System

Upgrade existing ASB by adding one cell and 300 kW aeration. Assume additional nutrients used (Note that measures to reduce AOX may improve raw effluent and make upgrade unnecessary)

SPRUCE FALLS POWER & PAPER CO. KAPUSKASING

ONTARIO

Effluent data ----->	107,553	7,081	29,085	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS	
Gravity Pipeline 1	107,553 cu. m/day	1.5	km long	\$1,272,724	To river
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	107,553 cu. m/day	1	km long	\$607,234	Mill to activated sludge reactors
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	107,553 cu. m/day	1		\$1,893,432	to activated sludge reactor
Pump Station 2	0 cu. m/day	0		-----	
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	1,000,000 Dollars	----- Lump Sum		\$1,000,000	Cross railroad tracks etc
Primary Clarifier	cu. m/day	0		-----	2 units exist
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	29,085 BOD kg/d	1		\$10,302,028	Mill has selected activated sludge
Aerators	29,085 BOD kg/d	1	Systems	\$3,315,733	
Nutrient Addition	-----	1	Systems	\$400,000	
Neutralisation	-----	1	Systems	\$200,000	
Secondary Clarifier	53,776 cu. m/day	2		\$6,803,967	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	10,000 kg/day	1	Systems	\$2,600,000	Addition to existing system
Submerged Outfall	107,553 cu. m/day	0	km long	-----	
Roads	-----	0	Kilometres	-----	
Site allowances (arbitrary)	2,000,000 Dollars	----- Lump Sums		\$2,000,000	Low labour productivity
Capital cost (excluding inflation and regional factors)				<u>\$30,395,118</u>	
(Regional factor = 1.05)		Capital Cost =		<u>\$31,915,000</u>	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	2023 kw	\$0.038 \$/kW hour	\$615,018	Pumping + aeration + misc
Lime for neutralisation	10000 kg/day	\$0.09 \$/kg Cao	\$315,000	
Ammonia	1766 kg/day	\$0.40 \$/kg NH3	\$247,226	For Activated Sludge
Phosphoric Acid	919 kg/day	\$1.03 \$/kg H3PO4	\$331,470	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	116 kg/day	\$14.00 \$/kg	\$570,073	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	10 dry t/day	\$60.00 \$/dry tonne	\$210,000	
Maintenance	Total maintenance labour and materials =		\$797,875	2.5% of capital cost
		Annual Operating Cost =	<u>\$3,850,000</u>	

Description of System

2500 metres of effluent piping, 1 Effluent Pump Stations.
 2 x 60 meter dia. Secondary Clarifiers
 48500 cu. meter Activated Sludge Reactor with 1660 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

BOISE CASCADE CANADA LTD.

KENORA

ONTARIO

Effluent data	61,000	3,360	28,702	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	61,000	cu. m/day	0.3	km long	\$176,066 Secondary clarifiers tonewoutfall
Gravity Pipeline 2	61,000	cu. m/day	0.7	km long	\$410,820 Clarifier to activated sludge reactors
Gravity Pipeline 3		cu. m/day	0	km long	-----
Forcemain 1		cu. m/day	0	km long	-----
Forcemain 2		cu. m/day	0	km long	-----
Pump Station 1		cu. m/day	0		-----
Pump Station 2	0	cu. m/day	0		-----
Pump Station 3	0	cu. m/day	0		-----
Lump Sum Piping	200,000	Dollars	Lump Sum		\$200,000 Extra long secondary sludge line
Primary Clarifier		cu. m/day	0		----- Existing one is adequate
Aerated Stabilisation Basin		BOD kg/d	0		-----
Activated Sludge Reactor	28,702	BOD kg/d	1		\$10,190,431
Aerators	28,702	BOD kg/d	1	Systems	\$3,271,983
Nutrient Addition	-----		1	Systems	\$400,000
Neutralisation	-----		1	Systems	\$200,000
Secondary Clarifier	30,500	cu. m/day	2		\$5,346,735
Secondary sludge thicken	1,100,000	Dollars	1		\$1,100,000
Sludge Dewatering	12,000	kg/day	1	Systems	\$2,620,000 Addition to existing system
Submerged Outfall	61,000	cu. m/day	0.5	km long	\$3,248,368 New location, abandon existing one
Roads	-----		0	Kilometres	-----
Site allowances (arbitrary)	600,000	Dollars	Lump Sums		\$600,000
Capital cost (excluding inflation and regional factors)					\$27,764,404
(Regional factor = 1.05)					Capital Cost = \$29,153,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1718 kw	\$0.038 \$/kW hour	\$522,209	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	\$0.09 \$/kg Cao	\$189,000	
Ammonia	1743 kg/day	\$0.40 \$/kg NH3	\$243,964	For Activated Sludge
Phosphoric Acid	907 kg/day	\$1.03 \$/kg H3PO4	\$327,096	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	115 kg/day	\$14.00 \$/kg	\$562,552	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	10 dry t/day	\$60.00 \$/dry tonne	\$210,000	
Maintenance	Total maintenance labour and materials =		\$728,825	2.5% of capital cost
			Annual Operating Cost =	\$3,547,000

Description of System

1000 metres of effluent piping,
 2 x 45 meter dia. Secondary Clarifiers
 47800 cu. meter Activated Sludge Reactor with 1640 kW installed aeration
 Submerged Outfall 500 metres long

CASCADES PAPER INC.

KINGSEY FALLS

QUEBEC

Effluent data ----->	5,594	862	3,549	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS	
Gravity Pipeline 1	cu. m/day	0	km long	-----	
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	cu. m/day	0	km long	-----	
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	cu. m/day	0		-----	
Pump Station 2	cu. m/day	0		-----	
Pump Station 3	cu. m/day	0		-----	
Lump Sum Piping	Dollars	-----	Lump Sum	-----	
Primary Clarifier	cu. m/day	0		-----	
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	BOD kg/d	0	Systems	-----	
Nutrient Addition	-----	0	Systems	-----	
Neutralisation	-----	0	Systems	-----	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickeners	1,100,000 Dollars	0		-----	
Sludge Dewatering	0 kg/day	0	Systems	-----	
Submerged Outfall	5,594 cu. m/day	0	km long	-----	
Roads	-----	0	Kilometres	-----	
Site allowances (arbitrary)	100,000 Dollars	-----	Lump Sums	-----	\$100,000
Capital cost (excluding inflation and regional factors)					\$100,000
(Regional factor = 1.05)			Capital Cost =		\$105,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	#VALUE! kw	\$0.022 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$2,625	2.5% of capital cost
	Annual Operating Cost =		\$3,000	

Description of System

No treatment required, discharge to municipal sewer

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

EUROCAN PULP & PAPER CO.

KITIMAT

B.C.

Effluent data ----->	90,298	5,524	9,336	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	90,298 cu. m/day	0.5 km long		\$378,659	For ASB extension
Gravity Pipeline 2	cu. m/day	0 km long		-----	
Gravity Pipeline 3	cu. m/day	0 km long		-----	
Forcemain 1	cu. m/day	0 km long		-----	
Forcemain 2	cu. m/day	0 km long		-----	
Pump Station 1	cu. m/day	0		-----	
Pump Station 2	cu. m/day	0		-----	
Pump Station 3	cu. m/day	0		-----	
Lump Sum Piping	Dollars	----- Lump Sum		-----	
Primary Clarifier	cu. m/day	0		-----	
Aerated Stabilisation Basin	12,000 BOD kg/d	1		\$4,760,676	Nominal Capacity for ASB extension
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	12,000 BOD kg/d	1 Systems		\$1,368,000	Nominal Capacity for ASB extension
Nutrient Addition		0 Systems		-----	
Neutralisation		0 Systems		-----	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0 Systems		-----	
Submerged Outfall	cu. m/day	0 km long		-----	
Roads		0 Kilometres		-----	
Site allowances (arbitrary)	Dollars	----- Lump Sums		-----	
Capital cost (excluding inflation and regional factors)				<u>\$6,507,335</u>	
(Regional factor = 1.20)		Capital Cost =		\$7,809,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	718 kw	\$0.030 \$/kW hour	\$172,368	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	47 kg/day	\$0.37 \$/kg	\$6,045	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$27.61 \$/man hour	-----	No additional labour required
Technicians	man hrs/d	\$60.75 \$/man hour	-----	No additional labour required
Process Engineer	person	\$90,000 \$/year	-----	No additional labour required
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		<u>\$195,225</u>	2.5% of capital cost
		Annual Operating Cost =	\$374,000	

Description of System

500 metres of effluent piping,

2.6 day retention Aerated Stabilisation Basin with 680 kW installed aeration
(Extend existing ASB) Note that in-plant measures probably more economic

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

ABITIBI PRICE INC.

LACHUTE

QUEBEC

Effluent data ----->	1,818	337	255	(Flow cu. m/day TSS kg/d BOD kg/d)
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----
Gravity Pipeline 2	cu. m/day	0	km long	-----
Gravity Pipeline 3	cu. m/day	0	km long	-----
Forcemain 1	cu. m/day	0	km long	-----
Forcemain 2	cu. m/day	0	km long	-----
Pump Station 1	cu. m/day	0		-----
Pump Station 2	cu. m/day	0		-----
Pump Station 3	cu. m/day	0		-----
Lump Sum Piping	Dollars	-----	Lump Sum	-----
Primary Clarifier	cu. m/day	0		-----
Aerated Stabilisation Basin	BOD kg/d	0		-----
Activated Sludge Reactor	BOD kg/d	0		-----
Aerators	BOD kg/d	0	Systems	-----
Nutrient Addition	-----	0	Systems	-----
Neutralisation	-----	0	Systems	-----
Secondary Clarifier	cu. m/day	0		-----
Secondary sludge thicken	1,100,000 Dollars	0		-----
Sludge Dewatering	0 kg/day	0	Systems	-----
Submerged Outfall	1,818 cu. m/day	0	km long	-----
Roads	-----	0	Kilometres	-----
Site allowances (arbitrary)	0 Dollars	-----	Lump Sums	-----
Capital cost (excluding inflation and regional factors)				<u>\$0</u>
(Regional factor = 1.05)		Capital Cost =		\$0
(Inflation factor = 1.00)				Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	#VALUE! kw	\$0.022 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$0	2.5% of capital cost
	Annual Operating Cost =		\$0	

Description of System

No treatment required, discharge to municipal sewer

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

CPFP INC.

LA TUQUE

QUEBEC

Effluent data ———>	301,008	11,253	49,223	(Flow cu. m/day TSS kg/d BOD kg/d)		
EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	301,008 cu. m/day		0.5 km long		\$828,199	ASB to St Maurice River
Gravity Pipeline 2	100,000 cu. m/day		0.5 km long		\$404,631	Mill collection
Gravity Pipeline 3	cu. m/day		0 km long		-----	
Forcemain 1	301,008 cu. m/day		7 km long		\$9,197,537	Mill to ASB
Forcemain 2	cu. m/day		0 km long		-----	
Pump Station 1	301,008 cu. m/day		1		\$3,167,583	Mill to ASB
Pump Station 2	0 cu. m/day		0		-----	
Pump Station 3	0 cu. m/day		0		-----	
Lump Sum Piping	100,000 Dollars		----- Lump Sum		\$100,000	Bleach plant collection
Primary Clarifier	50,000 cu. m/day		1		\$2,282,445	Add to existing equipment
Aerated Stabilisation Basin	49,223 BOD kg/d		1		\$14,934,345	
Activated Sludge Reactor	BOD kg/d		0		-----	
Aerators	49,223 BOD kg/d		1 Systems		\$5,611,394	
Nutrient Addition	-----		0 Systems		-----	
Neutralisation	-----		1 Systems		\$200,000	
Secondary Clarifier	cu. m/day		0		-----	
Secondary sludge thickener	Dollars		0		-----	
Sludge Dewatering	10,000 kg/day		1 Systems		\$2,600,000	Add to existing equipment
Submerged Outfall	301,008 cu. m/day		0.1 km long		\$1,230,252	
Roads	-----		0 Kilometres		-----	
Site allowances (arbitrary)	3,000,000 Dollars		----- Lump Sums		\$3,000,000	
Capital cost (excluding inflation and regional factors)					\$43,556,387	
(Regional factor = 1.05)			Capital Cost =		\$45,734,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	3736 kw	\$0.022 \$/kW hour	\$657,558	Pumping + aeration + misc
Lime for neutralisation	12000 kg/day	\$0.09 \$/kg Cao	\$378,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	246 kg/day	\$0.37 \$/kg	\$31,872	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	10 dry t/day	\$60.00 \$/dry tonne	\$210,000	In addition to existing
Maintenance	Total maintenance labour and materials =		\$1,143,350	2.5% of capital cost
		Annual Operating Cost =	\$2,554,000	

Description of System

8000 metres of effluent piping, 1 Effluent Pump Stations.
 46 meter dia. Primary Clarifier,
 4.1 day retention Aerated Stabilisation Basin with 2810 kW installed aeration
 Submerged Outfall 100 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

DOMTAR INC.

LEBEL-SUR-QUEVILLON

QUEBEC

Effluent data ----->	146,988	5,480	31,786	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	146,988 cu. m/day		1 km long	\$1,039,494	ASB to river, length from Beak 1985
Gravity Pipeline 2	cu. m/day		0 km long	-----	
Gravity Pipeline 3	cu. m/day		0 km long	-----	
Forcemain 1	146,988 cu. m/day		5 km long	\$3,837,698	Mill to ASB
Forcemain 2	cu. m/day		0 km long	-----	
Pump Station 1	146,988 cu. m/day		1	\$2,213,500	Mill to ASB
Pump Station 2	0 cu. m/day		0	-----	
Pump Station 3	0 cu. m/day		0	-----	
Lump Sum Piping	500,000 Dollars		----- Lump Sum	\$500,000	Allowance for pump station location
Primary Clarifier	cu. m/day		0	-----	Use existing settling basins
Aerated Stabilisation Basin	31,786 BOD kg/d		1	\$10,479,430	
Activated Sludge Reactor	BOD kg/d		0	-----	
Aerators	31,786 BOD kg/d		1 Systems	\$3,623,550	
Nutrient Addition	-----		0 Systems	-----	
Neutralisation	-----		1 Systems	\$200,000	
Secondary Clarifier	cu. m/day		0	-----	
Secondary sludge thickener	Dollars		0	-----	
Sludge Dewatering	0 kg/day		0 Systems	-----	
Submerged Outfall	146,988 cu. m/day		0.2 km long	\$1,847,164	
Roads	-----		5 Kilometres	\$125,000	
Site allowances (arbitrary)	1,500,000 Dollars		----- Lump Sums	\$1,500,000	
Capital cost (excluding inflation and regional factors)				<u>\$25,365,836</u>	
(Regional factor = 1.05)			Capital Cost =	<u>\$26,634,000</u>	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	2288 kw	\$0.022 \$/kW hour	\$402,724	Pumping + aeration + misc
Lime for neutralisation	14000 kg/day	\$0.09 \$/kg Cao	\$441,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	159 kg/day	\$0.37 \$/kg	\$20,581	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		<u>\$665,850</u>	2.5% of capital cost
	Annual Operating Cost =		<u>\$1,663,000</u>	

Description of System

6000 metres of effluent piping, 1 Effluent Pump Stations.

5.4 day retention Aerated Stabilisation Basin with 1810 kW installed aeration

Submerged Outfall 200 metres long

BOWATER MERSEY PAPER CO. LIVERPOOL N.S.

Effluent data ———>	49,806	6,161	38,960	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	49,806 cu. m/day	0.5 km long		\$257,214	Secondary clarifier to shore
Gravity Pipeline 2	cu. m/day	0 km long		-----	
Gravity Pipeline 3	cu. m/day	0 km long		-----	
Forcemain 1	49,806 cu. m/day	0.3 km long		\$102,264	Primary clarifier to activated sludge
Forcemain 2	49,806 cu. m/day	0.3 km long		\$102,264	To primary clarifier
Pump Station 1	49,806 cu. m/day	2		\$2,576,981	One into clarifier, one to ASB
Pump Station 2	0 cu. m/day	0		-----	
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	300,000 Dollars	----- Lump Sum		\$300,000	Effluent collection
Primary Clarifier	49,806 cu. m/day	1		\$2,278,239	
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	38,960 BOD kg/d	1		\$10,341,042	
Aerators	38,960 BOD kg/d	1 Systems		\$4,441,404	
Nutrient Addition	-----	1 Systems		\$400,000	
Neutralisation	-----	1 Systems		\$200,000	
Secondary Clarifier	24,903 cu. m/day	2		\$4,905,340	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	21,000 kg/day	1 Systems		\$2,710,000	
Submerged Outfall	49,806 cu. m/day	0.5 km long		\$2,995,345	
Roads	-----	0 Kilometres		-----	
Site allowances (arbitrary)	2,000,000 Dollars	----- Lump Sums		\$2,000,000	
Capital cost (excluding inflation and regional factors)				<u>\$33,610,094</u>	
(Regional factor = 1.15)		Capital Cost =		\$38,652,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	2462 kw	\$0.044 \$/kW hour	\$866,792	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	\$0.09 \$/kg Cao	\$189,000	
Ammonia	2365 kg/day	\$0.40 \$/kg NH3	\$331,157	For Activated Sludge
Phosphoric Acid	1232 kg/day	\$1.03 \$/kg H3PO4	\$444,002	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	156 kg/day	\$14.00 \$/kg	\$763,610	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	21 dry t/day	\$60.00 \$/dry tonne	\$441,000	
Maintenance	Total maintenance labour and materials	=	\$966,300	2.5% of capital cost
		Annual Operating Cost =	\$4,765,000	

Description of System

1100 metres of effluent piping, 2 Effluent Pump Stations.
 46 meter dia. Primary Clarifier, 2 x 41 meter dia. Secondary Clarifiers
 48700 cu. meter Activated Sludge Reactor with 2220 kW installed aeration
 Submerged Outfall 500 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

F.F. SOUCY INC.

RIVIERE-DU-LOUP

QUEBEC

Effluent data ———>	20,364	3,793	16,855	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	20,364 cu. m/day		2 km long	\$575,277	Secondary clarifier to river
Gravity Pipeline 2	cu. m/day		0 km long	---	
Gravity Pipeline 3	cu. m/day		0 km long	---	
Forcemain 1	20,364 cu. m/day		0.5 km long	\$87,147	Clarifier to activated sludge
Forcemain 2	cu. m/day		0 km long	---	
Pump Station 1	20,364 cu. m/day		1	\$823,888	Clarifier to activated sludge
Pump Station 2	0 cu. m/day		0	---	
Pump Station 3	0 cu. m/day		0	---	
Lump Sum Piping	0 Dollars		----- Lump Sum	---	
Primary Clarifier	cu. m/day		0	---	Use existing clarifier
Aerated Stabilisation Basin	BOD kg/d		0	---	
Activated Sludge Reactor	16,855 BOD kg/d		1	\$6,585,982	
Aerators	16,855 BOD kg/d		1 Systems	\$1,921,435	
Nutrient Addition	-----		1 Systems	\$400,000	
Neutralisation	-----		1 Systems	\$200,000	
Secondary Clarifier	10,182 cu. m/day		2	\$3,354,193	
Secondary sludge thickener	Dollars		0	---	
Sludge Dewatering	7,000 kg/day		1 Systems	\$2,570,000	Add to existing
Submerged Outfall	20,364 cu. m/day		0.5 km long	\$2,094,481	
Roads	-----		0 Kilometres	---	
Site allowances (arbitrary)	2,000,000 Dollars		----- Lump Sums	\$2,000,000	
Capital cost (excluding inflation and regional factors)				<u>\$20,612,404</u>	
(Regional factor = 1.05)			Capital Cost =	\$21,643,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1062 kw	\$0.022 \$/kW hour	\$186,949	Pumping + aeration + misc
Lime for neutralisation	5000 kg/day	\$0.09 \$/kg Cao	\$157,500	
Ammonia	1023 kg/day	\$0.40 \$/kg NH3	\$143,265	For Activated Sludge
Phosphoric Acid	533 kg/day	\$1.03 \$/kg H3PO4	\$192,084	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	67 kg/day	\$14.00 \$/kg	\$330,352	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	7 dry t/day	\$60.00 \$/dry tonne	\$147,000	
Maintenance	Total maintenance labour and materials	=	\$541,075	2.5% of capital cost
		Annual Operating Cost =	\$2,462,000	

Description of System

2500 metres of effluent piping, 1 Effluent Pump Stations.
 2 x 26 meter dia. Secondary Clarifiers
 28100 cu. meter Activated Sludge Reactor with 960 kW installed aeration
 Submerged Outfall 500 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

ST. RAYMOND PAPER (1983) INC. RIVIERE-DU-LOUP QUEBEC

Effluent data ———> 4,795 292 833 (Flow cu. m/day | TSS kg/d | BOD kg/d) {estimated bod}

EQUIPMENT DESIGN LOAD QUANTITY COMMENTS

Gravity Pipeline 1	4,795 cu. m/day	1 km long	\$112,358	From ASB to river
Gravity Pipeline 2	cu. m/day	0 km long	-----	
Gravity Pipeline 3	cu. m/day	0 km long	-----	
Forcemain 1	4,795 cu. m/day	1 km long	\$58,916	To ASB
Forcemain 2	cu. m/day	0 km long	-----	
Pump Station 1	4,795 cu. m/day	1	\$399,792	
Pump Station 2	0 cu. m/day	0	-----	
Pump Station 3	0 cu. m/day	0	-----	
Lump Sum Piping	0 Dollars	----- Lump Sum	-----	

Primary Clarifier	cu. m/day	0	-----	Note reqd
Aerated Stabilisation Basin	833 BOD kg/d	1	\$548,776	Small scale
Activated Sludge Reactor	BOD kg/d	0	-----	
Aerators	833 BOD kg/d	1 Systems	\$95,000	
Nutrient Addition	-----	0 Systems	-----	
Neutralisation	-----	0 Systems	-----	
Secondary Clarifier	cu. m/day	0	-----	
Secondary sludge thickener	Dollars	0	-----	
Sludge Dewatering	0 kg/day	0 Systems	-----	
Submerged Outfall	4,795 cu. m/day	0.1 km long	\$234,898	
Roads	-----	0 Kilometres	-----	
Site allowances (arbitrary)	0 Dollars	----- Lump Sums	-----	

Capital cost (excluding inflation and regional factors) \$1,449,738

(Regional factor = 1.05) **Capital Cost =** \$1,522,000
 (Inflation factor = 1.00)

Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	62 kw	\$0.022 \$/kW hour	\$10,993	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	4 kg/day	\$0.37 \$/kg	\$540	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$38,050	2.5% of capital cost
			Annual Operating Cost =	<u>\$183,000</u>

Description of System

2000 metres of effluent piping, 1 Effluent Pump Stations.

4.3 day retention Aerated Stabilisation Basin with 50 kW installed aeration
 Submerged Outfall 100 metres long

FLETCHER CHALLENGE CANADA LTD MACKENZIE

B.C.

Effluent data ———> 77,925 6,201 8,880 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS
Gravity Pipeline 1	cu. m/day	0 km long	-----
Gravity Pipeline 2	cu. m/day	0 km long	-----
Gravity Pipeline 3	cu. m/day	0 km long	-----
Forcemain 1	cu. m/day	0 km long	-----
Forcemain 2	cu. m/day	0 km long	-----
Pump Station 1	cu. m/day	0	-----
Pump Station 2	cu. m/day	0	-----
Pump Station 3	cu. m/day	0	-----
Lump Sum Piping	Dollars	----- Lump Sum	-----
Primary Clarifier	cu. m/day	0	-----
Aerated Stabilisation Basin	10,000 BOD kg/d	1	\$4,107,067 Upgrade existing ASB, by 10t/d nomina
Activated Sludge Reactor	BOD kg/d	0	-----
Aerators	10,000 BOD kg/d	1 Systems	\$1,140,000
Nutrient Addition	-----	0 Systems	-----
Neutralisation	-----	0 Systems	-----
Secondary Clarifier	cu. m/day	0	-----
Secondary sludge thickener	Dollars	0	-----
Sludge Dewatering	kg/day	0 Systems	-----
Submerged Outfall	cu. m/day	0 km long	-----
Roads	-----	0 Kilometres	-----
Site allowances (arbitrary)	Dollars	----- Lump Sums	-----
Capital cost (excluding inflation and regional factors)			<u>\$5,247,067</u>
(Regional factor = 1.20)		Capital Cost =	\$6,296,000
(Inflation factor = 1.00)			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	599 kw	\$0.030 \$/kW hour	\$143,640	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	44 kg/day	\$0.37 \$/kg	\$5,750	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$27.61 \$/man hour	-----	No additional labour required
Technicians	man hrs/d	\$60.75 \$/man hour	-----	
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$157,400	2.5% of capital cost
		Annual Operating Cost =	\$307,000	

Description of System

2.8 day retention Aerated Stabilisation Basin with 570 kW installed aeration
(Addition to existing ASB)

JAMES RIVER MARATHON LTD.

MARATHON

ONTARIO

Effluent data ———>	76,996	2,641	16,942	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	76,996 cu. m/day	0.5 km long		\$341,401	Diversion of existing effluent creek
Gravity Pipeline 2	76,996 cu. m/day	1 km long		\$682,802	ASB to existing outfall basin
Gravity Pipeline 3	cu. m/day	0 km long		-----	
Forcemain 1	cu. m/day	0 km long		-----	
Forcemain 2	cu. m/day	0 km long		-----	
Pump Station 1	cu. m/day	0		-----	
Pump Station 2	0 cu. m/day	0		-----	
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	0 Dollars	----- Lump Sum		-----	
Primary Clarifier	cu. m/day	0		-----	Exists
Aerated Stabilisation Basin	16,942 BOD kg/d	1		\$6,295,023	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	16,942 BOD kg/d	1 Systems		\$1,931,411	
Nutrient Addition	-----	0 Systems		-----	
Neutralisation	-----	1 Systems		\$200,000	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	0 kg/day	0 Systems		-----	
Submerged Outfall	76,996 cu. m/day	0 km long		-----	Exists
Roads	-----	0 Kilometres		-----	
Site allowances (arbitrary)	3,000,000 Dollars	----- Lump Sums		\$3,000,000	Rock blasting for ASB
Capital cost (excluding inflation and regional factors)				\$12,450,636	
(Regional factor = 1.05)		Capital Cost =		\$13,073,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	1014 kw	\$0.038 \$/kW hour	\$308,253	Pumping + aeration + misc
Lime for neutralisation	10000 kg/day	\$0.09 \$/kg Cao	\$315,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	85 kg/day	\$0.37 \$/kg	\$10,970	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$326,825	2.5% of capital cost
	Annual Operating Cost =		\$1,094,000	

Description of System

1500 metres of effluent piping,

5.5 day retention Aerated Stabilisation Basin with 970 kW installed aeration

MACLAREN INDUSTRIES INC.

MASSON

QUEBEC

Effluent data ———>	51,778	4,074	21,812	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	51,778 cu. m/day		3 km long	\$1,582,714	ASB to river, length from Beak 1985
Gravity Pipeline 2	cu. m/day		0 km long	-----	
Gravity Pipeline 3	cu. m/day		0 km long	-----	
Forcemain 1	51,778 cu. m/day		3 km long	\$1,052,853	Mill to ASB, length from Beak
Forcemain 2	51,778 cu. m/day		0.3 km long	\$105,285	To primary clarifier
Pump Station 1	51,778 cu. m/day		1	\$1,313,741	Mill to ASB
Pump Station 2	0 cu. m/day		0	-----	
Pump Station 3	0 cu. m/day		0	-----	
Lump Sum Piping	500,000 Dollars		----- Lump Sum	\$500,000	Miscellaneous collection
Primary Clarifier	51,778 cu. m/day		1	\$2,320,633	
Aerated Stabilisation Basin	21,812 BOD kg/d		1	\$7,724,720	
Activated Sludge Reactor	BOD kg/d		0	-----	
Aerators	21,812 BOD kg/d		1 Systems	\$2,486,622	
Nutrient Addition	-----		0 Systems	-----	
Neutralisation	-----		1 Systems	\$200,000	
Secondary Clarifier	cu. m/day		0	-----	
Secondary sludge thickener	Dollars		0	-----	
Sludge Dewatering	5,000 kg/day		1 Systems	\$2,550,000	
Submerged Outfall	51,778 cu. m/day		0.3 km long	\$1,825,328	
Roads	-----		2 Kilometres	\$50,000	
Site allowances (arbitrary)	500,000 Dollars		----- Lump Sums	\$500,000	
Capital cost (excluding inflation and regional factors)				\$22,211,896	
(Regional factor = 1.05)			Capital Cost =	\$23,322,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1441 kw	\$0.022 \$/kW hour	\$253,685	Pumping + aeration + misc
Lime for neutralisation	5000 kg/day	\$0.09 \$/kg Cao	\$157,500	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	109 kg/day	\$0.37 \$/kg	\$14,124	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$583,050	2.5% of capital cost
		Annual Operating Cost =	\$1,142,000	

Description of System

6300 metres of effluent piping, 1 Effluent Pump Stations.
 47 meter dia. Primary Clarifier,
 10.5 day retention Aerated Stabilisation Basin with 1240 kW installed aeration
 Submerged Outfall 300 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

CPFP INC.

MATANE

QUEBEC

Effluent data	8,003	2,188	28,870 (Flow cu. m/day TSS kg/d BOD kg/d)			
EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	8,003	cu. m/day	0.5	km long	\$78,371	Activated sludge reactor ro existing outf
Gravity Pipeline 2		cu. m/day	0	km long	---	
Gravity Pipeline 3		cu. m/day	0	km long	---	
Forcemain 1	8,003	cu. m/day	0.5	km long	\$43,254	Clarifier to activated sludge reactor
Forcemain 2		cu. m/day	0	km long	---	
Pump Station 1	8,003	cu. m/day	1		\$516,478	Clarifier to activated sludge reactor
Pump Station 2	0	cu. m/day	0		---	
Pump Station 3	0	cu. m/day	0		---	
Lump Sum Piping	0	Dollars	Lump Sum		---	
Primary Clarifier		cu. m/day	0		---	Existing unit
Aerated Stabilsation Basin		BOD kg/d	0		---	
Activated Sludge Reactor	28,870	BOD kg/d	1		\$6,735,415	
Aerators	28,870	BOD kg/d	1	Systems	\$3,291,222	
Nutrient Addition	-----		1	Systems	\$400,000	
Neutralisation	-----		0	Systems	---	
Secondary Clarifier	4,001	cu. m/day	2		\$2,255,249	
Secondary sludge thicken	1,100,000	Dollars	1		\$1,100,000	
Sludge Dewatering	10,000	kg/day	1	Systems	\$2,600,000	
Submerged Outfall		cu. m/day	0	km long	-----	Exists
Roads	-----		0	Kilometres	-----	
Site allowances (arbitrary)	100,000	Dollars	Lump Sums		\$100,000	
Capital cost (excluding inflation and regional factors)					\$17,119,989	
(Regional factor = 1.05)			Capital Cost =		\$17,976,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1749 kw	\$0.022 \$/kW hour	\$307,806	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	1753 kg/day	\$0.40 \$/kg NH3	\$245,398	For Activated Sludge
Phosphoric Acid	913 kg/day	\$1.03 \$/kg H3PO4	\$329,020	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	115 kg/day	\$14.00 \$/kg	\$565,859	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	10 dry t/day	\$60.00 \$/dry tonne	\$210,000	
Maintenance	Total maintenance labour and materials =		\$449,400	2.5% of capital cost
	Annual Operating Cost =		\$2,871,000	

Description of System

1000 metres of effluent piping, 1 Effluent Pump Stations.

2 x 16 meter dia. Secondary Clarifiers

28900 cu. meter Activated Sludge Reactor with 1650 kW installed aeration

(Assumed activated sludge. Liquor disposal or anaerobic probably somewhat less expensive)

HOWE SOUND PULP & PAPER LTD. PORT MELLON B.C.

Effluent data ———>	76,841	6,535	19,572	(Flow cu. m/day TSS kg/d BOD kg/d)
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----
Gravity Pipeline 2	cu. m/day	0	km long	-----
Gravity Pipeline 3	cu. m/day	0	km long	-----
Forcemain 1	cu. m/day	0	km long	-----
Forcemain 2	cu. m/day	0	km long	-----
Pump Station 1	cu. m/day	0		-----
Pump Station 2	cu. m/day	0		-----
Pump Station 3	cu. m/day	0		-----
Lump Sum Piping	Dollars	-----	Lump Sum	-----
Primary Clarifier	cu. m/day	0		-----
Aerated Stabilisation Basin	BOD kg/d	0		-----
Activated Sludge Reactor	BOD kg/d	0		-----
Aerators	BOD kg/d	0	Systems	-----
Nutrient Addition		0	Systems	-----
Neutralisation		0	Systems	-----
Secondary Clarifier	cu. m/day	0		-----
Secondary sludge thickener	Dollars	0		-----
Sludge Dewatering	kg/day	0	Systems	-----
Submerged Outfall	cu. m/day	0	km long	-----
Roads		0	Kilometres	-----
Site allowances (arbitrary)	Dollars	-----	Lump Sums	-----
Capital cost (excluding inflation and regional factors)				<u>\$0</u>
(Regional factor = 1.20)		Capital Cost =		\$0
(Inflation factor = 1.00)				Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	#VALUE! kw	\$0.030 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$27.61 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$60.75 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$0	2.5% of capital cost
	Annual Operating Cost =		\$0	

Description of System

Current mill modernisation will bring effluent into compliance

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

ROLLAND INC.

MONT ROLLAND

QUEBEC

Effluent data ———>	11,571	166	575	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----	
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	cu. m/day	0	km long	-----	
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	cu. m/day	0		-----	
Pump Station 2	cu. m/day	0		-----	
Pump Station 3	cu. m/day	0		-----	
Lump Sum Piping	Dollars	-----	Lump Sum	-----	
Primary Clarifier	cu. m/day	0		-----	
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	BOD kg/d	0	Systems	-----	
Nutrient Addition		0	Systems	-----	
Neutralisation		0	Systems	-----	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0	Systems	-----	
Submerged Outfall	cu. m/day	0	km long	-----	
Roads		0	Kilometres	-----	
Polymer system studies	250,000 Dollars	-----	Lump Sums	\$250,000	
Capital cost (excluding inflation and regional factors)				\$250,000	
(Regional factor = 1.05)			Capital Cost =	\$263,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	kw	\$0.022 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for clarifier	35 kg/day	\$8.00 \$/kg	\$97,199	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	2 man hrs/d	\$50.88 \$/man hour	\$35,613	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.30 person	\$90,000 \$/year	\$27,000	
Sludge disposal	2 dry t/day	\$60.00 \$/dry tonne	\$42,000	
Maintenance	Total maintenance labour and materials	=	\$6,575	2.5% of capital cost
		Annual Operating Cost =	\$208,000	

Description of System

Add polymer to existing clarifier, and increase technical supervision

ST. ANNE NACKAWIC PULP & PAPER NACKAWIC

N.B.

Effluent data ———>	85,354	4,054	4,008	(Flow cu. m/day TSS kg/d BOD kg/d)
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----
Gravity Pipeline 2	cu. m/day	0	km long	-----
Gravity Pipeline 3	cu. m/day	0	km long	-----
Forcemain 1	cu. m/day	0	km long	-----
Forcemain 2	cu. m/day	0	km long	-----
Pump Station 1	cu. m/day	0		-----
Pump Station 2	cu. m/day	0		-----
Pump Station 3	cu. m/day	0		-----
Lump Sum Piping	Dollars	-----	Lump Sum	-----
Primary Clarifier	cu. m/day	0		-----
Aerated Stabilisation Basin	BOD kg/d	0		-----
Activated Sludge Reactor	BOD kg/d	0		-----
Aerators	BOD kg/d	0	Systems	-----
Nutrient Addition		0	Systems	-----
Neutralisation		0	Systems	-----
Secondary Clarifier	cu. m/day	0		-----
Secondary sludge thickener	Dollars	0		-----
Sludge Dewatering	kg/day	0	Systems	-----
Submerged Outfall	cu. m/day	0	km long	-----
Roads		0	Kilometres	-----
Site allowances (arbitrary)	Dollars	-----	Lump Sums	-----
Capital cost (excluding inflation and regional factors)				<u>\$0</u>
(Regional factor = 1.15)		Capital Cost =		\$0
(Inflation factor = 1.00)				Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	kw	\$0.044 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$0	2.5% of capital cost
	Annual Operating Cost =		\$0	

Description of System

Mill was marginally out of compliance with proposed regulations on basis of 1987 data, but recent modernisations should rectify this

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

MACMILLAN BLOEDEL LTD.

NANAIMO

B.C.

Effluent data -----> 150,000 9,065 30,000 (Flow cu. m/day | TSS kg/d | BOD kg/d) {BOD estimated}

EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS
Gravity Pipeline 1	150,000 cu. m/day	3 km long	\$3,159,877 ASB to existing outfall
Gravity Pipeline 2	cu. m/day	0 km long	-----
Gravity Pipeline 3	cu. m/day	0 km long	-----
Forcemain 1	150,000 cu. m/day	3 km long	\$2,337,923 Mill to ASB
Forcemain 2	cu. m/day	0 km long	-----
Pump Station 1	150,000 cu. m/day	1	\$2,236,068 To ASB
Pump Station 2	50,000 cu. m/day	1	\$1,290,994 Into clarifier
Pump Station 3	0 cu. m/day	0	-----
Lump Sum Piping	200,000 Dollars	----- Lump Sum	\$200,000 Misc collection & segregation
Primary Clarifier	50,000 cu. m/day	1	\$2,282,445 Additional capacity
Aerated Stabilisation Basin	30,000 BOD kg/d	1	\$10,000,000
Activated Sludge Reactor	BOD kg/d	0	-----
Aerators	30,000 BOD kg/d	1 Systems	\$3,420,000
Nutrient Addition	-----	0 Systems	-----
Neutralisation	-----	0 Systems	-----
Secondary Clarifier	cu. m/day	0	-----
Secondary sludge thickener	Dollars	0	-----
Sludge Dewatering	7,000 kg/day	1 Systems	\$2,570,000 Addition to existing system
Submerged Outfall	cu. m/day	0 km long	----- Exists
Roads	-----	0 Kilometres	-----
Site allowances (arbitrary)	1,500,000 Dollars	----- Lump Sums	\$1,500,000 Includes effluent flow reduction
Capital cost (excluding inflation and regional factors)			<u>\$28,997,307</u>
(Regional factor = 1.20)		Capital Cost =	\$34,797,000
(Inflation factor = 1.00)			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	2321 kw	\$0.030 \$/kW hour	\$556,920	Pumping + aeration + misc
Lime for neutralisation	20000 kg/day	\$0.09 \$/kg Cao	\$630,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	150 kg/day	\$0.37 \$/kg	\$19,425	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$27.61 \$/man hour	\$38,658	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$60.75 \$/man hour	\$85,047	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	7 dry t/day	\$60.00 \$/dry tonne	\$147,000	
Maintenance	Total maintenance labour and materials	=	\$869,925	2.5% of capital cost
		Annual Operating Cost =	\$2,377,000	

Description of System

6000 metres of effluent piping, 2 Effluent Pump Stations.
 46 meter dia. Primary Clarifier,
 5 day retention Aerated Stabilisation Basin with 1710 kW installed aeration
 Assumes effluent flow can be readily reduced (capital allowance of \$1.5M included)

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

MIRAMICHI P&P INC. (kraft & paper) NEWCASTLE N.B.

Effluent data	87,500	10,907	8,510	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	87,500	cu. m/day	0.2	km long	\$148,397 For additional cell in ASB
Gravity Pipeline 2		cu. m/day	0	km long	-----
Gravity Pipeline 3		cu. m/day	0	km long	-----
Forcemain 1		cu. m/day	0	km long	-----
Forcemain 2		cu. m/day	0	km long	-----
Pump Station 1		cu. m/day	0		-----
Pump Station 2	0	cu. m/day	0		-----
Pump Station 3	0	cu. m/day	0		-----
Lump Sum Piping	0	Dollars	-----	Lump Sum	-----
Primary Clarifier		cu. m/day	0		-----
Aerated Stabilisation Basin	10,000	BOD kg/d	1		\$4,107,067 Nominal capacity of new cell for existin
Activated Sludge Reactor		BOD kg/d	0		----- aerated stabilisation basin
Aerators	10,000	BOD kg/d	1	Systems	\$1,140,000
Nutrient Addition	-----		0	Systems	-----
Neutralisation	-----		0	Systems	-----
Secondary Clarifier		cu. m/day	0		-----
Secondary sludge thickener		Dollars	0		-----
Sludge Dewatering		kg/day	0	Systems	-----
Submerged Outfall		cu. m/day	0	km long	-----
Roads	-----		0	Kilometres	-----
Site allowances (arbitrary)	900,000	Dollars	-----	Lump Sums	\$900,000
Capital cost (excluding inflation and regional factors)					\$6,295,464
(Regional factor = 1.15)				Capital Cost =	\$7,240,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	599 kw	\$0.044 \$/kW hour	\$210,672	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	Exists
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	43 kg/day	\$0.37 \$/kg	\$5,511	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	No additional labour required
Technicians	man hrs/d	\$50.88 \$/man hour	-----	No additional labour required
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$181,000	2.5% of capital cost
	Annual Operating Cost =		\$397,000	

Description of System

200 metres of effluent piping,
 Upgrade to existing ASB
 2.9 day retention Aerated Stabilisation Basin with 570 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

SCOTT MARITIMES LTD.

NEW GLASGOW

N.S.

Effluent data	114,531	4,000	5,984	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS	
Gravity Pipeline 1	114,531 cu. m/day	0.5	km long	\$441,937	For ASB extension
Gravity Pipeline 2	cu. m/day	0	km long	---	
Gravity Pipeline 3	cu. m/day	0	km long	---	
Forcemain 1	cu. m/day	0	km long	---	
Forcemain 2	cu. m/day	0	km long	---	
Pump Station 1	cu. m/day	0		---	
Pump Station 2	cu. m/day	0		---	
Pump Station 3	cu. m/day	0		---	
Lump Sum Piping	Dollars	Lump Sum		---	
Primary Clarifier	cu. m/day	0		---	
Aerated Stabilisation Basin	12,000 BOD kg/d	1		\$4,760,676	Nominal Capacity for ASB extension
Activated Sludge Reactor	BOD kg/d	0		---	
Aerators	12,000 BOD kg/d	1	Systems	\$1,368,000	Nominal Capacity for ASB extension
Nutrient Addition		0	Systems	---	
Neutralisation		0	Systems	---	
Secondary Clarifier	cu. m/day	0		---	
Secondary sludge thickener	Dollars	0		---	
Sludge Dewatering	kg/day	0	Systems	---	
Submerged Outfall	cu. m/day	0	km long	---	
Roads		0	Kilometres	---	
Site allowances (arbitrary)	Dollars	Lump Sums		---	
Capital cost (excluding inflation and regional factors)				\$6,570,612	
(Regional factor = 1.15)		Capital Cost =		\$7,556,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	718 kw	\$0.044 \$/kW hour	\$252,806	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	---	
Ammonia	kg/day	\$0.40 \$/kg NH3	---	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	---	For Activated Sludge
Fertiliser for Nutrient	30 kg/day	\$0.37 \$/kg	\$3,875	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	---	
Operators	man hrs/d	\$23.13 \$/man hour	---	No additional labour required
Technicians	man hrs/d	\$50.88 \$/man hour	---	No additional labour required
Process Engineer	person	\$90,000 \$/year	---	No additional labour required
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	---	
Maintenance	Total maintenance labour and materials =		\$188,900	2.5% of capital cost
	Annual Operating Cost =		\$446,000	

Description of System

500 metres of effluent piping,

1.3 day retention Aerated Stabilisation Basin with 680 kW installed aeration (extension to existing ASB)

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

STONE-CONSOLIDATED INC.

NEW RICHMOND

QUEBEC

Effluent data	54,706	2,705	7,277	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	54,706 cu. m/day	0.5 km long		\$273,391	
Gravity Pipeline 2	cu. m/day	0 km long		---	
Gravity Pipeline 3	cu. m/day	0 km long		---	
Forcemain 1	20,000 cu. m/day	0.5 km long		\$85,977	To new clarifier
Forcemain 2	54,706 cu. m/day	1 km long		\$365,736	
Pump Station 1	20,000 cu. m/day	1		\$816,497	To new clarifier
Pump Station 2	54,706 cu. m/day	1		\$1,350,386	To ASB
Pump Station 3	0 cu. m/day	0		---	
Lump Sum Piping	0 Dollars	----- Lump Sum		---	
Primary Clarifier	15,000 cu. m/day	1		\$1,288,347	Partial flow adequate
Aerated Stabilisation Basin	7,277 BOD kg/d	1		\$3,174,656	
Activated Sludge Reactor	BOD kg/d	0		---	
Aerators	7,277 BOD kg/d	1 Systems		\$829,539	
Nutrient Addition	-----	0 Systems		---	
Neutralisation	-----	0 Systems		---	
Secondary Clarifier	cu. m/day	0		---	
Secondary sludge thickener	Dollars	0		---	
Sludge Dewatering	3,000 kg/day	1 Systems		\$2,530,000	
Submerged Outfall	cu. m/day	0 km long		---	Exists
Roads	-----	1 Kilometres		\$25,000	
Site allowances (arbitrary)	500,000 Dollars	----- Lump Sums		\$500,000	
Capital cost (excluding inflation and regional factors)				\$11,239,528	
(Regional factor = 1.05)				Capital Cost =	\$11,802,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	632 kw	\$0.022 \$/kW hour	\$111,164	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	---	
Ammonia	kg/day	\$0.40 \$/kg NH3	---	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	---	For Activated Sludge
Fertiliser for Nutrient	36 kg/day	\$0.37 \$/kg	\$4,712	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	---	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	---	
Maintenance	Total maintenance labour and materials	=	\$295,050	2.5% of capital cost
		Annual Operating Cost =	\$544,000	

Description of System

2000 metres of effluent piping, 2 Effluent Pump Stations.
 25 meter dia. Primary Clarifier,
 3.3 day retention Aerated Stabilisation Basin with 410 kW installed aeration

BELKIN PAPERBOARD

NEW WESTMINSTER

B.C.

Effluent data —>	13,068	1,748	6,392	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS	
Gravity Pipeline 1	13,068 cu. m/day	0.5	km long	\$107,792	ASB to existing outfall
Gravity Pipeline 2	cu. m/day	0	km long	—	
Gravity Pipeline 3	cu. m/day	0	km long	—	
Forcemain 1	13,068 cu. m/day	0.5	km long	\$62,482	Mill to ASB
Forcemain 2	cu. m/day	0	km long	—	
Pump Station 1	13,068 cu. m/day	1		\$659,987	
Pump Station 2	0 cu. m/day	0		—	
Pump Station 3	0 cu. m/day	0		—	
Lump Sum Piping	0 Dollars	Lump Sum		—	
Primary Clarifier	cu. m/day	0		—	Exists
Aerated Stabilisation Basin	6,392 BOD kg/d	1		\$2,858,091	
Activated Sludge Reactor	BOD kg/d	0		—	
Aerators	6,392 BOD kg/d	1	Systems	\$728,643	
Nutrient Addition	—	0	Systems	—	
Neutralisation	—	0	Systems	—	
Secondary Clarifier	cu. m/day	0		—	
Secondary sludge thickener	Dollars	0		—	
Sludge Dewatering	kg/day	0	Systems	—	
Submerged Outfall	cu. m/day	0	km long	—	Exists
Roads	—	0	Kilometres	—	
Site allowances (arbitrary)	100,000 Dollars	Lump Sums		\$100,000	
Capital cost (excluding inflation and regional factors)				\$4,516,995	
(Regional factor = 1.20)		Capital Cost =		\$5,420,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	417 kw	\$0.030 \$/kW hour	\$100,042	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	—	
Ammonia	kg/day	\$0.40 \$/kg NH3	—	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	—	For Activated Sludge
Fertiliser for Nutrient	32 kg/day	\$0.37 \$/kg	\$4,139	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	—	
Operators	4 man hrs/d	\$27.61 \$/man hour	\$38,658	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$60.75 \$/man hour	\$85,047	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	—	
Maintenance	Total maintenance labour and materials =		\$135,500	2.5% of capital cost
Annual Operating Cost =			\$393,000	

Description of System

1000 metres of effluent piping, 1 Effluent Pump Stations.

12.2 day retention Aerated Stabilisation Basin with 360 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

SCOTT PAPER LTD.

NEW WESTMINSTER

B.C.

Effluent data ----->	18,486	2,091	2,553	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----	
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	cu. m/day	0	km long	-----	
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	cu. m/day	0		-----	
Pump Station 2	cu. m/day	0		-----	
Pump Station 3	cu. m/day	0		-----	
Lump Sum Piping	Dollars	-----	Lump Sum	-----	
Pulp Handling	cu. m/day	0			\$2,000,000
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	BOD kg/d	0	Systems	-----	
Nutrient Addition		0	Systems	-----	
Neutralisation		0	Systems	-----	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0	Systems	-----	
Submerged Outfall	cu. m/day	0	km long	-----	
Roads		0	Kilometres	-----	
Site allowances (arbitrary)	200,000 Dollars	-----	Lump Sums		\$200,000
Capital cost (excluding inflation and regional factors)					\$2,200,000
(Regional factor = 1.20)			Capital Cost =		\$2,640,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	200 kw	\$0.030 \$/kW hour	\$48,000	
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$27.61 \$/man hour	\$38,658	Inc Fringes and Overhead
Technicians	man hrs/d	\$60.75 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Purchase pulp	60 dry t/day	\$200.00 \$/dry tonne	\$4,200,000	Replace groundwood
Maintenance	Total maintenance labour and materials =		\$66,000	2.5% of capital cost
		Annual Operating Cost =	\$4,353,000	

Description of System

Shut down groundwood mill and purchase pulp

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

E.B. EDDY FOREST PRODUCTS LTD.

OTTAWA

ONTARIO

Effluent data ———>	9,938	460	1,600	(Flow cu. m/day TSS kg/d BOD kg/d)
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----
Gravity Pipeline 2	cu. m/day	0	km long	-----
Gravity Pipeline 3	cu. m/day	0	km long	-----
Forcemain 1	cu. m/day	0	km long	-----
Forcemain 2	cu. m/day	0	km long	-----
Pump Station 1	cu. m/day	0		-----
Pump Station 2	cu. m/day	0		-----
Pump Station 3	cu. m/day	0		-----
Lump Sum Piping	Dollars	-----	Lump Sum	-----
Primary Clarifier	cu. m/day	0		-----
Aerated Stabilisation Basin	BOD kg/d	0		-----
Activated Sludge Reactor	BOD kg/d	0		-----
Aerators	BOD kg/d	0	Systems	-----
Nutrient Addition		0	Systems	-----
Neutralisation		0	Systems	-----
Secondary Clarifier	cu. m/day	0		-----
Secondary sludge thickener	Dollars	0		-----
Sludge Dewatering	kg/day	0	Systems	-----
Submerged Outfall	cu. m/day	0	km long	-----
Roads		0	Kilometres	-----
WW tankage and polymer	400,000	Dollars	-----	Lump Sums \$400,000
Capital cost (excluding inflation and regional factors)				<u>\$400,000</u>
(Regional factor = 1.05)			Capital Cost =	\$420,000
(Inflation factor = 1.00)				Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	kw	\$0.038 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for clarifier	20 kg/day	\$8.00 \$/kg	\$55,650	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$6,300	1.5% of capital cost
		Annual Operating Cost =	\$133,000	

Description of System

Add polymer to existing clarifier
 Improve internal white water handling

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

WEYERHAEUSER CANADA LTD. PRINCE ALBERT SASK.

Effluent data —>	130,750	12,050	5,870	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	----	
Gravity Pipeline 2	cu. m/day	0	km long	----	
Gravity Pipeline 3	cu. m/day	0	km long	----	
Forcemain 1	cu. m/day	0	km long	----	
Forcemain 2	cu. m/day	0	km long	----	
Pump Station 1	cu. m/day	0		----	
Pump Station 2	cu. m/day	0		----	
Pump Station 3	cu. m/day	0		----	
Lump Sum Piping	Dollars	-----	Lump Sum	----	
Primary Clarifier	cu. m/day	0		----	
Aerated Stabilisation Basin	10,000 BOD kg/d	1		\$4,107,067	Nominal capacity ASB extension
Activated Sludge Reactor	BOD kg/d	0		----	
Aerators	10,000 BOD kg/d	1	Systems	\$1,140,000	
Nutrient Addition	-----	0	Systems	----	
Neutralisation	-----	0	Systems	----	
Secondary Clarifier	cu. m/day	0		----	
Secondary sludge thickener	Dollars	0		----	
Sludge Dewatering	kg/day	0	Systems	----	
Submerged Outfall	cu. m/day	0	km long	----	Exists
Roads	-----	0	Kilometres	----	
Site allowances (arbitrary)	1,300,000 Dollars	-----	Lump Sums	\$1,300,000	
Capital cost (excluding inflation and regional factors)				\$6,547,067	
(Regional factor = 1.10)			Capital Cost =	\$7,202,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	599 kw	\$0.038 \$/kW hour	\$181,944	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	----	
Ammonia	kg/day	\$0.40 \$/kg NH3	----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	----	For Activated Sludge
Fertiliser for Nutrient	29 kg/day	\$0.37 \$/kg	\$3,801	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	----	
Operators	man hrs/d	\$23.13 \$/man hour	----	No additional labour required
Technicians	man hrs/d	\$50.88 \$/man hour	----	No additional labour required
Process Engineer	person	\$90,000 \$/year	----	No additional labour required
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	----	
Maintenance	Total maintenance labour and materials =		\$180,050	2.5% of capital cost
		Annual Operating Cost =	\$366,000	

Description of System

1.9 day retention Aerated Stabilisation Basin with 570 kW installed aeration
(Additional cell for existing ASB)

NORTHWOOD PULP & TIMBER LTD. PRINCE GEORGE B.C.

Effluent data ———>	178,853	14,841	10,362	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	178,853 cu. m/day	0.5 km long		\$590,448	to new cell in ASB
Gravity Pipeline 2	cu. m/day	0 km long		-----	
Gravity Pipeline 3	cu. m/day	0 km long		-----	
Forcemain 1	cu. m/day	0 km long		-----	
Forcemain 2	cu. m/day	0 km long		-----	
Pump Station 1	cu. m/day	0		-----	
Pump Station 2	0 cu. m/day	0		-----	
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	0 Dollars	----- Lump Sum		-----	
Primary Clarifier	cu. m/day	0		-----	
Aerated Stabilisation Basin	10,000 BOD kg/d	1		\$4,107,067	Nominal capacity of increase in existing ASB
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	10,000 BOD kg/d	1 Systems		\$1,140,000	
Nutrient Addition	-----	0 Systems		-----	
Neutralisation	-----	0 Systems		-----	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0 Systems		-----	
Submerged Outfall	cu. m/day	0 km long		-----	Use existing outfall
Roads	-----	0 Kilometres		-----	
Site allowances (arbitrary)	500,000 Dollars	----- Lump Sums		\$500,000	
Capital cost (excluding inflation and regional factors)				\$6,337,514	
(Regional factor = 1.20)		Capital Cost =		\$7,605,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	599 kw	\$0.030 \$/kW hour	\$143,640	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	52 kg/day	\$0.37 \$/kg	\$6,709	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$27.61 \$/man hour	-----	No additional labour required
Technicians	man hrs/d	\$60.75 \$/man hour	-----	No additional labour required
Process Engineer	person	\$90,000 \$/year	-----	No additional labour required
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$190,125	2.5% of capital cost
		Annual Operating Cost =	\$340,000	

Description of System

500 metres of effluent piping,
 Additional cell for existing ASB
 1.4 day retention Aerated Stabilisation Basin with 570 kW installed aeration

PRINCE GEORGE P&P with INTERCON PRINCE GEORGE

B.C.

Effluent data ----- >	182,933	12,340	9,917	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	-----
Gravity Pipeline 2		cu. m/day	0	km long	-----
Gravity Pipeline 3		cu. m/day	0	km long	-----
Forcemain 1		cu. m/day	0	km long	-----
Forcemain 2		cu. m/day	0	km long	-----
Pump Station 1		cu. m/day	0		-----
Pump Station 2		cu. m/day	0		-----
Pump Station 3		cu. m/day	0		-----
Lump Sum Piping		Dollars	-----	Lump Sum	-----
Primary Clarifier		cu. m/day	0		-----
Aerated Stabilisation Basin	10,000	BOD kg/d	1		\$4,107,067 Nominal capacity for additional cell
Activated Sludge Reactor		BOD kg/d	0		-----
Aerators	10,000	BOD kg/d	0	Systems	-----
Nutrient Addition	-----		0	Systems	-----
Neutralisation	-----		0	Systems	-----
Secondary Clarifier		cu. m/day	0		-----
Secondary sludge thickener		Dollars	0		-----
Sludge Dewatering	0	kg/day	0	Systems	-----
Submerged Outfall		cu. m/day	0	km long	----- Use existing
Roads	-----		0	Kilometres	-----
Site allowances (arbitrary)	1,800,000	Dollars	-----	Lump Sums	\$1,800,000
Capital cost (excluding inflation and regional factors)					\$5,907,067
(Regional factor = 1.20)			Capital Cost =		\$7,088,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	599 kw	\$0.030 \$/kW hour	\$143,640	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	50 kg/day	\$0.37 \$/kg	\$6,421	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$27.61 \$/man hour	\$38,658	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$60.75 \$/man hour	\$85,047	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$177,200	2.5% of capital cost
		Annual Operating Cost =	\$481,000	

Description of System

1.4 day retention Aerated Stabilisation Basin with 570 kW installed aeration
 U(Additional cell for existing ASB)

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

ABITIBI PRICE INC.

PINE FALLS

MANITOBA

Effluent data ———>	50,889	10,915	35,338	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	50,889	cu. m/day	0.5	km long	\$260,834 Secondary clarifier to existing outfall
Gravity Pipeline 2		cu. m/day	0	km long	-----
Gravity Pipeline 3		cu. m/day	0	km long	-----
Forcemain 1	50,889	cu. m/day	0	km long	----- To activated sludge reactor
Forcemain 2		cu. m/day	0	km long	-----
Pump Station 1	50,889	cu. m/day	1		\$1,302,418 To activated sludge reactor
Pump Station 2	0	cu. m/day	0		-----
Pump Station 3	0	cu. m/day	0		-----
Lump Sum Piping	100,000	Dollars	----- Lump Sum		\$100,000
Primary Clarifier		cu. m/day	0		----- Exists
Aerated Stabilisation Basin		BOD kg/d	0		-----
Activated Sludge Reactor	35,338	BOD kg/d	1		\$9,545,978 Select activated sludge due to climate
Aerators	35,338	BOD kg/d	1	Systems	\$4,028,558 and fact that an ASB would have to be
Nutrient Addition	-----		1	Systems	\$400,000 about 20 days retention and would
Neutralisation	-----		1	Systems	\$200,000 probably not comply with TSS limit
Secondary Clarifier	25,444	cu. m/day	2		\$4,950,371
Secondary sludge thickener		Dollars	0		-----
Sludge Dewatering	12,000	kg/day	1	Systems	\$2,620,000
Submerged Outfall		cu. m/day	0	km long	----- Exists
Roads	-----		0	Kilometres	-----
Site allowances (arbitrary)	500,000	Dollars	----- Lump Sums		\$500,000
Capital cost (excluding inflation and regional factors)					\$23,908,158
(Regional factor = 1.10)					Capital Cost = \$26,299,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	2249 kw	\$0.037 \$/kW hour	\$665,578	Pumping + aeration + misc
Lime for neutralisation	5000 kg/day	\$0.09 \$/kg Cao	\$157,500	
Ammonia	2146 kg/day	\$0.40 \$/kg NH3	\$300,375	For Activated Sludge
Phosphoric Acid	1117 kg/day	\$1.03 \$/kg H3PO4	\$402,730	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	141 kg/day	\$14.00 \$/kg	\$692,629	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	12 dry t/day	\$60.00 \$/dry tonne	\$252,000	
Maintenance	Total maintenance labour and materials = \$657,475			2.5% of capital cost
Annual Operating Cost =				\$3,892,000

Description of System

500 metres of effluent piping, 1 Effluent Pump Stations.
 2 x 41 meter dia. Secondary Clarifiers
 44200 cu. meter Activated Sludge Reactor with 2010 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

STONE-CONSOLIDATED INC.

PORTAGE-DU-FORT

QUEBEC

Effluent data ———>	74,519	3,709	6,614	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day		0 km long	-----	
Gravity Pipeline 2	cu. m/day		0 km long	-----	
Gravity Pipeline 3	cu. m/day		0 km long	-----	
Forcemain 1	cu. m/day		0 km long	-----	
Forcemain 2	cu. m/day		0 km long	-----	
Pump Station 1	cu. m/day		0	-----	
Pump Station 2	cu. m/day		0	-----	
Pump Station 3	cu. m/day		0	-----	
Lump Sum Piping	100,000	Dollars	----- Lump Sum	\$100,000	
Primary Clarifier	cu. m/day		0	-----	
Aerated Stabilisation Basin	5,000	BOD kg/d	1	\$2,342,596	Nominal capacity for additional cell for existing ASB
Activated Sludge Reactor		BOD kg/d	0	-----	
Aerators	5,000	BOD kg/d	1 Systems	\$570,000	
Nutrient Addition	-----		0 Systems	-----	
Neutralisation	-----		0 Systems	-----	
Secondary Clarifier		cu. m/day	0	-----	
Secondary sludge thickener		Dollars	0	-----	
Sludge Dewatering		kg/day	0 Systems	-----	
Submerged Outfall		cu. m/day	0 km long	-----	Use existing
Roads	-----		0 Kilometres	-----	
Site allowances (arbitrary)	700,000	Dollars	----- Lump Sums	\$700,000	
Capital cost (excluding inflation and regional factors)				\$3,712,596	
(Regional factor = 1.05)			Capital Cost =	\$3,898,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	299 kw	\$0.022 \$/kW hour	\$52,668	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	33 kg/day	\$0.37 \$/kg	\$4,283	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	No additional labour required
Technicians	man hrs/d	\$50.88 \$/man hour	-----	No additional labour required
Process Engineer	person	\$90,000 \$/year	-----	No additional labour required
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$97,450	2.5% of capital cost
		Annual Operating Cost =	\$154,000	

Description of System

Add cell to existing ASB
 1.7 day retention Aerated Stabilisation Basin with 290 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

BPCO INC.

PONT ROUGE

QUEBEC

Effluent data ----->	8,244	2,171	7,147	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	8,244 cu. m/day		1 km long	\$159,798	ASB to river
Gravity Pipeline 2	cu. m/day		0 km long	-----	
Gravity Pipeline 3	cu. m/day		0 km long	-----	
Forcemain 1	8,244 cu. m/day		2 km long	\$176,915	Mill to ASB
Forcemain 2	cu. m/day		0 km long	-----	
Pump Station 1	8,244 cu. m/day		1	\$524,206	
Pump Station 2	0 cu. m/day		0	-----	
Pump Station 3	0 cu. m/day		0	-----	
Lump Sum Piping	0 Dollars		----- Lump Sum	-----	
Primary Clarifier	cu. m/day		0	-----	Use existing settling tanks
Aerated Stabilisation Basin	7,147 BOD kg/d		1	\$3,128,634	
Activated Sludge Reactor	BOD kg/d		0	-----	
Aerators	7,147 BOD kg/d		1 Systems	\$814,718	
Nutrient Addition	-----		0 Systems	-----	
Neutralisation	-----		0 Systems	-----	
Secondary Clarifier	cu. m/day		0	-----	
Secondary sludge thickener	Dollars		0	-----	
Sludge Dewatering	kg/day		0 Systems	-----	
Submerged Outfall	8,244 cu. m/day		0.1 km long	\$291,752	
Roads	-----		0 Kilometres	-----	
Site allowances (arbitrary)	100,000 Dollars		----- Lump Sums	\$100,000	
Capital cost (excluding inflation and regional factors)				\$5,196,022	
(Regional factor = 1.05)			Capital Cost =	\$5,456,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	449 kw	\$0.022 \$/kW hour	\$79,089	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	36 kg/day	\$0.37 \$/kg	\$4,627	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$136,400	2.5% of capital cost
		Annual Operating Cost =	\$353,000	

Description of System

3000 metres of effluent piping, 1 Effluent Pump Stations.

Aerated Stabilisation Basin with 330 kwh installed aeration
Submerged Outfall 100 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

J. FORD & COMPANY LTD.

PORTNEUF

QUEBEC

Effluent data ----->	8,764	2,357	3,419	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	8,764	cu. m/day	0.5	km long	\$83,140 Secondary clarifier to river
Gravity Pipeline 2		cu. m/day	0	km long	-----
Gravity Pipeline 3		cu. m/day	0	km long	-----
Forcemain 1	8,764	cu. m/day	0.5	km long	\$46,305 Mill to ASB
Forcemain 2		cu. m/day	0	km long	-----
Pump Station 1	8,764	cu. m/day	1		\$540,486 Require two stations for restricted site
Pump Station 2	4,764	cu. m/day	1		\$398,487
Pump Station 3	0	cu. m/day	0		-----
Lump Sum Piping	1,000,000	Dollars	-----	Lump Sum	\$1,000,000 Effluent collection
Primary Clarifier	8,764	cu. m/day	1		\$998,084
Aerated Stabilisation Basin		BOD kg/d	0		-----
Activated Sludge Reactor	3,419	BOD kg/d	1		\$1,780,330
Aerators	3,419	BOD kg/d	1	Systems	\$389,759
Nutrient Addition	-----		1	Systems	\$400,000
Neutralisation	-----		0	Systems	-----
Secondary Clarifier	4,382	cu. m/day	2		\$2,344,049
Secondary sludge thickener		Dollars	0		-----
Sludge Dewatering	4,000	kg/day	0	Systems	-----
Submerged Outfall	8,764	cu. m/day	0.1	km long	\$298,978
Roads	-----		0	Kilometres	-----
Site allowances (arbitrary)	100,000	Dollars	-----	Lump Sums	\$100,000
Capital cost (excluding inflation and regional factors)					\$8,379,619
(Regional factor = 1.05)				Capital Cost =	\$8,799,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	240 kw	\$0.222 \$/kW hour	\$42,263	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	208 kg/day	\$0.40 \$/kg NH3	\$29,061	For Activated Sludge
Phosphoric Acid	108 kg/day	\$1.03 \$/kg H3PO4	\$38,964	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	14 kg/day	\$14.00 \$/kg	\$67,011	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$219,975	2.5% of capital cost
		Annual Operating Cost =	\$1,161,000	

Description of System

1000 metres of effluent piping, 2 Effluent Pump Stations.
 19 meter dia. Primary Clarifier, 2 x 17 meter dia. Secondary Clarifiers
 5700 cu. meter Activated Sludge Reactor with 190 kW installed aeration
 Submerged Outfall 100 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

MACMILLAN BLOEDEL LTD.

POWELL RIVER

B.C.

Effluent data	388,966	28,016	34,147	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	388,966 cu. m/day	1	km long	\$1,956,736	Secondary clarifiers to existing outfall
Gravity Pipeline 2	cu. m/day	0	km long	---	
Gravity Pipeline 3	cu. m/day	0	km long	---	
Forcemain 1	388,966 cu. m/day	1	km long	\$1,592,482	Mill to activated sludge reactor
Forcemain 2	cu. m/day	0	km long	---	
Pump Station 1	388,966 cu. m/day	1		\$3,600,770	Mill to activated sludge reactor
Pump Station 2	cu. m/day	1			
Pump Station 3	0 cu. m/day	0		---	
Lump Sum Piping	2,000,000 Dollars		Lump Sum	\$2,000,000	Difficult site
Primary Clarifier	cu. m/day	0		---	Existing adequate for an activated slud system
Aerated Stabilisation Basin	BOD kg/d	0		---	
Activated Sludge Reactor	34,147 BOD kg/d	1		\$11,750,535	
Aerators	34,147 BOD kg/d	1	Systems	\$3,892,748	
Nutrient Addition	-----	1	Systems	\$400,000	
Neutralisation	-----	1	Systems	\$200,000	
Secondary Clarifier	194,483 cu. m/day	2		\$11,749,952	
Secondary sludge thicken	1,100,000 Dollars	1		\$1,100,000	
Sludge Dewatering	15,000 kg/day	2	Systems	\$5,300,000	
Submerged Outfall	cu. m/day	0	km long	---	Exists
Roads	-----	0	Kilometres	---	
Site allowances (arbitrary)	3,900,000 Dollars		Lump Sums	\$3,900,000	
Capital cost (excluding inflation and regional factors)				<u>\$47,443,222</u>	
(Regional factor = 1.20)			Capital Cost =	\$56,932,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	3065 kw	\$0.030 \$/kW hour	\$735,535	Pumping + aeration + misc
Lime for neutralisation	8000 kg/day	\$0.09 \$/kg Cao	\$252,000	
Ammonia	2073 kg/day	\$0.40 \$/kg NH3	\$290,249	For Activated Sludge
Phosphoric Acid	1079 kg/day	\$1.03 \$/kg H3PO4	\$389,154	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	137 kg/day	\$14.00 \$/kg	\$669,279	
Operators	48 man hrs/d	\$27.61 \$/man hour	\$463,890	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$60.75 \$/man hour	\$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	15 dry t/day	\$60.00 \$/dry tonne	\$315,000	
Maintenance	Total maintenance labour and materials	=	\$1,423,300	2.5% of capital cost
		Annual Operating Cost =	\$4,969,000	

Description of System

2000 metres of effluent piping, 2 Effluent Pump Stations.

2 x 115 meter dia. Secondary Clarifiers

56900 cu. meter Activated Sludge Reactor with 1950 kW installed aeration

SKEENA CELLULOSE INC.

PRINCE RUPERT

B.C.

Effluent data ———>	161,101	10,755	42,575	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	161,101 cu. m/day		1 km long	\$1,103,326	Secondary clarifiers to existing outfall
Gravity Pipeline 2	cu. m/day		0 km long	—	
Gravity Pipeline 3	cu. m/day		0 km long	—	
Forcemain 1	60,000 cu. m/day		1 km long	\$391,971	Bleach to activated sludge reactor
Forcemain 2	70,000 cu. m/day		1 km long	\$440,012	Clarifier to activated sludge reactor
Pump Station 1	60,000 cu. m/day		1	\$1,414,214	
Pump Station 2	70,000 cu. m/day		1	\$1,527,525	
Pump Station 3	0 cu. m/day		0	—	
Lump Sum Piping	1,000,000 Dollars		———— Lump Sum	\$1,000,000	Restricted site
Primary Clarifier	70,000 cu. m/day		1	\$2,678,003	
Aerated Stabilisation Basin	BOD kg/d		0	—	
Activated Sludge Reactor	42,575 BOD kg/d		1	\$19,634,061	High cost due to site
Aerators	42,575 BOD kg/d		1 Systems	\$4,853,537	Select activated sludge due to restricted
Nutrient Addition	————		1 Systems	\$400,000	space
Neutralisation	————		1 Systems	\$200,000	
Secondary Clarifier	80,551 cu. m/day		2	\$11,000,000	High cost due to site
Secondary sludge thicken	1,100,000 Dollars		1	\$1,100,000	
Sludge Dewatering	25,000 kg/day		2 Systems	\$5,500,000	
Submerged Outfall	cu. m/day		0 km long	—	Exists
Roads	————		0 Kilometres	—	
Site allowances (arbitrary)	9,000,000 Dollars		———— Lump Sums	\$9,000,000	Poor constructin conditions
Capital cost (excluding inflation and regional factors)				<u>\$60,242,648</u>	
(Regional factor = 1.20)			Capital Cost =	<u>\$72,291,000</u>	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	2889 kw	\$0.030 \$/kW hour	\$693,446	Pumping + aeration + misc
Lime for neutralisation	22000 kg/day	\$0.09 \$/kg Cao	\$693,000	
Ammonia	2585 kg/day	\$0.40 \$/kg NH3	\$361,887	For Activated Sludge
Phosphoric Acid	1346 kg/day	\$1.03 \$/kg H3PO4	\$485,203	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	170 kg/day	\$14.00 \$/kg	\$834,468	
Operators	48 man hrs/d	\$27.61 \$/man hour	\$463,890	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$60.75 \$/man hour	\$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	20 dry t/day	\$60.00 \$/dry tonne	\$420,000	
Maintenance	Total maintenance labour and materials	=	\$1,807,275	2.5% of capital cost
		Annual Operating Cost =	<u>\$6,189,000</u>	

Description of System

3000 metres of effluent piping, 2 Effluent Pump Stations.
 54 meter dia. Primary Clarifier, 2 x 74 meter dia. Secondary Clarifiers
 106400 cu. meter Activated Sludge Reactor with 2430 kW installed aeration
 (Company is presently building an oxygen activated sludge system)

DAISHOWA FOREST PRODUCTS LTD. QUEBEC

QUEBEC

Effluent data ———>	185,295	9,389	90,020	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	185,295 cu. m/day		0 km long	-----	
Gravity Pipeline 2	cu. m/day		0 km long	-----	
Gravity Pipeline 3	cu. m/day		0 km long	-----	
Forcemain 1	185,295 cu. m/day		0.5 km long	\$456,571	Clarifier to act sludge reactor
Forcemain 2	cu. m/day		0 km long	-----	
Pump Station 1	185,295 cu. m/day		1	\$2,485,257	Clarifier to act sludge reactor
Pump Station 2	0 cu. m/day		0	-----	
Pump Station 3	0 cu. m/day		0	-----	
Lump Sum Piping	0 Dollars		----- Lump Sum	-----	
Primary Clarifier	cu. m/day		0	-----	
Aerated Stabilisation Basin	BOD kg/d		0	-----	
Activated Sludge Reactor	90,020 BOD kg/d		1	\$20,550,284	
Aerators	90,020 BOD kg/d		1 Systems	\$10,262,285	
Nutrient Addition	-----		1 Systems	\$400,000	
Neutralisation	-----		1 Systems	\$200,000	
Secondary Clarifier	92,648 cu. m/day		2	\$8,573,647	
Secondary sludge thickeners	1,100,000 Dollars		2	\$2,200,000	
Sludge Dewatering	36,000 kg/day		2 Systems	\$5,720,000	
Submerged Outfall	185,295 cu. m/day		0 km long	-----	Use city outfall
Roads	-----		0 Kilometres	-----	
Site allowances (arbitrary)	1,900,000 Dollars		----- Lump Sums	\$1,900,000	
Capital cost (excluding inflation and regional factors)				<u>\$52,748,043</u>	
(Regional factor = 1.05)			Capital Cost =	\$55,385,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	5874 kw	\$0.022 \$/kW hour	\$1,033,841	Pumping + aeration + misc
Lime for neutralisation	7000 kg/day	\$0.09 \$/kg Cao	\$220,500	
Ammonia	5466 kg/day	\$0.40 \$/kg NH3	\$765,170	For Activated Sludge
Phosphoric Acid	2846 kg/day	\$1.03 \$/kg H3PO4	\$1,025,909	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	360 kg/day	\$14.00 \$/kg	\$1,764,393	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	36 dry t/day	\$60.00 \$/dry tonne	\$756,000	
Maintenance	Total maintenance labour and materials	=	\$1,384,625	2.5% of capital cost
		Annual Operating Cost =	\$7,714,000	

Description of System

500 metres of effluent piping, 1 Effluent Pump Stations.
 2 x 79 meter dia. Secondary Clarifiers
 112500 cu. meter Activated Sludge Reactor with 5130 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

CARIBOO PULP & PAPER CO.

QUESNEL

B.C.

Effluent data ———>	117,900	9,765	4,940	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	-----
Gravity Pipeline 2		cu. m/day	0	km long	-----
Gravity Pipeline 3		cu. m/day	0	km long	-----
Forcemain 1		cu. m/day	0	km long	-----
Forcemain 2		cu. m/day	0	km long	-----
Pump Station 1		cu. m/day	0		-----
Pump Station 2		cu. m/day	0		-----
Pump Station 3		cu. m/day	0		-----
Lump Sum Piping	100,000	Dollars	-----	Lump Sum	\$100,000
Primary Clarifier		cu. m/day	0		-----
Aerated Stabilisation Basin	5,000	BOD kg/d	1		\$2,342,596 Add one cell to existing ASB
Activated Sludge Reactor		BOD kg/d	0		-----
Aerators	5,000	BOD kg/d	1	Systems	\$570,000
Nutrient Addition	-----		0	Systems	-----
Neutralisation	-----		0	Systems	-----
Secondary Clarifier		cu. m/day	0		-----
Secondary sludge thickener		Dollars	0		-----
Sludge Dewatering		kg/day	0	Systems	-----
Submerged Outfall		cu. m/day	0	km long	----- Existing outfall is adequate
Roads	-----		0	Kilometres	-----
Site allowances (arbitrary)	1,200,000	Dollars	-----	Lump Sums	\$1,200,000
Capital cost (excluding inflation and regional factors)					<u>\$4,212,596</u>
(Regional factor = 1.20)			Capital Cost =		\$5,055,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	299 kw	\$0.030 \$/kW hour	\$71,820	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	25 kg/day	\$0.37 \$/kg	\$3,199	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$27.61 \$/man hour	-----	No additional labour required
Technicians	man hrs/d	\$60.75 \$/man hour	-----	No additional labour required
Process Engineer	person	\$90,000 \$/year	-----	No additional labour required
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$126,375	2.5% of capital cost
		Annual Operating Cost =	\$201,000	

Description of System

1.1 day retention Aerated Stabilisation Basin with 290 kW installed aeration (Additional cell for existing ASB)

QUESNEL RIVER PULP CO.

QUESNEL

B.C.

Effluent data ----->	13,529	14,360	11,967	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----	
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	cu. m/day	0	km long	-----	
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	cu. m/day	0		-----	
Pump Station 2	cu. m/day	0		-----	
Pump Station 3	cu. m/day	0		-----	
Lump Sum Piping	Dollars	-----	Lump Sum	-----	
Primary Clarifier	cu. m/day	0		-----	
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	BOD kg/d	0	Systems	-----	
Nutrient Addition		0	Systems	-----	
Neutralisation		0	Systems	-----	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0	Systems	-----	
Submerged Outfall	cu. m/day	0	km long	-----	
Roads		0	Kilometres	-----	Allowance for rectifying problems with
Rectify anaerobic system	5,000,000	Dollars	-----	Lump Sums	\$5,000,000 anaerobic treatments system
Capital cost (excluding inflation and regional factors)					<u>\$5,000,000</u>
(Regional factor = 1.20)			Capital Cost =		\$6,000,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	kw	\$0.030 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	-----	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	-----	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	-----	\$14.00 \$/kg	-----	
Operators	0 man hrs/d	\$27.61 \$/man hour	-----	Inc Fringes and Overhead
Technicians	8 man hrs/d	\$60.75 \$/man hour	\$170,093	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	Staff to optimise operation
Sludge disposal	-----	dry t/day \$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =			\$150,000 2.5% of capital cost
		Annual Operating Cost =	\$410,000	

Description of System

Allowance for rectifying problems with existing anaerobic treatment system

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

DOMTAR INC.

RED ROCK

ONTARIO

Effluent data ———>	120,625	4,800	19,901	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	120,625 cu. m/day	0.5 km long		\$457,082	ASB ro shore of Lake Superior
Gravity Pipeline 2	cu. m/day	0 km long		-----	
Gravity Pipeline 3	cu. m/day	0 km long		-----	
Forcemain 1	120,625 cu. m/day	1 km long		\$661,787	Mill to ASB
Forcemain 2	cu. m/day	0 km long		-----	
Pump Station 1	120,625 cu. m/day	1		\$2,005,202	Mill to ASB
Pump Station 2	0 cu. m/day	0		-----	
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	200,000 Dollars	----- Lump Sum		\$200,000	Collection to pump station
Primary Clarifier	cu. m/day	0		-----	Use existing
Aerated Stabilisation Basin	19,901 BOD kg/d	1		\$7,171,706	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	19,901 BOD kg/d	1 Systems		\$2,268,727	
Nutrient Addition	-----	0 Systems		-----	
Neutralisation	-----	0 Systems		-----	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0 Systems		-----	
Submerged Outfall	120,625 cu. m/day	0.5 km long		\$4,266,858	
Roads	-----	0 Kilometres		-----	
Site allowances (arbitrary)	1,200,000 Dollars	----- Lump Sums		\$1,200,000	
Capital cost (excluding inflation and regional factors)				<u>\$18,231,362</u>	
(Regional factor = 1.05)		Capital Cost =		<u>\$19,143,000</u>	BOD estimated since
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	1508 kw	\$0.038 \$/kW hour	\$458,348	Pumping + aeration + misc
Lime for neutralisation	2000 kg/day	\$0.09 \$/kg Cao	\$63,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	100 kg/day	\$0.37 \$/kg	\$12,886	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$478,575	2.5% of capital cost
		Annual Operating Cost =	<u>\$1,146,000</u>	

Description of System

1500 metres of effluent piping, 1 Effluent Pump Stations.

4.1 day retention Aerated Stabilisation Basin with 1130 kW installed aeration
Submerged Outfall 500 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

ROLLAND INC.

SAINT JEROME

QUEBEC

Effluent data ———>	17,211	2,316	3,268	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS	
Gravity Pipeline 1	17,211 cu. m/day	0.3	km long	\$77,355	Effluent collection
Gravity Pipeline 2	17,211 cu. m/day	0.8	km long	\$206,280	Secondary clarifier to outfall
Gravity Pipeline 3	cu. m/day	0	km long	—	
Forcemain 1	17,211 cu. m/day	0.3	km long	\$46,092	To activated sludge reactor
Forcemain 2	cu. m/day	0	km long	—	
Pump Station 1	17,211 cu. m/day	1		\$757,435	To activated sludge reactor
Pump Station 2	cu. m/day	0		—	
Pump Station 3	cu. m/day	0		—	
Lump Sum Piping	50,000 Dollars	Lump Sum		\$50,000	Misc collection
Primary Clarifier	cu. m/day	0		—	Existing in-plant system is adequate
Aerated Stabilisation Basin	BOD kg/d	0		—	
Activated Sludge Reactor	3,268 BOD kg/d	1		\$1,354,991	
Aerators	3,268 BOD kg/d	1	Systems	\$372,516	
Nutrient Addition		1	Systems	\$400,000	
Neutralisation		0	Systems	—	
Secondary Clarifier	8,606 cu. m/day	2		\$3,122,797	
Secondary sludge thickener	Dollars	0		—	
Sludge Dewatering	1,000 kg/day	1	Systems	\$1,673,333	
Submerged Outfall	cu. m/day		km long	—	
Roads		0	Kilometres	—	
	Dollars	Lump Sums		—	
Capital cost (excluding inflation and regional factors)				<u>\$8,060,800</u>	
(Regional factor = 1.05)		Capital Cost =		<u>\$8,464,000</u>	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	241 kw	\$0.022 \$/kW hour	\$42,372	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	—	
Ammonia	198 kg/day	\$0.40 \$/kg NH3	\$27,775	For Activated Sludge
Phosphoric Acid	103 kg/day	\$1.03 \$/kg H3PO4	\$37,240	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer	52 kg/day	\$14.00 \$/kg	\$253,005	
Operators	man hrs/d	\$23.13 \$/man hour	—	Inc Fringes and Overhead
Technicians	8 man hrs/d	\$50.88 \$/man hour	\$142,450	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.50 person	\$90,000 \$/year	\$45,000	
Sludge disposal	1 dry t/day	\$60.00 \$/dry tonne	\$21,000	
Maintenance	Total maintenance labour and materials =		\$211,600	2.5% of capital cost
		Annual Operating Cost =	<u>\$780,000</u>	

Description of System

1400 metres of effluent piping, 1 Effluent Pump Stations.
 2 x 24 meter dia. Secondary Clarifiers
 4100 cu. meter Activated Sludge Reactor with 190 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

ST. RAYMOND PAPER (1983) INC. SAINT RAYMOND QUEBEC

Effluent data -----> 13,941 4,894 8,000 (Flow cu. m/day | TSS kg/d | BOD kg/d) [BOD estiamted}

EQUIPMENT DESIGN LOAD QUANTITY COMMENTS

Gravity Pipeline 1	13,941	cu. m/day	1	km long	\$224,846	Secy clarifier to river
Gravity Pipeline 2		cu. m/day	0	km long	-----	
Gravity Pipeline 3		cu. m/day	0	km long	-----	
Forcemain 1	13,941	cu. m/day	0.5	km long	\$65,590	Mill to primary clarifier
Forcemain 2		cu. m/day	0	km long	-----	
Pump Station 1	13,941	cu. m/day	1		\$681,695	Mill to primary clarifier
Pump Station 2	0	cu. m/day	0		-----	
Pump Station 3	0	cu. m/day	0		-----	
Lump Sum Piping	0	Dollars	-----	Lump Sum	-----	

Primary Clarifier	13,941	cu. m/day	1		\$1,244,322	
Aerated Stabilisation Basin		BOD kg/d	0		-----	
Activated Sludge Reactor	8,000	BOD kg/d	1		\$2,823,537	
Aerators	8,000	BOD kg/d	1	Systems	\$912,000	
Nutrient Addition	-----		1	Systems	\$400,000	
Neutralisation	-----		1	Systems	\$200,000	
Secondary Clarifier	6,971	cu. m/day	2		\$2,855,300	
Secondary sludge thickener		Dollars	0		-----	
Sludge Dewatering	8,000	kg/day	0	Systems	-----	
Submerged Outfall	13,941	cu. m/day	0.1	km long	\$359,985	
Roads	-----		0	Kilometres	-----	
Site allowances (arbitrary)	100,000	Dollars	-----	Lump Sums	\$100,000	

Capital cost (excluding inflation and regional factors) \$9,867,275

(Regional factor = 1.05) **Capital Cost =** \$10,361,000

(inflation factor = 1.00) Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	515 kw	\$0.022 \$/kW hour	\$90,710	Pumping + aeration + misc
Lime for neutralisation	2000 kg/day	\$0.09 \$/kg Cao	\$63,000	
Ammonia	486 kg/day	\$0.40 \$/kg NH3	\$68,000	For Activated Sludge
Phosphoric Acid	253 kg/day	\$1.03 \$/kg H3PO4	\$91,172	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	32 kg/day	\$14.00 \$/kg	\$156,800	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	8 dry t/day	\$60.00 \$/dry tonne	\$168,000	
Maintenance	Total maintenance labour and materials =		\$259,025	2.5% of capital cost
	Annual Operating Cost =		<u>\$1,660,000</u>	

Description of System

1500 metres of effluent piping, 1 Effluent Pump Stations.
 24 meter dia. Primary Clarifier, 2 x 22 meter dia. Secondary Clarifiers
 10000 cu. meter Activated Sludge Reactor with 460 kW installed aeration
 Submerged Outfall 100 metres long

ST. MARYS PAPERS INC.

SAULT STE. MARIE

ONTARIO

Effluent data ———> 33,638 3,465 7,000 (Flow cu. m/day | TSS kg/d | BOD kg/d) {BOD load estimated}

EQUIPMENT DESIGN LOAD QUANTITY COMMENTS

Gravity Pipeline 1	33,638	cu. m/day	0	km long	-----	
Gravity Pipeline 2		cu. m/day	0	km long	-----	
Gravity Pipeline 3		cu. m/day	0	km long	-----	
Forcemain 1	33,638	cu. m/day	0.1	km long	\$25,396	To activated sludge reactor
Forcemain 2		cu. m/day	0	km long	-----	
Pump Station 1	33,638	cu. m/day	1		\$1,058,891	To activated sludge reactor
Pump Station 2	0	cu. m/day	0		-----	
Pump Station 3	0	cu. m/day	0		-----	
Lump Sum Piping	0	Dollars	-----	Lump Sum	-----	

Primary Clarifier		cu. m/day	0		-----	Exists
Aerated Stabilisation Basin		BOD kg/d	0		-----	
Activated Sludge Reactor	7,000	BOD kg/d	1		\$2,530,697	
Aerators	7,000	BOD kg/d	1	Systems	\$798,000	
Nutrient Addition	-----		1	Systems	\$400,000	
Neutralisation	-----		1	Systems	\$200,000	
Secondary Clarifier	16,819	cu. m/day	2		\$4,151,677	
Secondary sludge thickener		Dollars	0		-----	
Sludge Dewatering	5,000	kg/day	1	Systems	\$2,550,000	
Submerged Outfall	33,638	cu. m/day	0.1	km long	\$512,027	
Roads	-----		0	Kilometres	-----	
Site allowances (arbitrary)	300,000	Dollars	-----	Lump Sums	\$300,000	

Capital cost (excluding inflation and regional factors) \$12,526,687

(Regional factor = 1.05)

Capital Cost = \$13,153,000

(Inflation factor = 1.00)

Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	507 kw	\$0.038 \$/kW hour	\$154,204	Pumping + aeration + misc
Lime for neutralisation	3500 kg/day	\$0.09 \$/kg Cao	\$110,250	
Ammonia	425 kg/day	\$0.40 \$/kg NH3	\$59,500	For Activated Sludge
Phosphoric Acid	221 kg/day	\$1.03 \$/kg H3PO4	\$79,775	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	28 kg/day	\$14.00 \$/kg	\$137,200	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	3 dry t/day	\$60.00 \$/dry tonne	\$63,000	
Maintenance	Total maintenance labour and materials =		\$328,825	2.5% of capital cost
	Annual Operating Cost =		\$1,696,000	

Description of System

100 metres of effluent piping, 1 Effluent Pump Stations.

2 x 34 meter dia. Secondary Clarifiers

8800 cu. meter Activated Sludge Reactor with 400 kW installed aeration

Submerged Outfall 100 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

STONE-CONSOLIDATED INC.

SHAWINIGAN

QUEBEC

Effluent data ———>	104,234	19,000	60,378	(Flow cu. m/day TSS kg/d BOD kg/d)		
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS	
Gravity Pipeline 1	104,234	cu. m/day	0.3	km long	\$249,411	Secondary clarifiers to river
Gravity Pipeline 2		cu. m/day	0	km long	-----	
Gravity Pipeline 3		cu. m/day	0	km long	-----	
Forcemain 1	104,234	cu. m/day	4	km long	\$2,372,503	Mill to primary treatment
Forcemain 2		cu. m/day	0	km long	-----	(assume no space at mill)
Pump Station 1	104,234	cu. m/day	1		\$1,863,990	Mill to primary treatment
Pump Station 2	20,000	cu. m/day	1		\$816,497	Auxiliary pumping
Pump Station 3	0	cu. m/day	0		-----	
Lump Sum Piping	1,000,000	Dollars	-----	Lump Sum	\$1,000,000	Effluent collection
Primary Clarifier	104,234	cu. m/day	1		\$3,235,515	
Aerated Stabilisation Basin		BOD kg/d	0		-----	
Activated Sludge Reactor	60,378	BOD kg/d	1		\$14,810,935	
Aerators	60,378	BOD kg/d	1	Systems	\$6,883,135	
Nutrient Addition	-----		1	Systems	\$400,000	
Neutralisation	-----		1	Systems	\$200,000	
Secondary Clarifier	52,117	cu. m/day	2		\$6,713,934	
Secondary sludge thickeners	1,100,000	Dollars	1		\$1,100,000	
Sludge Dewatering	40,000	kg/day	2	Systems	\$5,800,000	
Submerged Outfall	104,234	cu. m/day	0.3	km long	\$2,414,837	
Roads	-----		2	Kilometres	\$50,000	
Site allowances (arbitrary)	1,000,000	Dollars	-----	Lump Sums	\$1,000,000	
Capital cost (excluding inflation and regional factors)					<u>\$48,910,758</u>	
(Regional factor = 1.05)					Capital Cost =	\$51,356,000
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost		
Power required	3940 kw	\$0.022 \$/kW hour	\$693,398	Pumping + aeration + misc	
Lime for neutralisation	9000 kg/day	\$0.09 \$/kg Cao	\$283,500		
Ammonia	3666 kg/day	\$0.40 \$/kg NH3	\$513,216	For Activated Sludge	
Phosphoric Acid	1909 kg/day	\$1.03 \$/kg H3PO4	\$688,099	For Activated Sludge	
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins	
Polymer for biosludge	242 kg/day	\$14.00 \$/kg	\$1,183,416		
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead	
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh	
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000		
Sludge disposal	40 dry t/day	\$90.00 \$/dry tonne	\$1,260,000	Sludge handling remote from mill	
Maintenance	Total maintenance labour and materials =			\$1,283,900	2.5% of capital cost
	Annual Operating Cost =			<u>\$6,669,000</u>	

Description of System

4300 metres of effluent piping, 2 Effluent Pump Stations.
 66 meter dia. Primary Clarifier, 2 x 59 meter dia. Secondary Clarifiers
 75500 cu. meter Activated Sludge Reactor with 3440 kW installed aeration
 Submerged Outfall 300 metres long

CRESTBROOK FOREST INDUSTRIES SKOOKUMCHUCK

B.C.

Effluent data ———>	36,350	3,280	3,230	(Flow cu. m/day TSS kg/d BOD kg/d)
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----
Gravity Pipeline 2	cu. m/day	0	km long	-----
Gravity Pipeline 3	cu. m/day	0	km long	-----
Forcemain 1	cu. m/day	0	km long	-----
Forcemain 2	cu. m/day	0	km long	-----
Pump Station 1	cu. m/day	0		-----
Pump Station 2	cu. m/day	0		-----
Pump Station 3	cu. m/day	0		-----
Lump Sum Piping	Dollars	-----	Lump Sum	-----
Primary Clarifier	cu. m/day	0		-----
Aerated Stabilisation Basin	BOD kg/d	0		-----
Activated Sludge Reactor	BOD kg/d	0		-----
Aerators	BOD kg/d	0	Systems	-----
Nutrient Addition		0	Systems	-----
Neutralisation		0	Systems	-----
Secondary Clarifier	cu. m/day	0		-----
Secondary sludge thickener	Dollars	0		-----
Sludge Dewatering	kg/day	0	Systems	-----
Submerged Outfall	cu. m/day	0	km long	-----
Roads		0	Kilometres	-----
Site allowances (arbitrary)	Dollars	-----	Lump Sums	-----
Capital cost (excluding inflation and regional factors)				<u>\$0</u>
(Regional factor = 1.20)		Capital Cost =		\$0
(Inflation factor = 1.00)				Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	kw	\$0.030 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$27.61 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$60.75 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =			\$0 2.5% of capital cost
	Annual Operating Cost =			\$0

Description of System

Mill is marginally out of compliance with proposed regulations according to 1987 data but will probably comply when AOX control measures are implemented

MALETTE KRAFT P&P

SMOOTH ROCK FALLS

ONTARIO

Effluent data ---->	66,250	4,760	9,861	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS	
Gravity Pipeline 1	66,250 cu. m/day	0.5	km long	\$309,621	ASB ro river
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	66,250 cu. m/day	3	km long	\$1,266,634	Mill to ASB
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	66,250 cu. m/day	3		\$4,458,139	Mill to ASB
Pump Station 2	0 cu. m/day	0		-----	
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	0 Dollars	----- Lump Sum		-----	
Primary Clarifier	cu. m/day	0		-----	Exists
Aerated Stabilisation Basin	9,861 BOD kg/d	1		\$4,060,615	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	9,861 BOD kg/d	1	Systems	\$1,124,103	
Nutrient Addition	-----	0	Systems	-----	
Neutralisation	-----	1	Systems	\$200,000	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0	Systems	-----	
Submerged Outfall	66,250 cu. m/day	0.1	km long	\$671,487	
Roads	-----	3	Kilometres	\$75,000	
Site allowances (arbitrary)	700,000 Dollars	----- Lump Sums		\$700,000	
Capital cost (excluding inflation and regional factors)				\$12,865,598	
(Regional factor = 1.05)		Capital Cost =		\$13,509,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	764 kw	\$0.038 \$/kW hour	\$232,274	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	\$0.09 \$/kg Cao	\$189,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	49 kg/day	\$0.37 \$/kg	\$6,385	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$337,725	2.5% of capital cost
	Annual Operating Cost =		\$899,000	

Description of System

3500 metres of effluent piping, 3 Effluent Pump Stations.

3.7 day retention Aerated Stabilisation Basin with 560 kW installed aeration
Submerged Outfall 100 metres long

WESTERN PULP LTD. PARTNERSHIP SQUAMISH

B.C.

Effluent data ----->	96,498	10,540	26,817	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	71,498 cu. m/day	0.2 km long		\$130,139	Primary clarifier to act sludge
Gravity Pipeline 2	cu. m/day	0 km long		-----	
Gravity Pipeline 3	cu. m/day	0 km long		-----	
Forcemain 1	71,498 cu. m/day	0.5 km long		\$223,526	High solids to primary clarifier
Forcemain 2	25,000 cu. m/day	0.7 km long		\$142,296	Bleach plant to activated sludge
Pump Station 1	71,498 cu. m/day	1		\$1,543,778	High solids to primary clarifier
Pump Station 2	25,000 cu. m/day	1		\$912,871	Bleach plant to activated sludge
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	2,000,000 Dollars	----- Lump Sum		\$2,000,000	Difficult effluent collection
Primary Clarifier	71,498 cu. m/day	1		\$4,057,597	Difficult site
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	26,817 BOD kg/d	1		\$14,457,408	Difficult site
Aerators	26,817 BOD kg/d	1 Systems		\$3,057,081	
Nutrient Addition	-----	1 Systems		\$400,000	
Neutralisation	-----	1 Systems		\$200,000	
Secondary Clarifier	48,249 cu. m/day	2		\$9,746,173	Difficult site
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	10,000 kg/day	2 Systems		\$5,200,000	20 t/day total capacity
Submerged Outfall	96,498 cu. m/day	0.5 km long		\$3,902,471	
Roads	-----	0 Kilometres		-----	
Site allowances (arbitrary)	1,000,000 Dollars	----- Lump Sums		\$1,000,000	(Note margins added to main units abo
Capital cost (excluding inflation and regional factors)				<u>\$46,973,341</u>	
(Regional factor = 1.20)		Capital Cost =		\$56,368,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1858 kw	\$0.030 \$/kW hour	\$445,986	Pumping + aeration + misc
Lime for neutralisation	12000 kg/day	\$0.09 \$/kg Cao	\$378,000	
Ammonia	1628 kg/day	\$0.40 \$/kg NH3	\$227,940	For Activated Sludge
Phosphoric Acid	848 kg/day	\$1.03 \$/kg H3PO4	\$305,613	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	107 kg/day	\$14.00 \$/kg	\$525,603	
Operators	48 man hrs/d	\$27.61 \$/man hour	\$463,890	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$60.75 \$/man hour	\$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	20 dry t/day	\$60.00 \$/dry tonne	\$420,000	
Maintenance	Total maintenance labour and materials	=	\$1,409,200	2.5% of capital cost
		Annual Operating Cost =	\$4,606,000	

Description of System

1400 metres of effluent piping, 2 Effluent Pump Stations.
 55 meter dia. Primary Clarifier, 2 x 57 meter dia. Secondary Clarifiers
 44700 cu. meter Activated Sludge Reactor with 1530 kW installed aeration
 Submerged Outfall 500 metres long

ST. RAYMOND PAPER (1983) INC. ST-ANTONIN QUEBEC

Effluent data ———> 7,156 526 1,200 (Flow cu. m/day | TSS kg/d | BOD kg/d) {BOD estimated}

EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS
Gravity Pipeline 1	7,156 cu. m/day	1 km long	\$145,759
Gravity Pipeline 2	cu. m/day	0 km long	-----
Gravity Pipeline 3	cu. m/day	0 km long	-----
Forcemain 1	7,156 cu. m/day	1 km long	\$79,553
Forcemain 2	cu. m/day	0 km long	-----
Pump Station 1	7,156 cu. m/day	1	\$488,407
Pump Station 2	0 cu. m/day	0	-----
Pump Station 3	0 cu. m/day	0	-----
Lump Sum Piping	0 Dollars	----- Lump Sum	-----
Settling basin	7,156 cu. m/day	1	\$400,000
Aerated Stabilisation Basin	1,200 BOD kg/d	1	\$73,734
Activated Sludge Reactor	BOD kg/d	0	-----
Aerators	1,200 BOD kg/d	1 Systems	\$136,800
Nutrient Addition	-----	0 Systems	-----
Neutralisation	-----	0 Systems	-----
Secondary Clarifier	cu. m/day	0	-----
Secondary sludge thickener	Dollars	0	-----
Sludge Dewatering	kg/day	0 Systems	-----
Submerged Outfall	7,156 cu. m/day	0.1 km long	\$275,700 Minimal outfall
Roads	-----	0 Kilometres	-----
Site allowances (arbitrary)	100,000 Dollars	----- Lump Sums	\$100,000
Capital cost (excluding inflation and regional factors)			\$1,699,953
(Regional factor = 1.05)		Capital Cost =	\$1,785,000
(Inflation factor = 1.00)			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	91 kw	\$0.022 \$/kW hour	\$15,947	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	6 kg/day	\$0.37 \$/kg	\$777	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	1 dry t/day	\$60.00 \$/dry tonne	\$10,500	
Maintenance	Total maintenance labour and materials =		\$44,625	2.5% of capital cost
		Annual Operating Cost =	\$173,000	

Description of System

2000 metres of effluent piping, 1 Effluent Pump Stations.
 17 meter dia. Primary Clarifier,
 4.2 day retention Aerated Stabilisation Basin with 70 kW installed aeration
 Submerged Outfall 100 metres long

ABITIBI PRICE INC.

STEPHENVILLE

NFLD.

Effluent data -----> 38,656 3,846 8,685 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS
Gravity Pipeline 1	cu. m/day	0 km long	-----
Gravity Pipeline 2	cu. m/day	0 km long	-----
Gravity Pipeline 3	cu. m/day	0 km long	-----
Forcemain 1	cu. m/day	0 km long	-----
Forcemain 2	cu. m/day	0 km long	-----
Pump Station 1	cu. m/day	0	-----
Pump Station 2	cu. m/day	0	-----
Pump Station 3	cu. m/day	0	-----
Lump Sum Piping	Dollars	----- Lump Sum	-----
Primary Clarifier	cu. m/day	0	-----
Aerated Stabilisation Basin	BOD kg/d	0	-----
Activated Sludge Reactor	8,685 BOD kg/d	1	\$1,000,000 Modify existing basin
Aerators	8,685 BOD kg/d	1 Systems	\$990,145
Nutrient Addition	-----	1 Systems	\$400,000
Neutralisation	-----	0 Systems	-----
Secondary Clarifier	38,656 cu. m/day	1	\$2,956,648
Secondary sludge thickener	Dollars	0	----- No sludge handling. Discharge bioslud
Sludge Dewatering	kg/day	0 Systems	----- to existing ASB
Submerged Outfall	cu. m/day	0 km long	----- Esists
Roads	-----	0 Kilometres	-----
Site allowances (arbitrary)	400,000 Dollars	----- Lump Sums	\$400,000
Capital cost (excluding inflation and regional factors)			\$5,746,794
(Regional factor = 1.15)		Capital Cost =	\$6,609,000
(Inflation factor = 1.00)			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	520 kw	\$0.044 \$/kW hour	\$182,979	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	527 kg/day	\$0.40 \$/kg NH3	\$73,827	For Activated Sludge
Phosphoric Acid	275 kg/day	\$1.03 \$/kg H3PO4	\$98,984	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	35 kg/day	\$14.00 \$/kg	\$170,236	
Operators	24 man hrs/d	\$23.13 \$/man hour	\$194,250	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$165,225	2.5% of capital cost
		Annual Operating Cost =	\$1,260,000	

Description of System

1 x 51 meter dia. Secondary Clarifiers
 14500 cu. meter Activated Sludge Reactor with 500 kW installed aeration
 Modification of existing system to overcome difficulties with low winter temperatures

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

DONOHUE ST. FELICIEN

ST. FELICIEN

QUEBEC

Effluent data —>	87,679	8,113	7,713	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	----	
Gravity Pipeline 2	cu. m/day	0	km long	----	
Gravity Pipeline 3	cu. m/day	0	km long	----	
Forcemain 1	cu. m/day	0	km long	----	
Forcemain 2	cu. m/day	0	km long	----	
Pump Station 1	cu. m/day	0		----	
Pump Station 2	cu. m/day	0		----	
Pump Station 3	cu. m/day	0		----	
Lump Sum Piping	Dollars	-----	Lump Sum	----	
Primary Clarifier	cu. m/day	0		----	
Aerated Stabilisation Basin	10,000 BOD kg/d	1		\$4,107,067	Nominal capacity for additional cell for existing ASB
Activated Sludge Reactor	BOD kg/d	0		----	
Aerators	10,000 BOD kg/d	1	Systems	\$1,140,000	
Nutrient Addition	-----	0	Systems	----	
Neutralisation	-----	0	Systems	----	
Secondary Clarifier	cu. m/day	0		----	
Secondary sludge thickener	Dollars	0		----	
Sludge Dewatering	kg/day	0	Systems	----	
Submerged Outfall	cu. m/day	0	km long	----	
Roads		0	Kilometres	----	
Site allowances (arbitrary)	Dollars	-----	Lump Sums	----	
Capital cost (excluding inflation and regional factors)				\$5,247,067	
(Regional factor = 1.05)		Capital Cost =		\$5,509,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	599 kw	\$0.022 \$/kW hour	\$105,336	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	----	For Activated Sludge
Fertiliser for Nutrient	39 kg/day	\$0.37 \$/kg	\$4,994	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	----	
Operators	man hrs/d	\$23.13 \$/man hour	----	No additional labour required
Technicians	man hrs/d	\$50.88 \$/man hour	----	No additional labour required
Process Engineer	person	\$90,000 \$/year	----	No additional labour required
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	----	
Maintenance	Total maintenance labour and materials =		\$137,725	2.5% of capital cost
		Annual Operating Cost =	\$248,000	

Description of System

2.2 day retention Aerated Stabilisation Basin with 570 kW installed aeration
(Additional cell for existing ASB)

LAKE UTOPIA PAPER LTD.

ST. GEORGE

N.B.

Effluent data ———> 8,519 2,502 20,741 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS
Gravity Pipeline 1	8,519 cu. m/day	0.3 km long	\$48,973
Gravity Pipeline 2	cu. m/day	0 km long	-----
Gravity Pipeline 3	cu. m/day	0 km long	-----
Forcemain 1	8,519 cu. m/day	0.2 km long	\$18,132 To activated sludge reactor
Forcemain 2	cu. m/day	0 km long	-----
Pump Station 1	8,519 cu. m/day	1	\$532,877 To activated sludge reactor
Pump Station 2	0 cu. m/day	0	-----
Pump Station 3	0 cu. m/day	0	-----
Lump Sum Piping	0 Dollars	----- Lump Sum	-----
Primary Clarifier	cu. m/day	0	----- Exists
Aerated Stabilisation Basin	BOD kg/d	0	-----
Activated Sludge Reactor	20,741 BOD kg/d	1	\$4,422,501 Assume activated sludge treatment.
Aerators	20,741 BOD kg/d	1 Systems	\$2,364,492 Probably would make more sense to sel
Nutrient Addition	-----	0 Systems	----- liquor to Woodland or other mill, and
Neutralisation	-----	1 Systems	\$200,000 upgrade existing ASB
Secondary Clarifier	4,259 cu. m/day	2	\$2,315,972
Secondary sludge thickener	Dollars	0	-----
Sludge Dewatering	10,000 kg/day	1 Systems	\$2,600,000
Submerged Outfall	cu. m/day	0 km long	-----
Roads	-----	0 Kilometres	-----
Site allowances (arbitrary)	100,000 Dollars	----- Lump Sums	\$100,000
Capital cost (excluding inflation and regional factors)			\$12,602,948
(Regional factor = 1.15)		Capital Cost =	\$14,493,000
(Inflation factor = 1.00)			Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1264 kw	\$0.044 \$/kW hour	\$444,830	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	1259 kg/day	\$0.40 \$/kg NH3	\$176,300	For Activated Sludge
Phosphoric Acid	656 kg/day	\$1.03 \$/kg H3PO4	\$236,376	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	83 kg/day	\$14.00 \$/kg	\$406,527	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	10 dry t/day	\$60.00 \$/dry tonne	\$210,000	
Maintenance	Total maintenance labour and materials	=	\$362,325	2.5% of capital cost
		Annual Operating Cost =	\$2,600,000	

Description of System

500 metres of effluent piping, 1 Effluent Pump Stations.
 2 x 17 meter dia. Secondary Clarifiers
 17300 cu. meter Activated Sludge Reactor with 1180 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

IRVING PULP & PAPER LTD.

SAINT JOHN

N.B.

Effluent data	96,029	8,651	21,992	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS		
Gravity Pipeline 1	96,029 cu. m/day	0.3 km long	\$236,468	Mill to primary clarifier	
Gravity Pipeline 2	96,029 cu. m/day	1 km long	\$788,225	Secondary clarifier to Saint John River	
Gravity Pipeline 3	cu. m/day	0 km long	---		
Forcemain 1	30,000 cu. m/day	0.2 km long	\$46,613	Interior to mill	
Forcemain 2	cu. m/day	0 km long	---		
Pump Station 1	30,000 cu. m/day	1	\$1,000,000	Interior to mill	
Pump Station 2	15,000 cu. m/day	1	\$707,107	Interior to mill	
Pump Station 3	0 cu. m/day	0	---		
Lump Sum Piping	1,000,000 Dollars	----- Lump Sum	\$1,000,000	Miscellaneous collection	
Primary Clarifier	96,029 cu. m/day	1	\$3,111,932		
Aerated Stabilisation Basin	BOD kg/d	0	---		
Activated Sludge Reactor	21,992 BOD kg/d	1	\$11,422,710		
Aerators	21,992 BOD kg/d	1 Systems	\$2,507,143		
Nutrient Addition	-----	1 Systems	\$400,000		
Neutralisation	-----	1 Systems	\$200,000		
Secondary Clarifier	48,014 cu. m/day	2	\$6,484,016		
Secondary sludge thickener	Dollars	0	---		
Sludge Dewatering	10,000 kg/day	2 Systems	\$5,200,000	Total capacity 20 t/d	
Submerged Outfall	96,029 cu. m/day	0.5 km long	\$3,894,877		
Roads	-----	0 Kilometres	---		
Site allowances (arbitrary)	1,000,000 Dollars	----- Lump Sums	\$1,000,000	Note allowances for effluent collection	
Capital cost (excluding inflation and regional factors)			\$37,999,091		
(Regional factor = 1.15)			Capital Cost =	\$43,699,000	
(Inflation factor = 1.00)				Inflation since Jan 1990	

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	1434 kw	\$0.044 \$/kW hour	\$504,900	Pumping + aeration + misc
Lime for neutralisation	18000 kg/day	\$0.09 \$/kg Cao	\$567,000	
Ammonia	1335 kg/day	\$0.40 \$/kg NH3	\$186,936	For Activated Sludge
Phosphoric Acid	695 kg/day	\$1.03 \$/kg H3PO4	\$250,636	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	88 kg/day	\$14.00 \$/kg	\$431,053	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	15 dry t/day	\$60.00 \$/dry tonne	\$315,000	
Maintenance	Total maintenance labour and materials =		\$1,092,475	2.5% of capital cost
	Annual Operating Cost =		\$4,111,000	

Description of System

1500 metres of effluent piping, 2 Effluent Pump Stations.
 64 meter dia. Primary Clarifier, 2 x 57 meter dia. Secondary Clarifiers
 55000 cu. meter Activated Sludge Reactor with 1250 kW installed aeration
 Submerged Outfall 500 metres long

ROTHESAY PAPER LTD.

SAINT JOHN

N.B.

Effluent data ———>	54,875	11,792	15,291	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	54,875 cu. m/day	0.5	km long	\$273,938	ASB to river
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	54,875 cu. m/day	0.5	km long	\$183,291	Existing clarifier to ASB
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	54,875 cu. m/day	1		\$1,352,467	Existing clarifier to ASB
Pump Station 2	0 cu. m/day	0		-----	
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	0 Dollars	-----	Lump Sum	-----	
Primary Clarifier	cu. m/day	0		-----	Exists
Aerated Stabilisation Basin	15,291 BOD kg/d	1		\$5,793,240	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	15,291 BOD kg/d	1	Systems	\$1,743,158	
Nutrient Addition	-----	0	Systems	-----	
Neutralisation	-----	1	Systems	\$200,000	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0	Systems	-----	
Submerged Outfall	54,875 cu. m/day	0.2	km long	\$1,245,498	
Roads	-----	0	Kilometres	-----	
Site allowances (arbitrary)	500,000 Dollars	-----	Lump Sums	\$500,000	
Capital cost (excluding inflation and regional factors)				\$11,291,592	
(Regional factor = 1.15)			Capital Cost =	\$12,985,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1059 kw	\$0.044 \$/kW hour	\$372,840	Pumping + aeration + misc
Lime for neutralisation	8000 kg/day	\$0.09 \$/kg Cao	\$252,000	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	76 kg/day	\$0.37 \$/kg	\$9,901	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$324,625	2.5% of capital cost
		Annual Operating Cost =	\$1,093,000	

Description of System

1000 metres of effluent piping, 1 Effluent Pump Stations.

7 day retention Aerated Stabilisation Basin with 870 kW installed aeration
Submerged Outfall 200 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

IRVING TISSUE CO.

SAINT JOHN

N.B.

Effluent data	4,438	430	0 (Flow cu. m/day TSS kg/d BOD kg/d)		
EQUIPMENT	DESIGN LOAD	QUANTITY	COMMENTS		
Gravity Pipeline 1	4,438 cu. m/day	0 km long	-----		
Gravity Pipeline 2	cu. m/day	0 km long	-----		
Gravity Pipeline 3	cu. m/day	0 km long	-----		
Forcemain 1	4,438 cu. m/day	0 km long	-----		
Forcemain 2	cu. m/day	0 km long	-----		
Pump Station 1	4,438 cu. m/day	0	-----		
Pump Station 2	0 cu. m/day	0	-----		
Pump Station 3	0 cu. m/day	0	-----		
Lump Sum Piping	0 Dollars	----- Lump Sum	-----		
Primary Clarifier	cu. m/day	0	-----		
Aerated Stabilisation Basin	0 BOD kg/d	0	-----		
Activated Sludge Reactor	0 BOD kg/d	0	-----		
Aerators	0 BOD kg/d	0 Systems	-----		
Nutrient Addition	-----	0 Systems	-----		
Neutralisation	-----	0 Systems	-----		
Secondary Clarifier	cu. m/day	0	-----		
Secondary sludge thickener	Dollars	0	-----		
Sludge Dewatering	kg/day	0 Systems	-----		
Submerged Outfall	cu. m/day	0 km long	-----		
Roads	-----	0 Kilometres	-----		
Site allowances (arbitrary)	0 Dollars	----- Lump Sums	-----		
Capital cost (excluding inflation and regional factors)					\$0
(Regional factor = 1.15)		Capital Cost =			\$0
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	0 kw	\$0.044 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$0	2.5% of capital cost
	Annual Operating Cost =		\$0	

Description of System

Assumed discharge to municipal sewer, or alternatively to the adjacent Irving kraft mill

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

TEMBEC INC.

TEMISCAMING

QUEBEC

Effluent data ———>	268,901	26,681	175,309	(Flow cu. m/day TSS kg/d BOD kg/d)	{BOD est. after anaero
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	268,901 cu. m/day	1	km long	\$1,539,306	Secondary clarifier to river
Gravity Pipeline 2	100,000 cu. m/day	0.5	km long	\$404,631	Misc collection
Gravity Pipeline 3	cu. m/day	0	km long	—	
Forcemain 1	268,901 cu. m/day	2	km long	\$2,414,711	Mill to activated sludge reactor
Forcemain 2	cu. m/day	0	km long	—	
Pump Station 1	268,901 cu. m/day	1		\$2,993,890	Mill to ASB
Pump Station 2	100,000 cu. m/day	1		\$1,825,742	Misc effluent collection
Pump Station 3	30,000 cu. m/day	1		\$1,000,000	Misc effluent collection
Lump Sum Piping	1,000,000 Dollars	—————	Lump Sum	\$1,000,000	Misc effluent collection
Anaerobic treatment		0		\$75,000,000	Company estimate + margin
Aerated Stabilisation Basin	BOD kg/d	0		—	
Activated Sludge Reactor	122,716 BOD kg/d	1		\$33,543,503	30% reduction anaerobically
Aerators	122,716 BOD kg/d	1	Systems	\$13,989,624	30% reduction anaerobically
Nutrient Addition	—————	1	Systems	\$400,000	
Neutralisation	—————	1	Systems	\$200,000	
Secondary Clarifier	134,451 cu. m/day	2		\$10,043,856	
Secondary sludge thickeners	5,300,000 Dollars	1		\$5,300,000	
Sludge Dewatering	25,000 kg/d each	2	Systems	\$5,500,000	
Submerged Outfall	268,901 cu. m/day	0.2	km long	\$2,351,962	
Roads	—————	0	Kilometres	—	
Site allowances (arbitrary)	5,000,000 Dollars	—————	Lump Sums	\$5,000,000	
Capital cost (excluding inflation and regional factors)				\$162,507,225	
(Regional factor = 1.05)			Capital Cost =	\$170,633,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	8392 kw	\$0.22 \$/kW hour	\$1,476,934	Pumping + aeration + misc
Lime for neutralisation	10000 kg/day	\$0.09 \$/kg Cao	\$315,000	
Ammonia	10644 kg/day	\$0.40 \$/kg NH3	\$1,490,123	For Activated Sludge
Phosphoric Acid	5542 kg/day	\$1.03 \$/kg H3PO4	\$1,997,896	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	701 kg/day	\$14.00 \$/kg	\$3,436,048	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials &
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	50 dry t/day	\$60.00 \$/dry tonne	\$1,050,000	
Maintenance	Total maintenance labour and materials	=	\$4,265,825	2.5% of capital cost
		Annual Operating Cost =	\$14,795,000	

Description of System

3500 metres of effluent piping, 3 Effluent Pump Stations. Anaerobic system
 2 x 95 meter dia. Secondary Clarifiers
 204500 cu. meter Activated Sludge Reactor with 6990 kW installed aeration
 Submerged Outfall 200 metres long

KIMBERLY CLARK OF CANADA LTD. TERRACE BAY ONTARIO

Effluent data ----->	151,400	5,520	31,052	(Flow cu. m/day TSS kg/d BOD kg/d)
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----
Gravity Pipeline 2	cu. m/day	0	km long	-----
Gravity Pipeline 3	cu. m/day	0	km long	-----
Forcemain 1	cu. m/day	0	km long	-----
Forcemain 2	cu. m/day	0	km long	-----
Pump Station 1	cu. m/day	0		-----
Pump Station 2	cu. m/day	0		-----
Pump Station 3	cu. m/day	0		-----
Lump Sum Piping	Dollars	-----	Lump Sum	-----
Primary Clarifier	cu. m/day	0		-----
Aerated Stabilisation Basin	BOD kg/d	0		-----
Activated Sludge Reactor	BOD kg/d	0		-----
Aerators	BOD kg/d	0	Systems	-----
Nutrient Addition		0	Systems	-----
Neutralisation		0	Systems	-----
Secondary Clarifier	cu. m/day	0		-----
Secondary sludge thickener	Dollars	0		-----
Sludge Dewatering	kg/day	0	Systems	-----
Submerged Outfall	cu. m/day	0	km long	-----
Roads		0	Kilometres	-----
Site allowances (arbitrary)	Dollars	-----	Lump Sums	-----
Capital cost (excluding inflation and regional factors)				<u>\$0</u>
(Regional factor = 1.05)		Capital Cost =		<u>\$0</u>
(Inflation factor = 1.00)				Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	kw	\$0.038 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =			\$0 2.5% of capital cost
		Annual Operating Cost =	<u>\$0</u>	

Description of System

Company installed ASB in 1989 which complies with proposed regulations

MANFOR LTD.

THE PAS

MANITOBA

Effluent data ----->	46,500	2,629	2,668	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----	
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	cu. m/day	0	km long	-----	
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	cu. m/day	0		-----	
Pump Station 2	cu. m/day	0		-----	
Pump Station 3	cu. m/day	0		-----	
Lump Sum Piping	Dollars	-----	Lump Sum	-----	
Primary Clarifier	cu. m/day	0		-----	
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	BOD kg/d	0		-----	
Aerators	BOD kg/d	0	Systems	-----	
Nutrient Addition		0	Systems	-----	
Neutralisation		0	Systems	-----	
Secondary Clarifier	cu. m/day	0		-----	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	kg/day	0	Systems	-----	
Submerged Outfall	cu. m/day	0	km long	-----	
Roads		0	Kilometres	-----	
Site allowances (arbitrary)	250,000	Dollars	-----	Lump Sums	\$250,000 For minor upgrades
Capital cost (excluding inflation and regional factors)					<u>\$250,000</u>
(Regional factor = 1.10)			Capital Cost =		<u>\$275,000</u>
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	50 kw	\$0.037 \$/kW hour	\$14,800	Minor upgrades
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.20 person	\$90,000 \$/year	\$18,000	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =		\$6,875	2.5% of capital cost
		Annual Operating Cost =	<u>\$111,000</u>	

Description of System

Mill was marginally out of compliance with the proposed regulations, according to 1987 data
 The costs shown assume that relatively simple in-plant measures can improve the effluent by the 10% required
 An allowance is included for increased technical personnel for water pollution control

BEAVER WOOD FIBRE COMPANY LTD THOROLD

ONTARIO

Effluent data ----->	17,500	1,092	2,491	(Flow cu. m/day TSS kg/d BOD kg/d)
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----
Gravity Pipeline 2	cu. m/day	0	km long	-----
Gravity Pipeline 3	cu. m/day	0	km long	-----
Forcemain 1	cu. m/day	0	km long	-----
Forcemain 2	cu. m/day	0	km long	-----
Pump Station 1	cu. m/day	0		-----
Pump Station 2	cu. m/day	0		-----
Pump Station 3	cu. m/day	0		-----
Lump Sum Piping	Dollars	-----	Lump Sum	-----
Primary Clarifier	cu. m/day	0		-----
Aerated Stabilisation Basin	BOD kg/d	0		-----
Activated Sludge Reactor	BOD kg/d	0		-----
Aerators	BOD kg/d	0	Systems	-----
Nutrient Addition		0	Systems	-----
Neutralisation		0	Systems	-----
Secondary Clarifier	cu. m/day	0		-----
Secondary sludge thickener	Dollars	0		-----
Sludge Dewatering	kg/day	0	Systems	-----
Submerged Outfall	cu. m/day	0	km long	-----
Roads		0	Kilometres	-----
Polymer system	150,000 Dollars	-----	Lump Sums	<u>\$150,000</u>
Capital cost (excluding inflation and regional factors)				<u>\$150,000</u>
(Regional factor = 1.05)			Capital Cost =	<u>\$158,000</u>
(Inflation factor = 1.00)				Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	kw	\$0.038 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for clarifier	35 kg/day	\$8.00 \$/kg	\$98,000	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	<u>\$3,950</u>	2.5% of capital cost
	Annual Operating Cost =		<u>\$102,000</u>	

Description of System

Add polymer to existing clarifier.

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

FRASER INC.

THOROLD

ONTARIO

Effluent data	31,625	918	2,801	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----	
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	31,625 cu. m/day	0.1	km long	\$24,247	
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	31,625 cu. m/day	1		\$1,026,726	Feed to additional activated sludge
Pump Station 2	0 cu. m/day	0		-----	reactor
Pump Station 3	0 cu. m/day	0		-----	
Lump Sum Piping	0 Dollars	-----	Lump Sum	-----	
Primary Clarifier	cu. m/day	0		-----	
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	2,801 BOD kg/d	1		\$1,512,021	
Aerators	2,801 BOD kg/d	1	Systems	\$319,360	
Nutrient Addition	-----	0	Systems	-----	
Neutralisation	-----	0	Systems	-----	
Secondary Clarifier	15,813 cu. m/day	1		\$2,022,118	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	2,000 kg/day	1	Systems	\$2,520,000	
Submerged Outfall	cu. m/day	0	km long	-----	
Roads	-----	0	Kilometres	-----	
Site allowances (arbitrary)	Dollars	-----	Lump Sums	-----	
Capital cost (excluding inflation and regional factors)				\$7,424,473	
(Regional factor = 1.05)			Capital Cost =	\$7,796,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	251 kw	\$0.038 \$/kW hour	\$76,207	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	170 kg/day	\$0.40 \$/kg NH3	\$23,812	For Activated Sludge
Phosphoric Acid	89 kg/day	\$1.03 \$/kg H3PO4	\$31,926	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	11 kg/day	\$14.00 \$/kg	\$54,908	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials	=	\$194,900	2.5% of capital cost
		Annual Operating Cost =	\$1,145,000	

Description of System

100 metres of effluent piping, 1 Effluent Pump Stations.
 1 x 33 meter dia. Secondary Clarifiers
 4700 cu. meter Activated Sludge Reactor with 160 kW installed aeration
 (Upgrade existing activated sludge system)

QUEBEC & ONTARIO PAPER CO. LTD. THOROLD

ONTARIO

Effluent data —>	136,416	6,120	5,375	(Flow cu. m/day TSS kg/d BOD kg/d)
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----
Gravity Pipeline 2	cu. m/day	0	km long	-----
Gravity Pipeline 3	cu. m/day	0	km long	-----
Forcemain 1	cu. m/day	0	km long	-----
Forcemain 2	cu. m/day	0	km long	-----
Pump Station 1	cu. m/day	0		-----
Pump Station 2	cu. m/day	0		-----
Pump Station 3	cu. m/day	0		-----
Lump Sum Piping	Dollars	-----	Lump Sum	-----
Primary Clarifier	cu. m/day	0		-----
Aerated Stabilisation Basin	BOD kg/d	0		-----
Activated Sludge Reactor	BOD kg/d	0		-----
Aerators	BOD kg/d	0	Systems	-----
Nutrient Addition		0	Systems	-----
Neutralisation		0	Systems	-----
Secondary Clarifier	cu. m/day	0		-----
Secondary sludge thickener	Dollars	0		-----
Sludge Dewatering	kg/day	0	Systems	-----
Submerged Outfall	cu. m/day	0	km long	-----
Roads		0	Kilometres	-----
Site allowances (arbitrary)	Dollars	-----	Lump Sums	-----
Capital cost (excluding inflation and regional factors)				<u>\$0</u>
(Regional factor = 1.05)		Capital Cost =		<u>\$0</u>
(Inflation factor = 1.00)				Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	kw	\$0.038 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =			\$0 2.5% of capital cost
		Annual Operating Cost =	<u>\$0</u>	

Description of System

Mill was not in compliance with the proposed regulations in 1987, but subsequently shut down the sulphit pulping operation permanently, and now comply

ABITIBI PRICE INC. (FT. WILLIAM DIV. THUNDER BAY

ONTARIO

Effluent data ———>	32,745	2,025	15,610	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	32,745 cu. m/day		0.5 km long	\$195,841	Secondary clarifiers to shore
Gravity Pipeline 2	cu. m/day		0 km long	-----	
Gravity Pipeline 3	cu. m/day		0 km long	-----	
Forcemain 1	32,745 cu. m/day		0.5 km long	\$124,443	Existing settling basin to primary clarifie
Forcemain 2	cu. m/day		0 km long	-----	
Pump Station 1	32,745 cu. m/day		1	\$1,044,749	Existing settling basin to primary clarifie
Pump Station 2	0 cu. m/day		0	-----	
Pump Station 3	0 cu. m/day		0	-----	
Lump Sum Piping	0 Dollars		----- Lump Sum	-----	
Primary Clarifier	32,745 cu. m/day		1	\$1,866,738	
Aerated Stabilisation Basin	BOD kg/d		0	-----	
Activated Sludge Reactor	15,610 BOD kg/d		1	\$4,884,740	
Aerators	15,610 BOD kg/d		1 Systems	\$1,779,497	
Nutrient Addition	-----		1 Systems	\$400,000	
Neutralisation	-----		1 Systems	\$200,000	
Secondary Clarifier	16,373 cu. m/day		2	\$4,104,499	
Secondary sludge thickener	Dollars		0	-----	
Sludge Dewatering	15,000 kg/day		1 Systems	\$2,650,000	
Submerged Outfall	32,745 cu. m/day		0 km long	-----	Not required. Existing surface outfall is
Roads	-----		1 Kilometres	\$25,000	largely invisible
Site allowances (arbitrary)	300,000 Dollars		----- Lump Sums	\$300,000	
Capital cost (excluding inflation and regional factors)				\$17,575,507	
(Regional factor = 1.05)			Capital Cost =	\$18,454,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	1020 kw	\$0.038 \$/kW hour	\$310,138	Pumping + aeration + misc
Lime for neutralisation	4000 kg/day	\$0.09 \$/kg Cao	\$126,000	
Ammonia	948 kg/day	\$0.40 \$/kg NH3	\$132,682	For Activated Sludge
Phosphoric Acid	493 kg/day	\$1.03 \$/kg H3PO4	\$177,894	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	62 kg/day	\$14.00 \$/kg	\$305,949	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	Total disposal cost unchanged
Maintenance	Total maintenance labour and materials	=	\$461,350	2.5% of capital cost
	Annual Operating Cost =		\$2,277,000	

Description of System

1000 metres of effluent piping, 1 Effluent Pump Stations.
 37 meter dia. Primary Clarifier, 2 x 33 meter dia. Secondary Clarifiers
 19500 cu. meter Activated Sludge Reactor with 890 kW installed aeration

ABITIBI PRICE INC. (PROVINCIAL DIV. THUNDER BAY

ONTARIO

Effluent data —>	58,750	884	4,254	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS	
Gravity Pipeline 1	7,500 cu. m/day	0.3	km long	\$45,082	Secondary clarifier to existing pond
Gravity Pipeline 2	cu. m/day	0	km long	-----	
Gravity Pipeline 3	cu. m/day	0	km long	-----	
Forcemain 1	7,500 cu. m/day	0.3	km long	\$24,721	Groundwood to act sludge reactor
Forcemain 2	cu. m/day	0	km long	-----	
Pump Station 1	7,500 cu. m/day	1		\$200,000	
Pump Station 2	cu. m/day	0		-----	
Pump Station 3	cu. m/day	0		-----	
Lump Sum Piping	Dollars	-----	Lump Sum	-----	
Primary Clarifier	cu. m/day	0		-----	
Aerated Stabilisation Basin	BOD kg/d	0		-----	
Activated Sludge Reactor	5,000 BOD kg/d	1		\$1,599,370	
Aerators	5,000 BOD kg/d	1	Systems	\$570,000	
Nutrient Addition		1	Systems	\$400,000	
Neutralisation		1	Systems	\$200,000	
Secondary Clarifier	5,000 cu. m/day	1		\$1,239,634	
Secondary sludge thickener	Dollars	0		-----	
Sludge Dewatering	2,000 kg/day	1	Systems	\$2,520,000	Add to existing system
Submerged Outfall	cu. m/day	0	km long	-----	
Roads		0	Kilometres	-----	
Site allowances (arbitrary)	Dollars	-----	Lump Sums	-----	
Capital cost (excluding inflation and regional factors)				<u>\$6,798,806</u>	
(Regional factor = 1.05)			Capital Cost =	\$7,139,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	319 kw	\$0.038 \$/kW hour	\$96,957	Pumping + aeration + misc
Lime for neutralisation	8000 kg/day	\$0.09 \$/kg Cao	\$252,000	
Ammonia	258 kg/day	\$0.40 \$/kg NH3	\$36,159	For Activated Sludge
Phosphoric Acid	134 kg/day	\$1.03 \$/kg H3PO4	\$48,480	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	17 kg/day	\$14.00 \$/kg	\$83,378	
Operators	8 man hrs/d	\$23.13 \$/man hour	\$64,750	Inc Fringes and Overhead
Technicians	8 man hrs/d	\$50.88 \$/man hour	\$142,450	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.50 person	\$90,000 \$/year	\$45,000	
Sludge disposal	2 dry t/day	\$60.00 \$/dry tonne	\$42,000	
Maintenance	Total maintenance labour and materials =		\$178,475	2.5% of capital cost
		Annual Operating Cost =	\$990,000	

Description of System

600 metres of effluent piping, 1 Effluent Pump Stations.

1 x 18 meter dia. Secondary Clarifiers

5000 cu. meter Activated Sludge Reactor with 290 kW installed aeration for groundwood effluent only

ABITIBI PRICE INC. (THUNDER BAY DI THUNDER BAY

ONTARIO

Effluent data ———>	47,250	1,426	24,355	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	47,250 cu. m/day	0.5 km long		\$248,554	Secondary clarifiers to lakeshore
Gravity Pipeline 2	cu. m/day	0 km long		—	
Gravity Pipeline 3	cu. m/day	0 km long		—	
Forcemain 1	47,250 cu. m/day	1 km long		\$327,674	Existing basins to act. sludge reactor
Forcemain 2	cu. m/day	0 km long		—	
Pump Station 1	47,250 cu. m/day	1		\$1,254,990	Existing basins to act. sludge reactor
Pump Station 2	0 cu. m/day	0		—	
Pump Station 3	0 cu. m/day	0		—	
Lump Sum Piping	0 Dollars	----- Lump Sum		—	
Primary Clarifier	cu. m/day	0		—	Use existing clarifier and settling basins
Aerated Stabilisation Basin	BOD kg/d	0		—	
Activated Sludge Reactor	24,355 BOD kg/d	1		\$8,906,630	
Aerators	24,355 BOD kg/d	1 Systems		\$2,776,483	
Nutrient Addition	-----	1 Systems		\$400,000	
Neutralisation	-----	1 Systems		\$200,000	
Secondary Clarifier	23,625 cu. m/day	2		\$4,796,719	
Secondary sludge thicken	1,100,000 Dollars	0		—	
Sludge Dewatering	10,000 kg/day	1 Systems		\$2,600,000	
Submerged Outfall	47,250 cu. m/day	1 km long		\$5,865,756	
Roads	-----	0 Kilometres		—	
Site allowances (arbitrary)	1,000,000 Dollars	----- Lump Sums		\$1,000,000	
Capital cost (excluding inflation and regional factors)				<u>\$28,376,805</u>	
(Regional factor = 1.05)		Capital Cost =		\$29,796,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1582 kw	\$0.038 \$/kW hour	\$480,832	Pumping + aeration + misc
Lime for neutralisation	4000 kg/day	\$0.09 \$/kg Cao	\$126,000	
Ammonia	1479 kg/day	\$0.40 \$/kg NH3	\$207,018	For Activated Sludge
Phosphoric Acid	770 kg/day	\$1.03 \$/kg H3PO4	\$277,562	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	97 kg/day	\$14.00 \$/kg	\$477,360	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	10 dry t/day	\$60.00 \$/dry tonne	\$210,000	
Maintenance	Total maintenance labour and materials =		\$744,900	2.5% of capital cost
		Annual Operating Cost =	\$3,287,000	

Description of System

1500 metres of effluent piping, 1 Effluent Pump Stations.
 2 x 40 meter dia. Secondary Clarifiers
 40600 cu. meter Activated Sludge Reactor with 1390 kW installed aeration
 Submerged Outfall 1000 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

CPFP INC.

THUNDER BAY

ONTARIO

Effluent data	187,500	11,348	56,127	(Flow cu. m/day TSS kg/d BOD kg/d)		
EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	187,500	cu. m/day	0.5	km long	\$608,850	To existing outfall
Gravity Pipeline 2		cu. m/day	0	km long	---	
Gravity Pipeline 3		cu. m/day	0	km long	---	
Forcemain 1	147,500	cu. m/day	0.5	km long	\$384,773	From clarifiers to act. sludge reactor
Forcemain 2	40,000	cu. m/day	1	km long	\$289,191	From bleach to act. sludge reactor
Pump Station 1	147,500	cu. m/day	1		\$2,217,356	From clarifiers to act. sludge reactor
Pump Station 2	40,000	cu. m/day	1		\$1,154,701	From bleach to act. sludge reactor
Pump Station 3	0	cu. m/day	0		---	
Lump Sum Piping	250,000	Dollars	Lump Sum		\$250,000	Misc collection
Primary Clarifier		cu. m/day	0		---	Exists
Aerated Stabilisation Basin		BOD kg/d	0		---	
Activated Sludge Reactor	56,127	BOD kg/d	1		\$17,661,585	
Aerators	56,127	BOD kg/d	1	Systems	\$6,398,466	
Nutrient Addition	-----		1	Systems	\$400,000	
Neutralisation	-----		1	Systems	\$200,000	
Secondary Clarifier	93,750	cu. m/day	2		\$8,616,860	
Secondary sludge thicken	1,100,000	Dollars	1		\$1,100,000	
Sludge Dewatering	12,000	kg/d each	2	Systems	\$5,240,000	
Submerged Outfall	187,500	cu. m/day	0.3	km long	\$3,054,112	
Roads	-----		0	Kilometres	---	
Site allowances (arbitrary)	3,000,000	Dollars	Lump Sums		\$3,000,000	
Capital cost (excluding inflation and regional factors)					\$50,575,894	
(Regional factor = 1.05)					Capital Cost =	\$53,105,000
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	3851 kw	\$0.038 \$/kW hour	\$1,170,820	Pumping + aeration + misc
Lime for neutralisation	20000 kg/day	\$0.09 \$/kg Cao	\$630,000	
Ammonia	3408 kg/day	\$0.40 \$/kg NH3	\$477,079	For Activated Sludge
Phosphoric Acid	1774 kg/day	\$1.03 \$/kg H3PO4	\$639,647	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	225 kg/day	\$14.00 \$/kg	\$1,100,087	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	24 dry t/day	\$60.00 \$/dry tonne	\$504,000	
Maintenance	Total maintenance labour and materials =		\$1,327,625	2.5% of capital cost
			Annual Operating Cost =	\$6,613,000

Description of System

2000 metres of effluent piping, 2 Effluent Pump Stations.
 2 x 80 meter dia. Secondary Clarifiers
 93500 cu. meter Activated Sludge Reactor with 3200 kW installed aeration
 Submerged Outfall 300 metres long

MACLAREN INDUSTRIES INC.

THURSO

QUEBEC

Effluent data —>	54,759	4,242	17,295	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	54,759 cu. m/day		2 km long	\$1,094,244	Mill to ASB
Gravity Pipeline 2	54,759 cu. m/day		0.5 km long	\$273,561	ASB to river
Gravity Pipeline 3	cu. m/day		0 km long	---	
Forcemain 1	cu. m/day		0 km long	---	
Forcemain 2	cu. m/day		0 km long	---	
Pump Station 1	cu. m/day		0	---	
Pump Station 2	0 cu. m/day		0	---	
Pump Station 3	0 cu. m/day		0	---	
Lump Sum Piping	400,000 Dollars		Lump Sum	\$400,000	Mil pipeline in poor soil
Primary Clarifier	cu. m/day		0	---	Use existing settling basins
Aerated Stabilisation Basin	17,295 BOD kg/d		1	\$6,400,910	
Activated Sludge Reactor	BOD kg/d		0	---	
Aerators	17,295 BOD kg/d		1 Systems	\$1,971,598	
Nutrient Addition	-----		0 Systems	---	
Neutralisation	-----		0 Systems	---	
Secondary Clarifier	cu. m/day		0	---	
Secondary sludge thickener	Dollars		0	---	
Sludge Dewatering	kg/day		0 Systems	---	
Submerged Outfall	54,759 cu. m/day		0.1 km long	\$622,221	
Roads	-----		2 Kilometres	\$50,000	
Site allowances (arbitrary)	500,000 Dollars		Lump Sums	\$500,000	
Capital cost (excluding inflation and regional factors)				\$11,312,534	
(Regional factor = 1.05)			Capital Cost =	\$11,878,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	1035 kw	\$0.022 \$/kW hour	\$182,176	Pumping + aeration + misc
Lime for neutralisation	7000 kg/day	\$0.09 \$/kg Cao	\$220,500	
Ammonia	--- kg/day	\$0.40 \$/kg NH3	---	For Activated Sludge
Phosphoric Acid	--- kg/day	\$1.03 \$/kg H3PO4	---	For Activated Sludge
Fertiliser for Nutrient	86 kg/day	\$0.37 \$/kg	\$11,198	For aerated Stabilisation basins
Polymer for biosludge	--- kg/day	\$14.00 \$/kg	---	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	--- dry t/day	\$60.00 \$/dry tonne	---	
Maintenance	Total maintenance labour and materials =		\$296,950	2.5% of capital cost
	Annual Operating Cost =		\$844,000	

Description of System

2500 metres of effluent piping,

7.9 day retention Aerated Stabilisation Basin with 990 kW installed aeration

Submerged Outfall 100 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

CPFP INC.

TROIS RIVIERES

QUEBEC

Effluent data	102,106	4,766	110,434	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	102,106 cu. m/day	2	km long	\$1,640,603	Secondary clarifiers to river
Gravity Pipeline 2	52,106 cu. m/day	1	km long	\$529,746	Part of collection system
Gravity Pipeline 3	50,000 cu. m/day	0.5	km long	\$257,864	High solids
Forcemain 1	50,000 cu. m/day	0.5	km long	\$170,938	to primary clarifier
Forcemain 2	32,000 cu. m/day	1	km long	\$244,626	Low solids to activated sludge
Pump Station 1	50,000 cu. m/day	1		\$1,290,994	to primary clarifier
Pump Station 2	32,000 cu. m/day	1		\$1,032,796	Low solids to activated sludge
Pump Station 3	0 cu. m/day	0		---	
Lump Sum Piping	2,000,000 Dollars		Lump Sum	\$2,000,000	Allowance for difficult site
Primary Clarifier	50,000 cu. m/day	1		\$2,282,445	
Aerated Stabilisation Basin	BOD kg/d	0		---	
Activated Sludge Reactor	110,434 BOD kg/d	1		\$22,062,661	
Aerators	110,434 BOD kg/d	1	Systems	\$12,589,440	
Nutrient Addition	-----	1	Systems	\$400,000	
Neutralisation	-----	1	Systems	\$200,000	
Secondary Clarifier	51,053 cu. m/day	2		\$6,655,348	
Secondary sludge thicken	1,100,000 Dollars	1		\$1,100,000	
Sludge Dewatering	20,000 kg/d each	2	Systems	\$5,400,000	
Submerged Outfall	102,106 cu. m/day	0.5	km long	\$3,991,666	
Roads	-----	0	Kilometres	---	
Site allowances (arbitrary)	1,000,000 Dollars		Lump Sums	\$1,000,000	
Capital cost (excluding inflation and regional factors)				\$62,849,127	
(Regional factor = 1.05)			Capital Cost =	\$65,992,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	6825 kw	\$0.022 \$/kW hour	\$1,201,148	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	\$0.09 \$/kg Cao	\$189,000	
Ammonia	6705 kg/day	\$0.40 \$/kg NH3	\$938,686	For Activated Sludge
Phosphoric Acid	3491 kg/day	\$1.03 \$/kg H3PO4	\$1,258,552	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	442 kg/day	\$14.00 \$/kg	\$2,164,500	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	40 dry t/day	\$60.00 \$/dry tonne	\$840,000	
Maintenance	Total maintenance labour and materials	=	\$1,649,800	2.5% of capital cost
	Annual Operating Cost =		\$9,005,000	

Description of System

5000 metres of effluent piping, 2 Effluent Pump Stations.
 46 meter dia. Primary Clarifier, 2 x 59 meter dia. Secondary Clarifiers
 122700 cu. meter Activated Sludge Reactor with 6290 kW installed aeration
 Submerged Outfall 500 metres long (Assumed biotreat for spent sulphite liquor, mill would probably reduce it, or change pulp sour

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

DOMTAR INC.

TRENTON

ONTARIO

Effluent data	4,625	2,425	9,059 (Flow cu. m/day TSS kg/d BOD kg/d)			
EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	4,625	cu. m/day	0.3	km long	\$32,926	Miscellaneous collection
Gravity Pipeline 2		cu. m/day	0	km long	-----	
Gravity Pipeline 3		cu. m/day	0	km long	-----	
Forcemain 1	4,625	cu. m/day	0	km long	-----	To Activated Sludge Reactor
Forcemain 2		cu. m/day	0	km long	-----	
Pump Station 1	4,625	cu. m/day	0		-----	To Activated Sludge Reactor
Pump Station 2	0	cu. m/day	0		-----	
Pump Station 3	0	cu. m/day	0		-----	
Lump Sum Piping	50,000	Dollars	----- Lump Sum		\$50,000	Miscellaneous collection
Primary Clarifier		cu. m/day	0		-----	Not required, mill system is tight
Aerated Stabilisation Basin		BOD kg/d	0		-----	
Activated Sludge Reactor	9,059	BOD kg/d	1		\$5,519,760	Select activated sludge process due to space limitations at mill
Aerators	9,059	BOD kg/d	0	Systems	-----	
Nutrient Addition	-----		1	Systems	\$400,000	
Neutralisation	-----		0	Systems	-----	
Secondary Clarifier	2,313	cu. m/day	2		\$1,786,471	
Secondary sludge thickener		Dollars	0		-----	
Sludge Dewatering	5,000	kg/day	1	Systems	\$2,550,000	
Submerged Outfall		cu. m/day	0	km long	-----	Exists
Roads	-----		0	Kilometres	-----	
Site allowances (arbitrary)	0	Dollars	----- Lump Sums		-----	
Capital cost (excluding inflation and regional factors)					\$10,339,157	
(Regional factor = 1.05)					Capital Cost =	\$10,856,000
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	554 kw	\$0.038 \$/kW hour	\$168,519	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	550 kg/day	\$0.40 \$/kg NH3	\$77,004	For Activated Sludge
Phosphoric Acid	286 kg/day	\$1.03 \$/kg H3PO4	\$103,243	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	36 kg/day	\$14.00 \$/kg	\$177,561	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	8 man hrs/d	\$50.88 \$/man hour	\$142,450	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.60 person	\$90,000 \$/year	\$54,000	
Sludge disposal	5 dry t/day	\$60.00 \$/dry tonne	\$105,000	
Maintenance	Total maintenance labour and materials =		\$271,400	2.5% of capital cost
	Annual Operating Cost =		\$1,488,000	

Description of System

300 metres of effluent piping, Assume that spent liquor disposal on roads will continue
 2 x 13 meter dia. Secondary Clarifiers
 22600 cu. meter Activated Sludge Reactor with 520 kW installed aeration

TRENT VALLEY PAPERBOARD MILLS TRENTON

ONTARIO

Effluent data ———>	2,938	594	2,636	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	2,938 cu. m/day		0.5 km long	\$40,855	From ASB to river
Gravity Pipeline 2	cu. m/day		0 km long	—	
Gravity Pipeline 3	cu. m/day		0 km long	—	
Forcemain 1	2,938 cu. m/day		1 km long	\$40,797	From mill to ASB
Forcemain 2	cu. m/day		0 km long	—	
Pump Station 1	2,938 cu. m/day		1	\$312,916	
Pump Station 2	0 cu. m/day		0	—	
Pump Station 3	0 cu. m/day		0	—	
Lump Sum Piping	0 Dollars		———— Lump Sum	—	
Primary Clarifier	cu. m/day		0	—	Existing flotation units adequate
Aerated Stabilisation Basin	2,636 BOD kg/d		1	\$1,394,924	
Activated Sludge Reactor	BOD kg/d		0	—	
Aerators	2,636 BOD kg/d		1 Systems	\$300,549	
Nutrient Addition	————		0 Systems	—	
Neutralisation	————		0 Systems	—	
Secondary Clarifier	cu. m/day		0	—	
Secondary sludge thickener	Dollars		0	—	
Sludge Dewatering	kg/day		0 Systems	—	
Submerged Outfall	2,938 cu. m/day		0.1 km long	\$193,088	
Roads	————		0 Kilometres	—	
Site allowances (arbitrary)	0 Dollars		———— Lump Sums	—	
Capital cost (excluding inflation and regional factors)				<u>\$2,283,129</u>	
(Regional factor = 1.05)			Capital Cost =	\$2,397,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit Cost	Annual Cost	
Power required	165 kw	\$0.038 \$/kW hour	\$50,312	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	—	
Ammonia	kg/day	\$0.40 \$/kg NH3	—	For Activated Sludge
Phosphoric Acid	kg/day	\$1.03 \$/kg H3PO4	—	For Activated Sludge
Fertiliser for Nutrient	13 kg/day	\$0.37 \$/kg	\$1,707	For aerated Stabilisation basins
Polymer for biosludge	kg/day	\$14.00 \$/kg	—	
Operators	4 man hrs/d	\$23.13 \$/man hour	\$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	\$50.88 \$/man hour	\$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	\$90,000 \$/year	\$29,700	
Sludge disposal	dry t/day	\$60.00 \$/dry tonne	—	
Maintenance	Total maintenance labour and materials	=	\$59,925	2.5% of capital cost
	Annual Operating Cost =		\$245,000	

Description of System

1500 metres of effluent piping, 1 Effluent Pump Stations.

Aerated stabilisation basin

Submerged Outfall 100 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

KRUGER INC.

TROIS RIVIERES

QUEBEC

Effluent data —>	103,038	7,686	21,737	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	103,038 cu. m/day		0.5 km long	\$412,578	Secondary clarifiers to river
Gravity Pipeline 2	cu. m/day		0 km long	---	
Gravity Pipeline 3	cu. m/day		0 km long	---	
Forcemain 1	103,038 cu. m/day		0.5 km long	\$294,007	Primary clarifier to activated sludge
Forcemain 2	cu. m/day		0 km long	---	
Pump Station 1	103,038 cu. m/day		1	\$1,853,263	Primary clarifier to activated sludge
Pump Station 2	0 cu. m/day		0	---	
Pump Station 3	0 cu. m/day		0	---	
Lump Sum Piping	200,000 Dollars		----- Lump Sum	\$200,000	Misc collection
Primary Clarifier	cu. m/day		0	---	Existing unit adequate
Aerated Stabilisation Basin	BOD kg/d		0	---	
Activated Sludge Reactor	21,737 BOD kg/d		1	\$6,408,716	
Aerators	21,737 BOD kg/d		1 Systems	\$2,478,071	
Nutrient Addition	-----		1 Systems	\$400,000	
Neutralisation	-----		1 Systems	\$200,000	
Secondary Clarifier	51,519 cu. m/day		2	\$6,681,078	
Secondary sludge thickener	Dollars		0	---	
Sludge Dewatering	9,000 kg/day		2 Systems	\$5,180,000	Addition to existing, allows for large
Submerged Outfall	103,038 cu. m/day		0.5 km long	\$4,006,188	proportoin on biosludge
Roads	-----		0 Kilometres	---	
Site allowances (arbitrary)	1,000,000 Dollars		----- Lump Sums	\$1,000,000	
Capital cost (excluding inflation and regional factors)				\$29,113,901	
(Regional factor = 1.05)			Capital Cost =	\$30,570,000	
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1571 kw	\$0.022 \$/kW hour	\$276,577	Pumping + aeration + misc
Lime for neutralisation	12000 kg/day	\$0.09 \$/kg Cao	\$378,000	
Ammonia	1320 kg/day	\$0.40 \$/kg NH3	\$184,768	For Activated Sludge
Phosphoric Acid	687 kg/day	\$1.03 \$/kg H3PO4	\$247,730	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	87 kg/day	\$14.00 \$/kg	\$426,054	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	8 dry t/day	\$60.00 \$/dry tonne	\$168,000	In addition to present
Maintenance	Total maintenance labour and materials	=	\$764,250	2.5% of capital cost
		Annual Operating Cost =	\$3,209,000	

Description of System

1000 metres of effluent piping, 1 Effluent Pump Stations.
 2 x 59 meter dia. Secondary Clarifiers
 27200 cu. meter Activated Sludge Reactor with 1240 kW installed aeration
 Submerged Outfall 500 metres long

STONE-CONSOLIDATED INC.

TROIS RIVIERES

QUEBEC

Effluent data ———>	108,035	10,449	16,996	(Flow cu. m/day TSS kg/d BOD kg/d)	
EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	108,035	cu. m/day	0.5	km long	\$425,477 From secondary clarifier to river
Gravity Pipeline 2	68,035	cu. m/day	1.5	km long	\$945,055 Part of collection system
Gravity Pipeline 3	40,000	cu. m/day	2	km long	\$892,192 Part of collection system
Forcemain 1	108,035	cu. m/day	1	km long	\$609,276 To activated sludge reactor
Forcemain 2		cu. m/day	0	km long	-----
Pump Station 1	68,035	cu. m/day	1		\$1,505,933 Part of collection system
Pump Station 2	40,000	cu. m/day	1		\$1,154,701 Part of collection system
Pump Station 3	0	cu. m/day	0		-----
Lump Sum Piping	5,000,000	Dollars	----- Lump Sum		\$5,000,000 Extremely difficult site

Primary Clarifier		cu. m/day	0		-----
Aerated Stabilisation Basin		BOD kg/d	0		-----
Activated Sludge Reactor	16,996	BOD kg/d	1		\$6,631,210
Aerators	16,996	BOD kg/d	1	Systems	\$1,937,538
Nutrient Addition	-----		1	Systems	\$400,000
Neutralisation	-----		1	Systems	\$200,000
Secondary Clarifier	54,018	cu. m/day	2		\$6,816,923
Secondary sludge thickener		Dollars	0		-----
Sludge Dewatering	12,000	kg/day	1	Systems	\$2,620,000 Upgrade existing
Submerged Outfall	108,035	cu. m/day	0.3	km long	\$2,449,685
Roads	-----		1	Kilometres	\$25,000
Site allowances (arbitrary)	1,100,000	Dollars	----- Lump Sums		\$1,100,000
Capital cost (excluding inflation and regional factors)					\$32,712,990
(Regional factor = 1.05)					Capital Cost = \$34,349,000
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	1301 kw	\$0.022 \$/kW hour	\$228,941	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	\$0.09 \$/kg Cao	\$189,000	
Ammonia	1032 kg/day	\$0.40 \$/kg NH3	\$144,466	For Activated Sludge
Phosphoric Acid	537 kg/day	\$1.03 \$/kg H3PO4	\$193,694	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	68 kg/day	\$14.00 \$/kg	\$333,121	
Operators	48 man hrs/d	\$23.13 \$/man hour	\$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	\$50.88 \$/man hour	\$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	\$90,000 \$/year	\$90,000	
Sludge disposal	12 dry t/day	\$60.00 \$/dry tonne	\$252,000	
Maintenance	Total maintenance labour and materials =		\$858,725	2.5% of capital cost
			Annual Operating Cost =	\$2,963,000

Description of System

5000 metres of effluent piping, 2 Effluent Pump Stations.

2 x 60 meter dia. Secondary Clarifiers

28300 cu. meter Activated Sludge Reactor with 970 kW installed aeration

Submerged Outfall 300 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

DOMTAR INC.

WINDSOR

QUEBEC

Effluent data ———>	89,646	12,971	22,948	(Flow cu. m/day TSS kg/d BOD kg/d)
EQUIPMENT	DESIGN LOAD	QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-----
Gravity Pipeline 2	cu. m/day	0	km long	-----
Gravity Pipeline 3	cu. m/day	0	km long	-----
Forcemain 1	cu. m/day	0	km long	-----
Forcemain 2	cu. m/day	0	km long	-----
Pump Station 1	cu. m/day	0		-----
Pump Station 2	0 cu. m/day	0		-----
Pump Station 3	0 cu. m/day	0		-----
Lump Sum Piping	0 Dollars	-----	Lump Sum	-----
Primary Clarifier	cu. m/day	0		-----
Aerated Stabilisation Basin	BOD kg/d	0		-----
Activated Sludge Reactor	BOD kg/d	0		-----
Aerators	BOD kg/d	0	Systems	-----
Nutrient Addition	-----	0	Systems	-----
Neutralisation	-----	0	Systems	-----
Secondary Clarifier	cu. m/day	0		-----
Secondary sludge thickener	Dollars	0		-----
Sludge Dewatering	0 kg/day	0	Systems	-----
Submerged Outfall	cu. m/day	0	km long	-----
Roads	-----	0	Kilometres	-----
Site allowances (arbitrary)	Dollars	-----	Lump Sums	-----
Capital cost (excluding inflation and regional factors)				\$0
(Regional factor = 1.05)		Capital Cost =		\$0
(Inflation factor = 1.00)				Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost	Annual_Cost	
Power required	kw	\$0.022 \$/kW hour	-----	Pumping + aeration + misc
Lime for neutralisation	kg/day	\$0.09 \$/kg Cao	-----	
Ammonia	----- kg/day	\$0.40 \$/kg NH3	-----	For Activated Sludge
Phosphoric Acid	----- kg/day	\$1.03 \$/kg H3PO4	-----	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	\$0.37 \$/kg	\$0	For aerated Stabilisation basins
Polymer for biosludge	----- kg/day	\$14.00 \$/kg	-----	
Operators	0 man hrs/d	\$23.13 \$/man hour	-----	Inc Fringes and Overhead
Technicians	0 man hrs/d	\$50.88 \$/man hour	-----	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.00 person	\$90,000 \$/year	-----	
Sludge disposal	----- dry t/day	\$60.00 \$/dry tonne	-----	
Maintenance	Total maintenance labour and materials =			\$0 2.5% of capital cost
	Annual Operating Cost =			\$0

Description of System

Although the 1987 effluent data that this report is based upon shows a major effluent flow, it is known that the mill has been shut do replaced by a new kraft mill with a modern effluent treatment system.

