FRANCONIA MANUFACTURING CORPORATION
EAST BRANCH OF THE PEMIGEWASSET RIVER
LINCOLN, NEW HAMPSHIRE
APRIL 5, 1972

INTRODUCTION

In July, 1971, the Franconia Manufacturing Corporation in Lincoln, New Hampshire, started operation of what was originally the Franconia Paper Company mill. Since that time, several fish kills have been reported downstream of the mill.

The last Federal survey of the pollution problem in the East Branch of the Pemigewasset River was conducted between 1964 and 1966. Between 1966 and the present, the pulp and paper mill converted to an ammonium based sulfite process with sulfur recovery using the Copeland Process and installed a white water treatment plant (WWTP). In 1969, the town of Lincoln constructed a new water pollution control facility(WPCF).

Because of the fish kills and the lack of current data on both the mill effluent and the stream conditions, Region I, Environmental Protection Agency, assisted by the New Hampshire Water Supply and Pollution Control Commission (NHWS & PCC), conducted a study of the mill's WWTP, the town's WPCF, and the East Branch of the Pemigewasset River.

FRANCONIA MANUFACTURING CORPORATION

Franconia Manufacturing Corporation, an ammonia based sulfite pulp and paper mill, produces 110 tons of paper per day with a waste water discharge of approximately seven million gallons per day to the East Branch of the Pemigewasset River. Raw materials used in the manufacture of paper include anhydrous ammonia and sulfur used to produce the ammonium bisulfite cooking liquor, soft and hard-wood logs,

chlorine bleach, caustic soda, hypochlorite wash, clay, starches, rosin sizing, and dyes. The mill purchases approximately ten tons of pulp per day in addition to the ninety tons produced per day.

Figure 1 shows the location of the mill.

PULP MILL OPERATION

The company trucks in both hard and soft wood logs, which are debarked and chipped for use in the sulfite pulp mill. The bark from the debarker drums is trucked away to a bark pile located just upstream of the mill proper. Some transport water is used to carry the logs to the chipper. Over-flows and drains in the woodroom are connected to the WWTP.

The mill burns sulfur to sulfur dioxide gas and absorbs it in an ammonium hydroxide and water mixture to produce the ammonium bisulfite cooking liquor.

The chips and ammonium bisulfite are cooked in digesters for 6 hours at 130°C and 90 psi(pounds per square inch). At the end of that time the mixture is blown into blow tanks.

The pulp is then passed through knotters where knots and other undigested particles are removed and trucked away to the bark pile after which the pulp is washed on drum washers with a counter-current washwater flow. The spent sulfite liquor (SSL) is sent to the Copeland Process incinerator.

After washing, the pulp is screened and sent to the three stage chlorine bleach, caustic extraction, and hypochlorite wash bleachery. All wastes from the screen room and bleachery are sent to the WWTP. The whitened pulp is conveyed to the paper mill.

See Figure 2 for a flow diagram of the pulp mill.

PAPER MILL OPERATION

Pulp is mixed with clay, starch, and rosin sizing in beaters and sent through cyclone cleaners to paper machine head boxes. Wastewaters from the paper mill originate from cleaning the pulp, paper machine white water overflow, and washdown operations. These wastes are treated in the WWTP. Figure 3 shows a flow diagram of the paper mill.

WHITE WATER TREATMENT PLANT

All the waste flows from the Franconia Manufacturing Corporation, except sanitary waste which is treated at the municipal treatment facility and the spent sulfite liquor (SSL) which is treated separately, are treated at the white water treatment plant (WWTP). The WWTP is located on town owned land within the Franconia Manufacturing Corporation mill area and operated by mill personnel. Treatment consists of flocculation and settling. The settled sludge is thickened, vacuum filtered and trucked to the bark pile dump area.

Chemicals used in the treatment of a calculated 7 mgd(million gallons per day) are lime (CaO) for pH adjustment, followed by the addition of an alum (Al_2O_3) solution for flocculation. Only one of the two clarifiers was in operation on the survey date. Refer to Figure 4 for a flow diagram of the WWTP and sampling locations.

FRANCONIA MANUFACTURING CORPORATION
WHITE WATER TREATMENT PLANT

BASIC DESIGN DATA*

Flow	Average 10 MGD
	Maximum 14 MGD
Mixing	1 Tank, 15 ft. X 15 ft. and 15 ft. deep.
	Detention Period: 2.5 minutes
Flocculation and Sedimentation	2 clarifiers, each 110 ft. diameter and 10 ft. deep.
	Detention Periods: Flocculation zone 30 minutes
	settling zone 3 hours
Sludge thickening	1 Unit, 80 ft. diameter and 13 ft. deep
	(Sludge quantity: 10 to 15 tons per day dry)
Sludge Dewatering	2 rotary vacuum filters, each 8 ft. X 14 ft.
	each 350 sq. ft.
	(Loading: 3.55 lbs. minimum per sq. ft. per hour)

* Data from publication by Camp, Dresser , & McKee
"Water Pollution Control Facilities", Lincoln, N.H., Dec., 1969

COPELAND INCINERATION PROCESS

The spent sulfite cooking liquor (SSL) is being sent to the Copeland Incinerator Process which is located in the recovery plant building on town land within the mill yard and operated by mill personnel. In the process, the SSL is evaporated to 32 to 37 percent solids and burned in an atomized dispersion type fluidized bed incinerator. The steam generated is sufficient to run the evaporators and to supplement the pulp mill steam requirements.

The combustion of SSL releases sulfur dioxide which is scrubbed from the exhaust gas by absorption in ammonium hydroxide. The resultant ammonium bisulfite is used to supplement the mill's cooking liquor requirement.

The two wastewater sources from this process are foul condensate and washwater from the cyclone containing fly ash. Both are sent to the WWTP for treatment prior to discharge.

Figure 5 is a flow diagram of the incineration process published by the consultant engineers Camp, Dresser, and McKee.

POLLUTIONAL RIVER LOADINGS

All process wastewater receives treatment in either the Copeland Incinerator or the WWTP. The wastewaters from the incinerator are sent to the WWTP; the WWTP effluent flows in a ditch for approximately 200 yards before entering the river on the north bank. Also, yard and roof drains carry run-off from the WWTP area to the ditch.

Another source of waste is the leachate and run-off from debarking and sludge wastes dumped on the north bank of the river upstream from the pulp and paper mill.

LINCOLN, NEW HAMPSHIRE

The town of Lincoln, New Hampshire, is located on the headwaters of the Pemigewasset River. The town has an area of approximately 128 square miles with a highly variable population with a peak during the tourist season in the summer months.

The population of Lincoln is concentrated in the southwest corner of the town along the East Branch of the Pemigewasset River about one mile upstream from its confluence with the North Branch of the river. Many summer homes, tourist cabins, and motels in Lincoln are located on Route 3 along the North Branch of the Pemigewasset River.

The principal industry in the town is the Franconia Manufacturing Corporation employing approximately 300 people. Sanitary wastes from the paper mill and part of the town are treated at the municipal water pollution control facility (WPCF).

WATER POLLUTION CONTROL FACILITY

The WPCF consists of approximately 10 acres of stabilization pond in two five acre cells, operating in series.

Sewage flow is comminuted prior to entering the first cell which is aerated. The overflow from the second non-aerated cell is chlorinated to a five milligram per liter residual in a chlorine contact chamber having a designed detention time of fifteen minutes before discharged to the East Branch of the Pemigewasset River.

Figure 6 is a flow diagram of the WPCF also showing sampling locations and Figure 1 shows the location of the facility.

TOWN OF LINCOLN, NEW HAMPSHIRE
WATER POLLUTION CONTROL FACILITY
BASIC DESIGN DATA *

Population served	2000 (Year 1985)
Sewage flow (Year 2000)	Average daily 0.74 mgd.- Peak 2.64 mgd.
Comminution	1 Unit, capacity 2 mgd. Bypass bar racks provided
Stabilization	2 ponds, each 5 acres. Operating depth: 3 to 5 Ft. Detention time: 30 days (Loading: 200 persons per acre)
Chlorination	2 chlorinators, capacity: 200 lbs. per day each (Dosage: 20 mg/l)

*Data from publication by Camp, Dresser , & McKee
"Water Pollution Control Facilities", Lincoln, N.H., Dec., 1969

PEMIGEWASSET RIVER

Figure 1 is a map of the general area and Table 1 locates and describes the sampling stations. The Pemigewasset River originates in Franconia and Lincoln, New Hampshire. It flows in a southerly direction through the towns of Woodstock, Thornton, Campton, Holderness, Plymouth, Ashland, Bridgewater, Bristol, New Hampton, Hill, Sanbornton, and Franklin where it joins the Merrimack River. The length of the Pemigewasset River from the steel highway bridge on Route 3A in Lincoln, about one-half mile north of the Lincoln-Woodstock town line, to the highway bridge on Route 3 in Franklin, about 0.2 miles upstream from Merrimack River, is about 56 miles.

The Franconia Manufacturing Corporation discharge is located approximately one mile upstream from the Route 3A bridge on the East Branch of the Pemigewasset River, an interstate body of water, as is the Pemigewasset River downstream from its confluence with the East Branch.

The East Branch of the Pemigewasset River from the Franconia Manufacturing Corporation effluent discharge downstream to its confluence with the North Branch has been classified "C" by the N.H. WSPCC which was approved by the U.S. Department of Interior on December 1, 1970.

SAMPLING INFORMATION

Table 1 locates and describes the sampling locations. Most samples were collected, preserved, and analyzed according to EPA Standard Methods for the Examination of Water and Wastewater where applicable. The only exception being the spent sulfite liquor analysis by the Pearl-Benson Method recommended by the Technical Association of the Pulp and Paper Industry. The EPA Region 1 chain of custody record system was used to safeguard the samples.

RESULTS

Tables 2 through 4 summarize the results of the laboratory analyses. An efficiency study is presented in Table 5 of the WWTP and WPCF which are the two main pollutional sources to the East Branch of the Pemigewasset River in Lincoln, New Hampshire.

WHITE WATER TREATMENT PLANT (WWTP)

The WWTP was functioning fully during the survey, with the exception of one of the two clarifiers. The company reported some problems with flocculation by liquid alum addition which was started

on the survey date.

The WWTP receives a calculated 7 mgd(million gallons per day) of process wastes containing 5800 pounds of suspended solids and 12,800 pounds of BDD_5. It removes approximately 1240 ppd (pounds per day) or 21% of the suspended solids. However, the unit only removes 1360 ppd of 5-day biochemical oxygen demanding (BOD_5) material, or less than 11%. Analyses of the influent and effluent from the WWTP is given in Table 2.

The WWTP effluent constituents are present in concentrations so as to create the following pollution load on the river:

Parameter	Plant Loading indicated by * grab sample analyses	River Loading indicated by ** composite sample analyses
BOD_5	11,500 ppd	13,400 ppd
Suspended solids	4610 ppd	4300 ppd
Settleable solids	1830 ppd	845 ppd
NH_3 - N	1165 ppd	1980 ppd

* Based on three grab sample analyses

** Based on twelve hour composite sample analyses collected from 1730 hours, April 4, to 0430 hours, April 5, 1972

The effluent also contained total coliform bacterial densities in excess of 3,000,000 per 100 milliliters and was highly turbid.

The samplers noticed a strong odor from the effluent.

Another outfall was observed to be discharging yard drainage from the vicinity of the WWTP. This yard is caked with lime due to sloppy feeding methods. The discharge, which was milky white in appearance, may contain large amounts of lime.

WATER POLLUTION CONTROL FACILITY (WPCF)

Analyses of the influent and effluent from the WPCF is given in Table 3 . Based upon a calculated discharge rate of 200,000 gpd and measured effluent concentrations, the following pollutional loadings are placed on the East Branch of the Pemigewasset River:

Parameter	River Loading (ppd)
BOD_5	14.5
Suspended solids	13.5
Settleable solids	3.5
NH_3-N	13.4

The effluent also contains a chlorine residual in excess of 4.5 milligrams per liter (mg/l) and a total coliform bacterial density of less than 1000 per 100 milliliters. The sampling crew observed a leak in the chlorine feed line inside the contact chamber during the reconnaissance survey of March 29, 1972 and again on April 5, 1972 during the sampling survey.

By comparing the WWTP and WPCF loading rates, it can be established that the major pollutional source is that of the Franconia

Manufacturing Corporation WWTP discharge.

EAST BRANCH-PEMIGEWASSET RIVER

Analytical results generated from river sampling are given in Table 4.

Upstream of Mill:

The temperature in the river upstream of the mill(EBP1)ranged between 0.5 and 1.0°C. The level of turbidity was below 5 J.T.U. and the concentration of total nonfilterable residue (a measure of suspended solids) averaged approximately 3 mg/l. The dissolved oxygen content of the river at this location was near saturation. The average BOD_5 concentration was less than 1.2 mg/l. This is a normal background BOD_5 for waters caused by natural organics. Also, a total coliform bacterial density upstream of the mill averaged 16/100 ml.

In addition, analyses for ammonia-nitrogen (NH_3-N) and spent sulfite liquor (S.S.L.) was accomplished in order to determine background levels present upstream of the mill. The NH_3-N concentration averaged 0.01 mg/l; the S.S.L. concentration was less than 15 mg/l.

Stream conditions at the time of the sampling were characterized as high flow, turbulence, and low temperature.

Between WWTP effluent and WPCF effluent

The concentrations of all measured constituents increased markedly between the mill and the WPCF (EBP2) as compared with the upstream concentrations except for the dissolved oxygen level which decreased.

A temperature rise of between 4 and 5 Centigrade degrees was

observed; the level of turbidity increased from an average 3 to 24 J.T.U.; suspended solids concentration rose to an average 15.5 mg/l; BOD_5 concentration increased to 47 mg/l; total coliform density increased considerably to an average greater than 283,000/100 ml.; NH_3-N concentration increased to 5.2 mg/l and S.S.L. concentration averaged 382 mg/l. All increases in concentrations are attributable to the type of waste being discharged from the Franconia Manufacturing Corporation WWTP. The dissolved oxygen level decrease to 11.4 mg/l in the reach of the river between the mill and the WPCF is indicative of the deoxygenating potential of the WWTP effluent.

Downstream of the WPCF

Increased mixing and dilution resulted in lower concentrations downstream of the WPCF(EBP3) as compared with those in the river between the mill and the WPCF, with the exception of dissolved oxygen content. However, the constituents present in the river downstream of the WPCF still combine to form an antagonistic environment for fish and other aquatic life.

The temperature level decreased to approximately 1.7°C; turbidity to 10 J.T.U.; suspended solids to 4.3 mg/l; BOD_5 to 9.1 mg/l; NH_3-N to 1.0 mg/l; and S.S.L. to 83 mg/l. The dissolved oxygen level rose to an average 12.7 mg/l. The rise in D.O. is attributable to the reaeration potential of the river in this reach. The average coliform density downstream of the WPCF was 1,500,000/100 ml. The sampling crew observed an odor at this location similar to that noticed at the WWTP effluent.

DISCUSSION

FRANCONIA MANUFACTURING CORPORATION

Figures 2 and 3 are schematic diagrams of the pulp and paper mill processes. The washing process is the only operation in the pulp mill incorporating a countercurrent flow cycle. Significant water usage reduction methods using additional recycling and countercurrent flow processes could possibly be proposed by a water management study. Such a study could show methods for reducing water consumption thus producing a lower volume but more concentrated waste which would be easier to treat.

The Copeland Incineration Process appeared to be operating properly although a significant quantity of ammonia was present in the WWTP effluent. Facilities for ammonia removal should be incorporated into the WWTP. Such a system may be economically justified in that recovered ammonia can be used to supplement the cooking liquor requirements of the pulp mill.

The bark pile is located above the mill on the bank of the East Branch of the Pemigewasset River in an area which was at one time, a pond. Bark and knots from the pulp mill and sludge from the WWTP are trucked to the dump. The bark pile should be eliminated since the leachate produced from the bark and sludge dumped in this area can create a pollutional load on the river. The bark could be incinerated and the by-product steam could supplement the steam requirements of the mill. The possibility of burning sludge should be investigated. If necessary, the sludge could be trucked to a properly operated sanitary landfill.

WHITE WATER TREATMENT PLANT

Table 5 contains an efficiency study of the WWTP. Additional treatment is necessary to increase the efficiency of this facility. The lime cake on the ground in the vicinity of the WWTP should be eliminated. The yard drains in this area carry off the lime into the river creating another pollutional load on the East Branch of the Pemigewasset River. Due to a problem in the past with one of the two clarifiers, sludge was dumped on the ground at the periphery of the WWTP. This waste could also be carried to the river through the yard drains by the spring runoff.

WATER POLLUTION CONTROL FACILITY

As can be seen from the analytical results given in Table 3, the influent to the WPCF can be categorized as weak. This indicates a high infiltration rate which should not be present in a new sewer system such as this.

The WPCF may be overdesigned since the 10 acres of lagoons at this facility receive only 14 pounds BOD_5 per acre. The effluent is low in organic content and bacterial density. Table 5 shows the efficiency of the WPCF.

EAST BRANCH-PEMIGEWASSET RIVER

Analyses of samples taken in the river upstream of the mill indicate that the State-Federal water quality classification (Class B) is met. However, the river below the mill contains organic matter, bacteria, suspended solids, NH_3-N, and S.S.L in concentrations above those which would be considered acceptable for the established use

classification (Class C) for this reach of the river.

The BOD_5 concentrations in the river below the mill indicate a very strong deoxygenating waste being introduced by the WWTP effluent and the leachate entering the river from the bark pile area. The decrease in BOD_5 concentrations between Stations EBP-2 and EBP-3 is attributable to increased dilution.

The effluent from the WWTP and the bark pile leachate, because of the organic content, will create an oxygen deficit in the river. During periods of low river flow and/or warm temperatures, low D.O. levels can inhibit the growth and activity of fish and other aquatic life.

Because of the WWTP effluent suspended solids concentration, fish propagation may be diminished. Suspended solids are iminical to aquatic life by causing abrasive injuries; by clogging the gills; and by blanketing the bottom thereby destroying spawning beds, killing eggs, young, and food organisms. In the presence of even low concentrations of toxic substances, fish may be so weakened that the abrasive and clogging actions of suspended solids become more effective and dangerous, and even lethal.

The WWTP effluent contains excessive NH_3-N thereby creating an average concentration in the river between the mill and the WPCF of 5.2 mg/l. The effect of NH_3-N at a concentration as low as 1.0 mg/l decreases the ability of hemoglobin to combine with oxygen resulting in suffocation of fish. The toxicity of NH_3-N is markedly increased by a reduced dissolved oxygen content in the water.

The S.S.L contains, in dissolved or very finely divided suspension, approximately half the weight of the wood used for pulping and comprises fibre binding substances such as lignin, pectin, hemicelluloses, sulfur dioxide, sulfites, organic acids, and other organic and inorganic substances. Acid in reaction, the S.S.L is high in BOD and organic matter with a pungent odor and has a characteristic tendency to foam in receiving waters. S.S.L is inimical to fish and other aquatic life in that it results in oxygen depletion Exposures to S.S.L adversely affects the internal organs of fish at concentrations as low as 10 mg/l.

Most of the S.S.L is incinerated in the Copeland Process. However, some is carried in the stock past the brown stock washers. Any S.S.L which is carried over is, when separated from the stock, sent to the WWTP and to the river. The knots and other undigested particles separated by the knotters are coated with S.S.L. This S.S.L. will be carried into the river by the leachate from the bark pile where the knots are dumped.

The S.S.L concentration in the East Branch of the Pemigewasset River between the mill and the WPCF averaged 382 mg/l which reflects the type of waste discharged to the river by the Franconia Manufacturing Corporation WWTP. Moreover, S.S.L imparts a definite taste to fish flesh.

GENERAL ANALYSIS

The water quality of the East Branch of the Pemigewasset River is degraded by the waste discharges from Franconia Manufacturing Corporation and the Lincoln municipal WPCF.

A marked increase in the river BOD, bacterial density, suspended solids, turbidity, ammonia-nitrogen, and spent sulfite liquor concentrations, and temperature level were observed from above the mill to below the WPCF. This is the reach into which Franconia Manufacturing Corporation and the WPCF discharge their wastes.

These concentrations are considered to be above those which would be considered acceptable for the established use classification (Class C) for this reach of the river.

TABLE 1

SAMPLE STATION IDENTIFICATION

STATION	LATITUDE o ' "	LONGITUDE o ' "	DESCRIPTION
(River)			
EBP1	44 03 25	71 38 05	Pemigewasset River at Loon Mountain Bridge
EBP2	44 02 05	71 40 22	Pemigewasset River 0.5 miles downstream from WWTP discharge
EBP3	44 01 49	71 40 47	Pemigewasset River at I - 93 construction crossing
(WWTP)			
FMC1	44 02 25	71 40 06	WWTP influent
FMC2	44 02 24	71 40 04	WWTP effluent to ditch
(WPCF)			
LTP I	44 02 12	71 40 34	WPCF influent after comminutor
LTPE	44 02 10	71 40 37	WPCF effluent from chlorine contact chamber

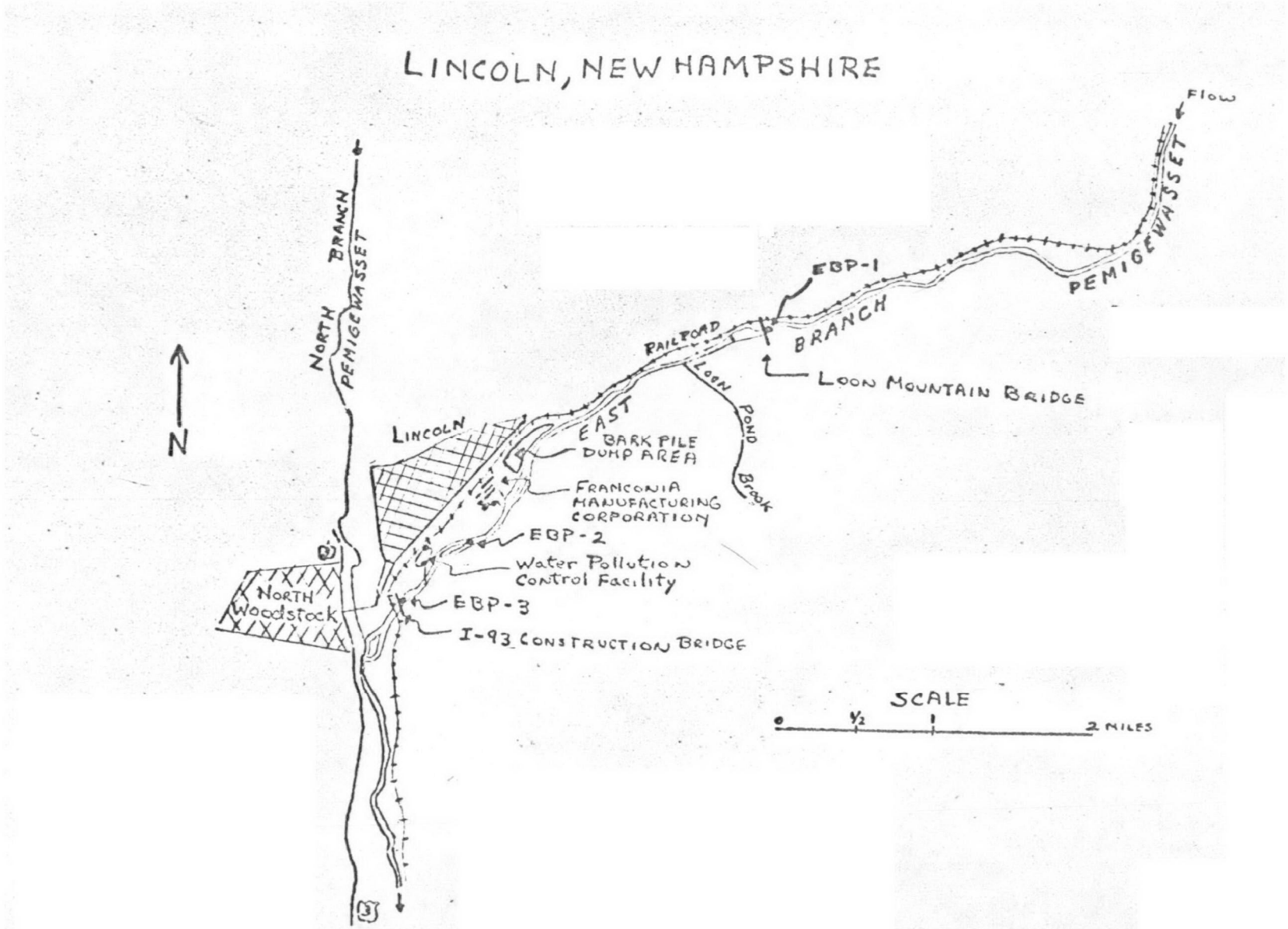

LINCOLN, NEW HAMPSHIRE
Flow
PEMIGEWASSET
EBP-1
RAILROAD
BRANCH
LOON MOUNTAIN BRIDGE
NORTH BRANCH PEMIGEWASSET
N
LINCOLN
EAST
BARK PILE DUMP AREA
LOON POND BROOK
FRANCONIA MANUFACTURING CORPORATION
EBP-2
Water Pollution Control Facility
NORTH Woodstock
EBP-3
I-93 CONSTRUCTION BRIDGE
SCALE
½
1
2 MILES

FIGURE 1

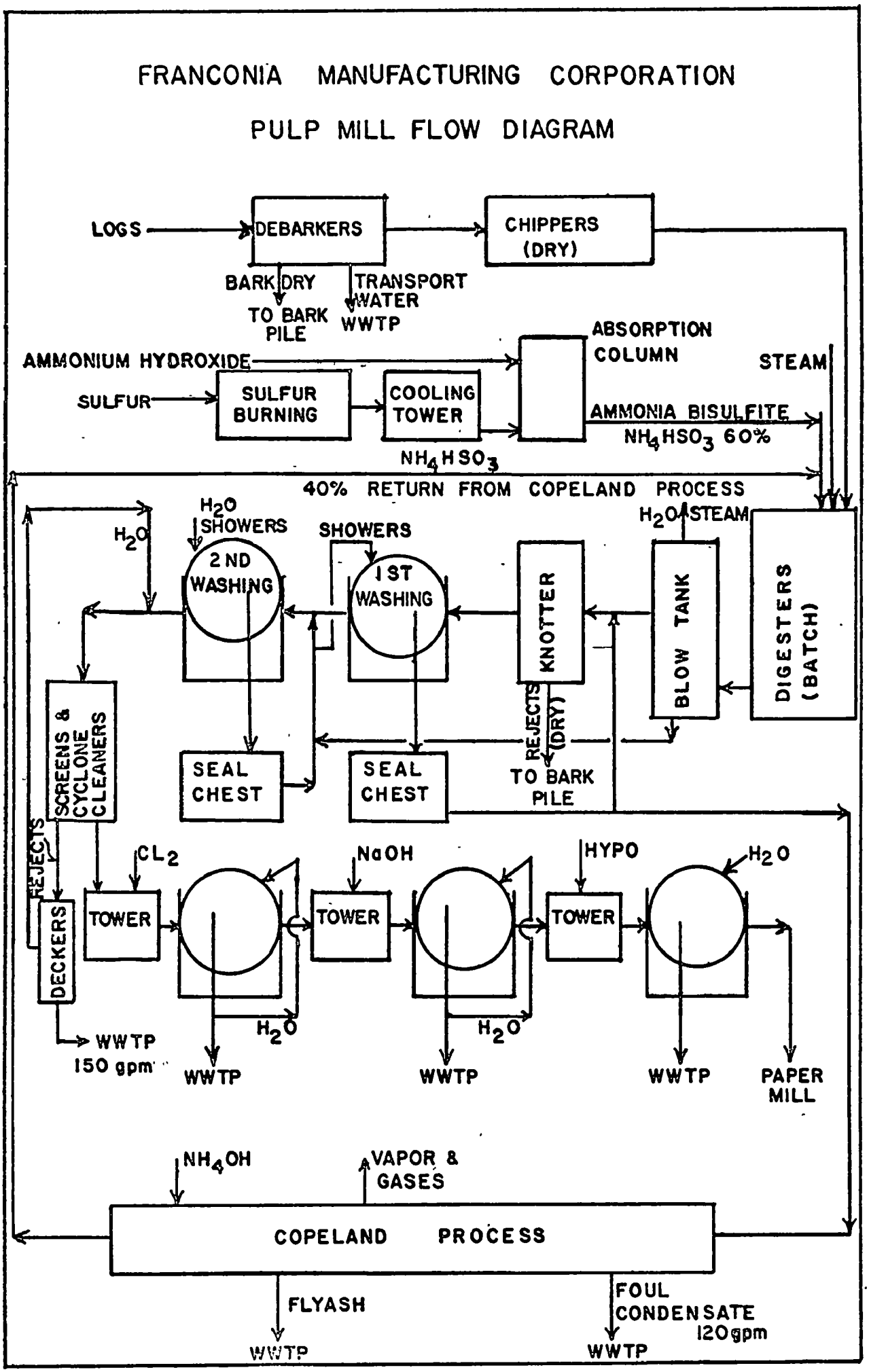

FRANCONIA MANUFACTURING CORPORATION
PULP MILL FLOW DIAGRAM
LOGS
DEBARKERS
CHIPPERS (DRY)
BARK DRY TO BARK PILE
TRANSPORT WATER WWTP
AMMONIUM HYDROXIDE
SULFUR
SULFUR BURNING
COOLING TOWER
ABSORPTION COLUMN
STEAM
AMMONIA BISULFITE NH_4HSO_3 60%
NH_4HSO_3
40% RETURN FROM COPELAND PROCESS
H_2O
H_2O SHOWERS
2ND WASHING
SHOWERS
1ST WASHING
KNOTTER
H_2O STEAM
BLOW TANK
DIGESTERS (BATCH)
SCREENS & CYCLONE CLEANERS
REJECTS (DRY)
SEAL CHEST
SEAL CHEST
TO BARK PILE
REJECTS
DECKERS
CL_2
TOWER
NaOH
TOWER
HYPO
TOWER
H_2O
WWTP 150 gpm
H_2O
H_2O
WWTP
WWTP
WWTP
PAPER MILL
NH_4OH
VAPOR & GASES
COPELAND PROCESS
FLYASH
WWTP
FOUL CONDENSATE 120gpm
WWTP

FIGURE 2

FRANCONIA MANUFACTURING CORPORATION

PAPER MILL

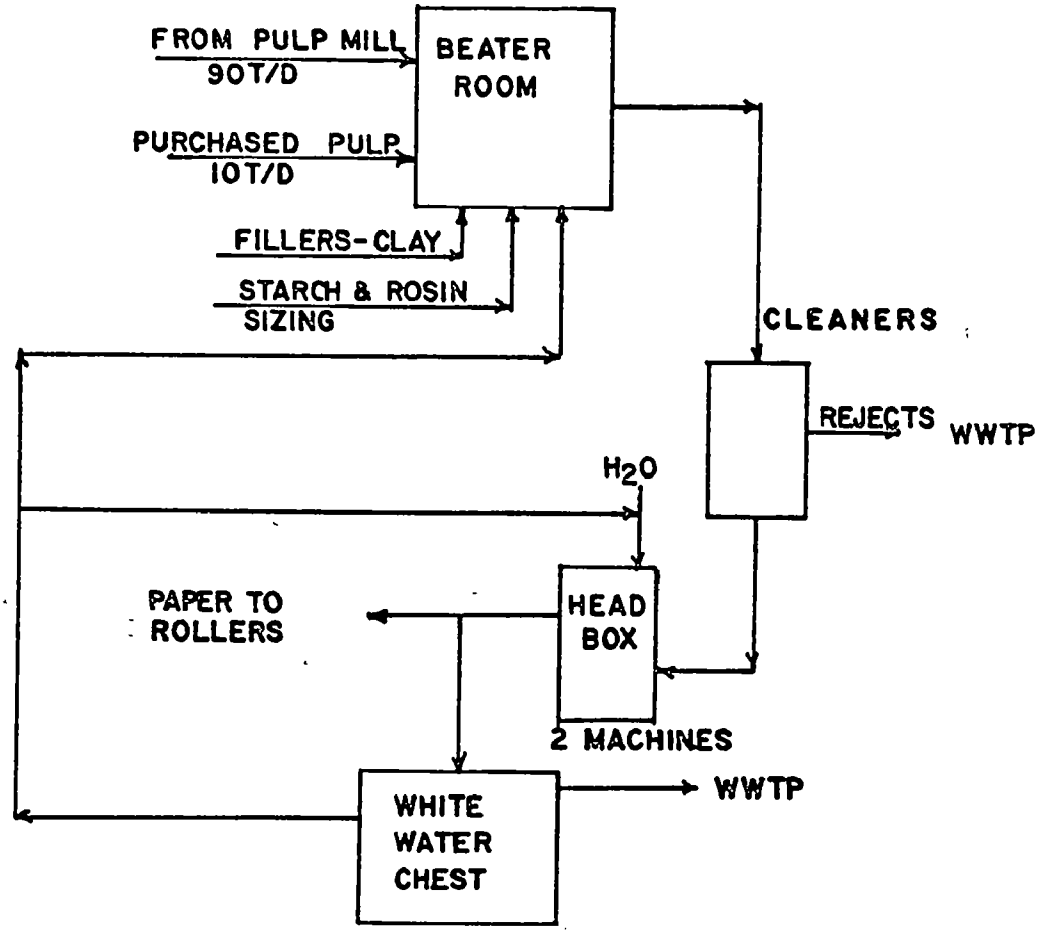


FIGURE 3

FRANCONIA MANUFACTURING CORPORATION

WHITE WATER TREATMENT PLANT

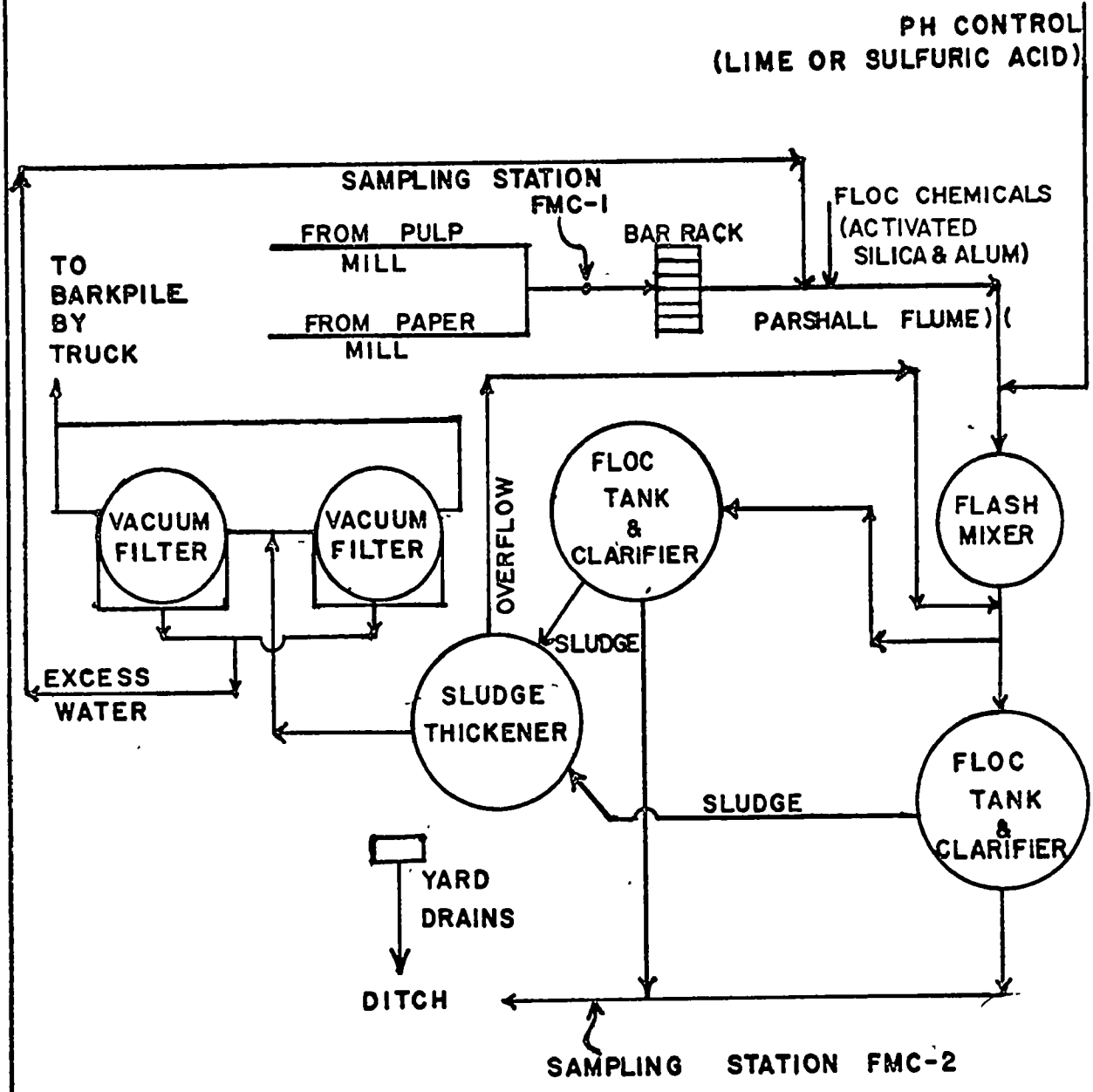
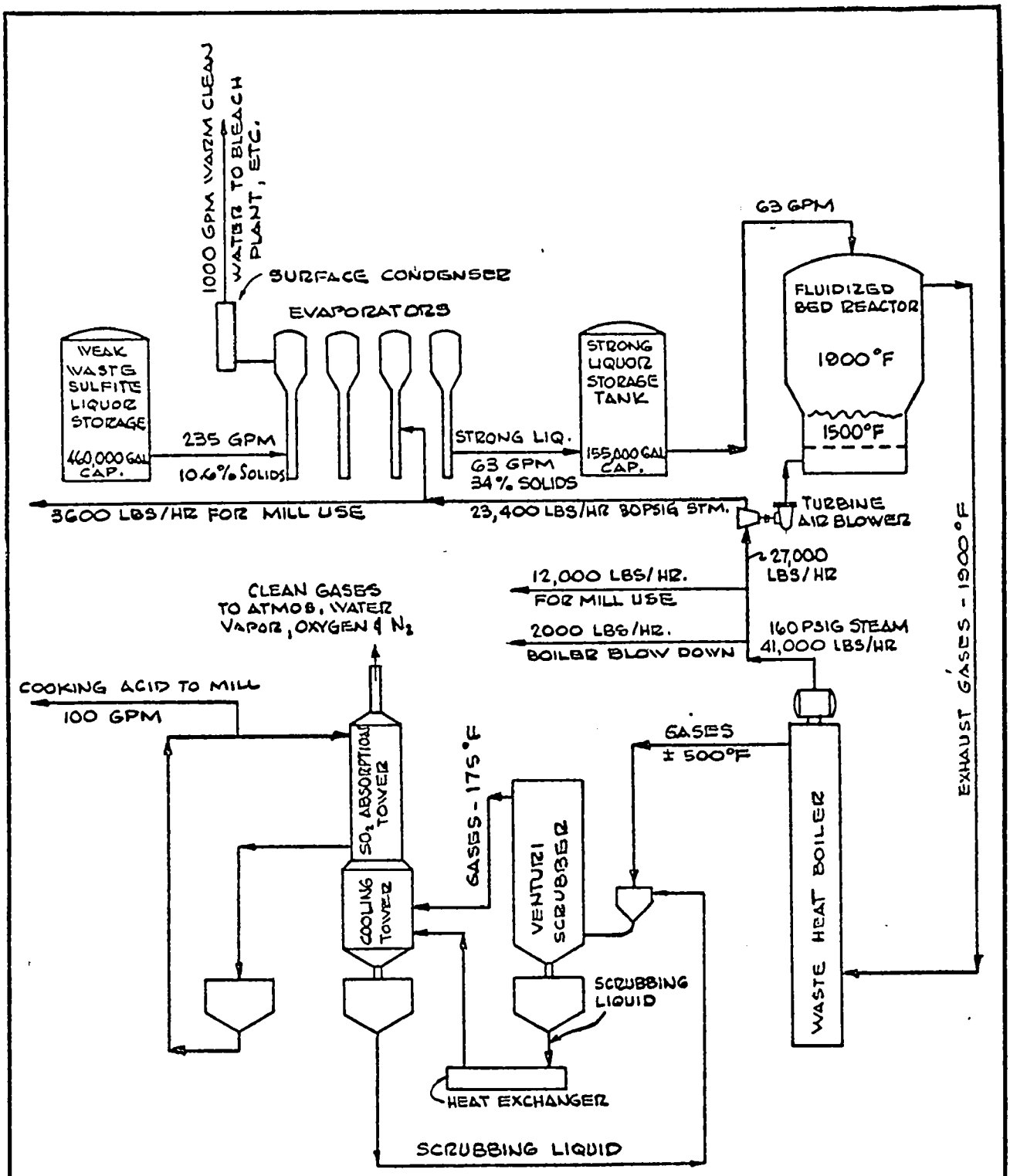


FIGURE 4



FRANCONIA PAPER CORPORATION
ACID RECOVERY SYSTEM

COPELAND PROCESS CORPORATION

TOWN of LINCOLN
LINCOLN, NEW HAMPSHIRE

SULFITE LIQUOR DISPOSAL PLANT

FIGURE 5

LINCOLN, NEW HAMPSHIRE

WATER POLLUTION CONTROL FACILITY

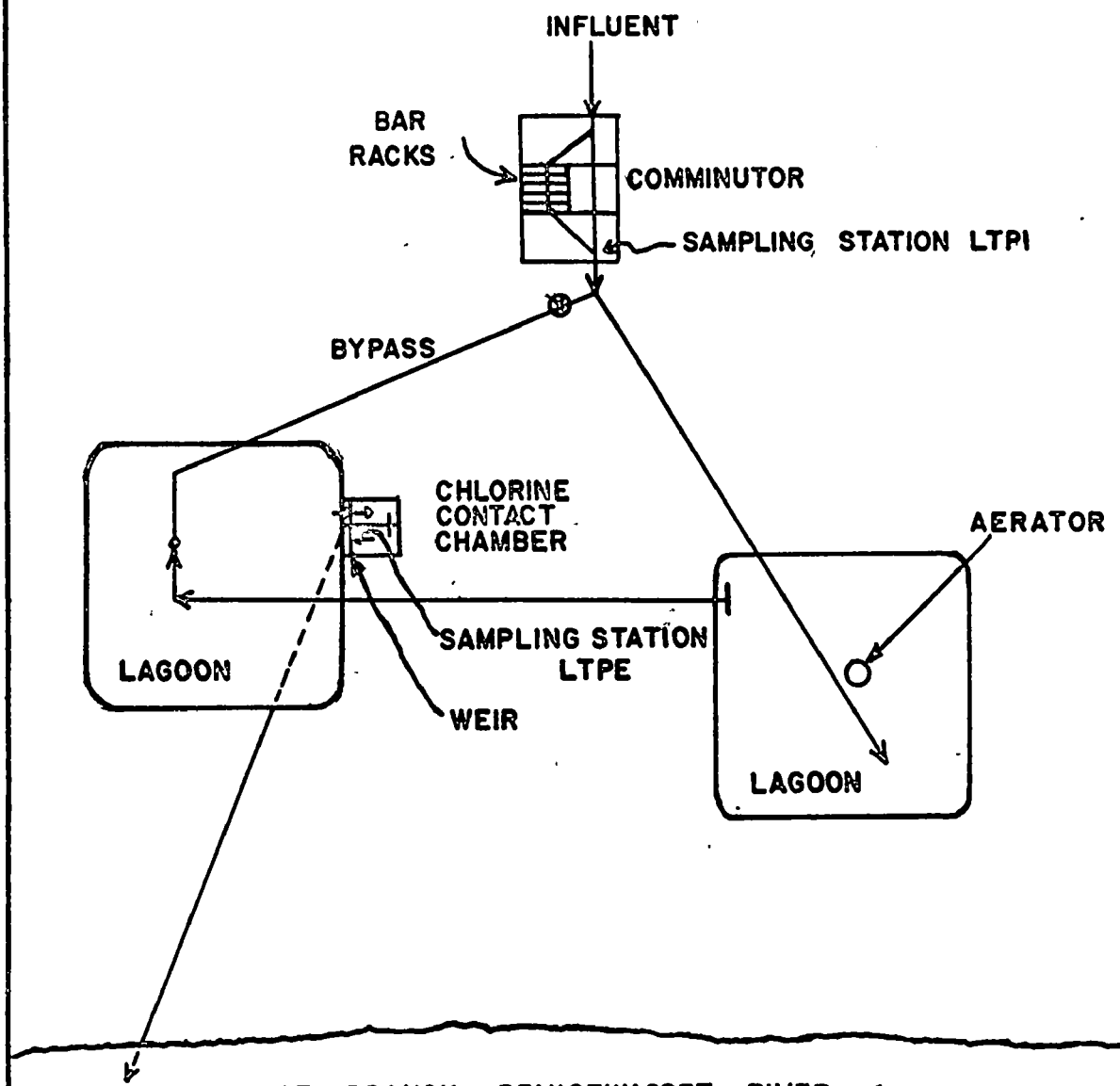


FIGURE 6

SAMPLE ANALYSES
ABBREVIATIONS & UNITS OF MEASURE

ANALYSIS	DESCRIPTION	UNITS OF MEASURE
Temp.	Temperature	Degrees Centigrade (^{o}C)
pH	Hydrogen ion concentration	Standard Units (S.U.)
D.O. (Probe)	Dissolved Oxygen	mg/l (milligrams/liter)
BOD_5	5 day biochemical oxygen demand	mg/l
Total Coliforms	Total Coliform bacteria	per 100 milliliters(/100 ml)
Fecal Coliforms	Fecal Coliform bacteria	(/100 ml)
NH_3-N	Ammonia reported as Nitrogen	mg/l as nitrogen
S.S.L.	Spent sulfite liquor	mg/l as sulfur
Cl_2Residual	Chlorine Residual	mg/l
Turbidity	Turbidity	J.T.U. (Jackson Candle Turbidity Uni
Settleable Solids	Weight of matter that settles out in one hour	mg/l
Total Residue	Total Solids	mg/l
Total N.F.Residue	Total non-filterable residue (A measure of Suspended Solids)	mg/l
Fixed Residue	Fixed Solids (A measure of inorganic Solid)	mg/l
Fixed N.F.Residue	Fixed non-filterable Solids (A measure of inorganic Suspended Solids)	mg/l

Letter Code:

K - less than
J - estimated value
L - greater than

TABLE 2
FRANCONIA MANUFACTURING CORPORATION
WHITE WATER TREATMENT PLANT
ANALYSES RESULTS
APRIL 5, 1972

TATION	TIME	DEPTH (FT.)	TEMP. (°C)	pH (S.U.)	PROBE D.O. (mg/1)	BOD_5 (mg/1)	COLIFORMS (MF/100ml) Total	Fecal
FMC 1	0630	1.0	15.0	4.4	--	230	K100	K100
-	0810	1.0	15.0	3.0	--	210	100	K100
-	1000	1.0	15.0	3.2	--	220	200	K100
FMC 2	0630	1.0	15.0	8.4	7.2	180	L3,000,000	K100
-	0810	1.0	16.0	7.9	7.4	200	L3,000,000	K100
-	1000	1.0	16.0	8.2	7.2	210	L3,000,000	K100
-	COMPOSITE (1730-0430)	1.0	--	--	--	230	--	--

RESIDUE SERIES

TATION	TIME	Set.Solids (mg/1)	Total (mg/1)	Fixed (mg/1)	Total NF (mg/1)	Fixed NF (mg/1)	Turbidity (J.T.U.)	NH_3-N (mg/1)	Cl_2 Residual (mg/1)
FMC 1	0630	107.3	1053.2	387.9	130.9	60.4	110	--	--
-	0810	67.1	1043.1	610.6	91.5	38.2	80	--	--
-	1000	52.2	924.5	543.5	79.0	21.0	96	--	--
FMC 2	0630	19.6	1329.7	858.5	83.9	32.8	54	27.0	--
-	0810	46.7	1223.5	773.5	85.9	16.1	63	15.0	K0.1
-	1000	8.1	1221.5	781.1	68.5	22.1	52	15.0	K0.1
-	COMPOSITE (1730-0430)	14.5	1137.4	688.1	73.5	11.2	73	34.0	--

TABLF 3
FRANCONIA MANUFAC' NG CORPORATION
LINCOLN MUNICIPAL .REATMENT PLANT
ANALYSES RESULTS
APRIL 5, 1972

ATION	TIME	DEPTH (FT.)	TEMP. (°C)	pH (S.U.)	PROBE D.O. (mg/1)	BOD_5 (mg/1)	COLIFORMS (MF/100ml) Total	Fecal
TPI	0730	1.0	5.0	--	--	J 118	4,000,000	1,000,000
-	0900	1.0	4.0	6.4	--	J 70	11,000,000	190,000
-	1000	1.0	--	6.6	--	J 66	11,000,000	480,000
TPE	0730	1.0	2.0	6.8	5.4	11.0	K1000	K100
-	0900	1.0	1.0	--	6.2	7.3	K1000	K100
-	1030	1.0	1.0	6.8	7.4	7.6	K1000	K100

RESIDUE SERIES

ATION	TIME	Set. Solids (mg/1)	Total (mg/1)	Fixed (mg/1)	Total NF (mg/1)	Fixed NF (mg/1)	Turbidity (J.T.U.)	NH_3-N (mg/1)	Cl_2 Residual (mg/1)
TPI	0730	57.4	277.8	129.5	82.2	10.2	48	--	--
-	0900	13.7	230.2	141.6	29.4	0.8	20	--	--
-	1000	25.6	241.8	139.9	42.8	40.5	27	--	--
TPE	0730	3.0	171.6	103.4	7.7	1.0	7.3	7.0	4.5
-	0900	0.0	167.0	110.4	7.4	0.1	7	9.0	K5.0
-	1030	3.4	163.4	90.7	9.1	0.4	11	7.0	4.5

TABLE 4

FRANCONIA MANUFACTURING CORPORATION
EAST BRANCH-PEMIGEWASSET RIVER
ANALYSES RESULTS
APRIL 5, 1972

STATION	TIME	DEPTH (FT.)	TEMP. (°C)	PROBE D.O. (mg/1)	S.S.L. (mg/1)	BOD_5 (mg/1)	COLIFORMS (MF/100ml) Total	Fecal	Cl_2 Residual (mg/1)	NH_3-N (mg/1)
EBP1	0630	2.0	0.5	13.4	K15	K1.2	8	K2	-	0.01
-	0820	1.0	1.0	14.0	K15	K1.2	12	2	-	0.01
-	0930	1.0	1.0	-	K15	K1.2	30	K2	-	0.01
EBP2	0710	1.0	5.0	11.4	396	46	L 350,000	K10	0	11.0
-	0845	1.0	5.0	11.4	381	48	L 200,000	K10	0	3.8
-	0955	1.0	6.0	11.3	369	48	L 300,000	K10	0	0.8
EBP3	0740	1.0	1.0	13.1	80	8.5	1,800,000	K100	0	1.5
-	0915	1.0	2.0	12.7	86	10.0	1,500,000	K100	-	0.9
-	1015	1.0	2.0	12.3	85	8.8	1,200,000	K100	-	0.5

		RESIDUE SERIES				
STATION	TIME	Set. Solids (mg/1)	Total (mg/1)	Fixed (mg/1)	Total NF (mg/1)	Fixed NF (mg/1)	Turbidity (J.T.U.)
EBP1	0630	-	25.5	1.5	2.6	0.4	0.7
-	0820	2.4	47.5	9.9	3.2	1.0	4
-	0930	2.3	45.5	33.0	3.2	0.2	5
EBP2	0710	-	323.8	214.3	14.7	3.2	24
-	0845	5.9	301.6	178.7	17.6	0.1	28
-	0955	4.1	306.3	188.5	14.3	2.0	21
EBP3	0740	3.0	89.4	51.5	5.9	0.8	11
-	0915	1.7	97.7	60.5	6.9	0.5	10
-	1015	-	97.0	59.0	1.2	0.2	10

TABLE 5

EFFICIENCY

WHITE WATER TREATMENT PLANT

Parameter	PPD In	PPD Out	Removal efficiency
BOD_5	12,860	11,400	11%
Suspended solids	5800	4610	21%
Settleable solids	4300	1800	58%

WATER POLLUTION CONTROL FACILITY

Parameter	PPD In	PPD Out	Removal efficiency
BOD_5	J 142.0	14.4	J90%
Suspended solids	86.0	13.5	85%
Settleable solids	53.5	3.5	94%

FRANCONIA MANUFACTURING CORPORATION
EAST BRANCH OF THE PEMIGEWASSET RIVER
LINCOLN, NEW HAMPSHIRE
APRIL 5, 1972