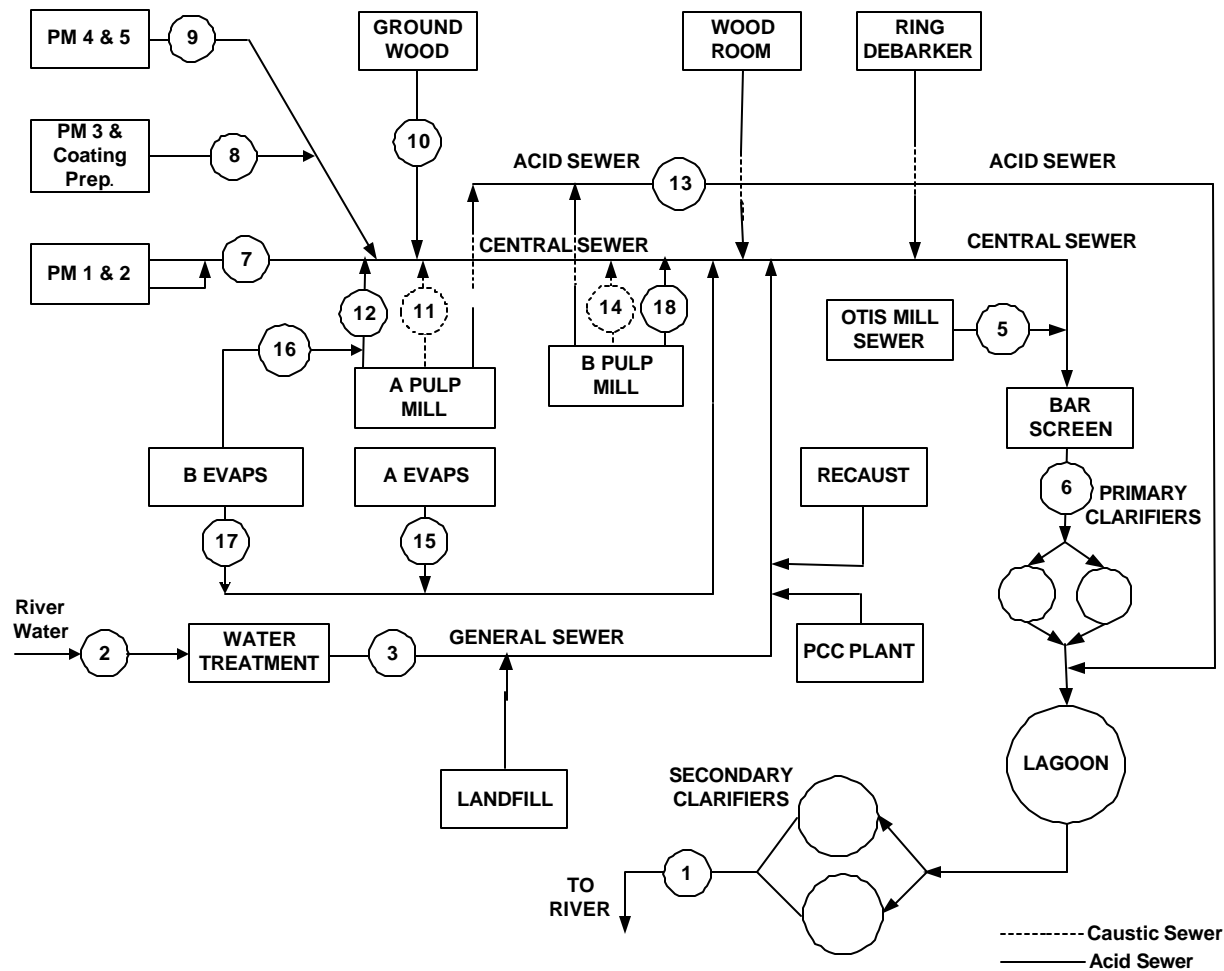


**Figure 1.**  
**Layout of Mill Sewer System Showing Sample Locations**



**Table 1.**  
**Sample Location and Flow Measurement Identification**

SAMPLE		FLOW	
Number	Description	Measured	Estimated
1	Final mill effluent – Composite Sample	X	
2	Raw water intake – Grab Sample		X
3	Raw water waste – Grab Sample		X
5*	Otis waste water – Composite Sample	X	
6	Mill sewer after bar screen – Composite Sample	X	
7	Effluent of paper machines 1 plus 2 – Composite Sample	X	
8	Effluent of paper machine 3 plus coating prep. – Composite Sample	X	
9	Effluent of paper machines 4 plus 5 – Composite	X	
10	Groundwood mill effluent - Composite Sample	X	
11	Caustic sewer of A pulp mill - Composite Sample	X	
12	General sewer of A pulp mill – Composite Sample	X	
13	Acid sewer – Grab Sample		X
14	Caustic sewer of B pulp mill – Grab Sample		X
15	Evaporators effluent of A pulp mill – Grab Sample		X
16	Evaporators effluent of B pulp mill – Grab Sample		X
17	6 <sup>th</sup> effect evaporator plus surface condenser effluent of B pulp mill – Grab Sample		X
18	General sewer of B pulp mill – Composite Sample	X	

\*Sample four (4) is non-existent

**Table 2.**  
**XL-2 Sewer Survey (2001)**

**INTERNATIONAL PAPER COMPANY, ANDROSCOGGIN MILL**

<i>Sample Point</i>	<i>ISCO Sampler Present</i>	<i>Flow Measurement Device Available</i>	<i>Color, pH<sup>1</sup></i>	<i>Toxicity<sup>2</sup></i>	<i>TSS, VSS, Ash, Conductivity, BOD (filtered/unfiltered), COD (filtered/unfiltered)<sup>2</sup></i>	<i>Comments<sup>3</sup></i>
PM 1 & 2 (near main lab)	✓ xx	✓ xx	✓ xx		✓ xx	
PM 1 & 2 General Sewer (inside parshall flume house)		✓ xx	✓ xx		✓ xx	Flow meter requires calibration. Sampler not presently at site.
PM 1 & 2 Caustic Sewer (inside parshall flume house)		✓ xx	✓ xx		✓ xx	Flow meter requires calibration. Sampler not presently at site.
PM 3 & Coating Prep	✓ xx	✓ xx	✓ xx	✓ xx	✓ xx	
PM 4 & 5	✓ xx	✓ xx	✓ xx		✓ xx	
A Pulp Mill General Sewer (inside parshall flume house)	✓ xx	✓ xx	✓ xx		✓ xx	Flow meter requires calibration.
A Pulp Mill Caustic Sewer (inside parshall flume house)		✓ xx	✓ xx	✓ xx	✓ xx	Flow meter requires calibration. Sampler not presently at site.
B Pulp Mill General Sewer	✓ xx	✓ xx	✓ xx		✓ xx	
B Pulp Mill Caustic Sewer			✓ xx		✓ xx	grab sample
Groundwood	✓ xx	✓ xx	✓ xx		✓ xx	
Evaporators			✓ xx		✓ xx	grab sample
Acid Sewer			✓ xx	✓ xx	✓ xx	Acid sewer sample point now available at waste treatment.
Otis	✓ xx	✓ xx	✓ xx		✓ xx	
Water Treatment		✓ xx	✓ xx		✓ xx	grab sample
Total Mill (Bar Screen)	✓ xx	✓ xx	✓ xx	✓ xx	✓ xx	
Mill Effluent	✓ xx	✓ xx	✓ xx		✓ xx	

**NOTES:**

- 1) pH and color to be completed by International Paper
- 2) Toxicity, TSS, VSS, ash, conductivity, BOD, COD to be completed by external laboratory
- 3) In all cases listed, John will follow-up and get flow meters calibrated. Travis will follow-up and have ISCO samplers, or other means of sampling, available for the survey.
- 4) Digital photos to be taken of all sewer samples
- 5) 3, 24 hour composite samples to be taken at each location with an ISCO composite sampler
- 6) 3 grab samples, taken each day of the survey at approximately 7:00am, will be taken at locations with no ISCO sampler
- 7) Mill production rates to be recorded by Travis Flagg during the survey

**Table 3.**  
**Average Daily Emissions (lbs/Day) for Measured Quantities**

Location	Flow Rate (gpm)	Total		Dissolved		Susp.	Solids Diss.	Est. Total	Color
		BOD	COD	BOD	COD				
(#/Day)									
(2) Raw Water - Grab	29028	6170	21305	5821	13155	4773	30152	34925	2328
(8) PM #3 & Coating Prep - Composite	3492	4565	74780	2591	6134	47346	21384	68730	6750
(9) PM #4 & #5 - Composite	2065	5747	44715	629	4157	24941	5548	30489	18383
(7) PM #1& #2 - Composite	5036	7574	54691	2100	5453	34313	24316	58629	929
<b>Paper Mill Total</b>	<b>10592</b>	<b>17885</b>	<b>174185</b>	<b>5320</b>	<b>15743</b>	<b>106600</b>	<b>51248</b>	<b>157848</b>	<b>26062</b>
(12) A Pulp Mill (general) - Composite	1836	3881	17911	3174	13831	759	23516	24274	16018
(11) A Pulp Mill (caustic) - Composite	630	5789	23296	5748	22184	222	41918	42140	14162
(18) B Pulp Mill (General)- Composite	223	2479	14885	481	2578	10347	2931	13278	5475
(14) B Pulp Mill (caustic) - Grab	656	8998	18496	7014	16391	800	17943	18743	4025
(13) Acid Sewer - Grab	2620	6431	24252	5769	21793	462	65568	66031	10245
(15) A Evaporators - Grab	800	9051	16459	8422	12577	64	603	667	337
(16) B Evaporators - Grab	494	937	2088	644	1320	38	164	202	258
(17) B Evaporators 6th & SC - Grab	310	4998	7410	4066	6652	5	469	474	298
<b>BL Cycle Total</b>	<b>7075</b>	<b>41627</b>	<b>122709</b>	<b>34674</b>	<b>96006</b>	<b>12659</b>	<b>152948</b>	<b>165607</b>	<b>50561</b>
(10) Groundwood - Composite	274	551	2140	517	1153	4269	578	4847	798
(5) Otis - Composite	2371	10842	30823	4698	9701	6486	10899	17385	618
(3) River Waste - Grab	347	33	1421	15	85	3010	1546	4556	153
<b>Others Total</b>	<b>2993</b>	<b>11427</b>	<b>34384</b>	<b>5231</b>	<b>10939</b>	<b>13765</b>	<b>13023</b>	<b>26788</b>	<b>1569</b>
(6) Mill Sewer (Bar Screen) - Composite	25717	87774	313139	46001	143367	212988	311282	524270	133053
Sum Paper Mill, BL Cycle, Others minus Acid Sewer and B Evaporators	18040	64508	307026	39456	100895	132562	151650	284213	67946
(1) Mass Closure at Bar Screen (%)	29.9	26.5	2.0	14.2	29.6	37.8	51.3	45.8	48.9
<b>Mill Effluent - Composite</b>	<b>29537</b>	<b>3672</b>	<b>73328</b>	<b>1895</b>	<b>55559</b>	<b>11491</b>	<b>367115</b>	<b>378606</b>	<b>89439</b>

(mg/L)(X)[flow(gpm)]=(#/day)

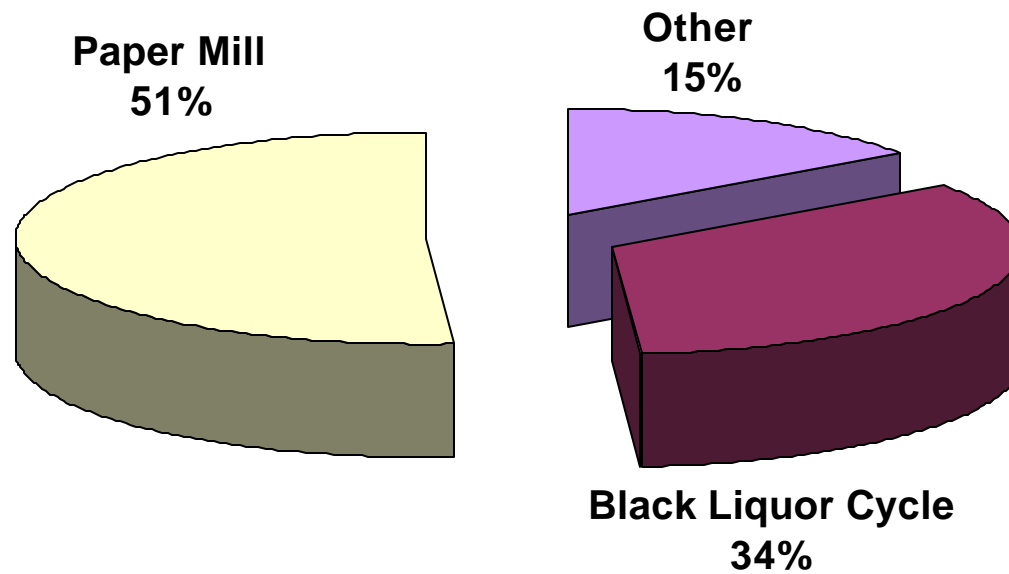
where x= 0.012032

**Table 4.**  
**Mass Balances For Combined Effluent at Bar Screen**

<b>VARIABLE</b>	<b>MEASURED</b> (1000 lbs/day)	<b>CALCULATED</b> (1000 lbs/day)	<b>DIFFERENCE</b> (%)
<b>Total BOD</b>	88	65	27
<b>Dissolved BOD<sup>(a)</sup></b>	46	39	14
<b>Total COD</b>	313	307	2
<b>Dissolved COD<sup>(a)</sup></b>	143	101	30
<b>Color</b>	133	68	49
<b>Total Suspended Solids (TSS)</b>	213	133	38
<b>Dissolved Solids</b>	311	152	51
<b>Estimated Total Solids</b>	524	284	46
<b>Flow (million gallons/day)</b>	37	26	30

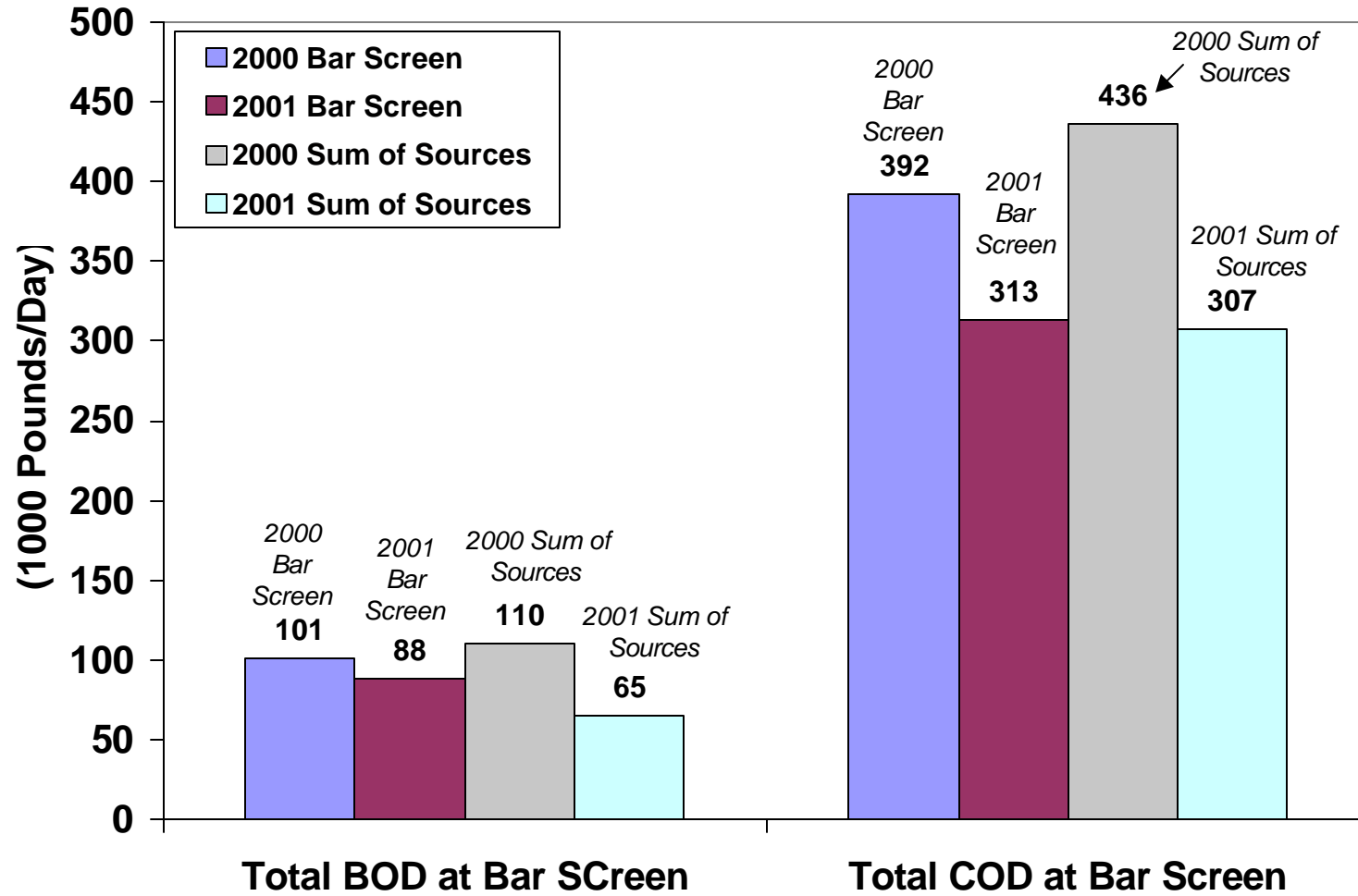
(a) Samples were filtered through a 0.8 micron filter.

**Figure 2**  
**Percentage Flow by Area**

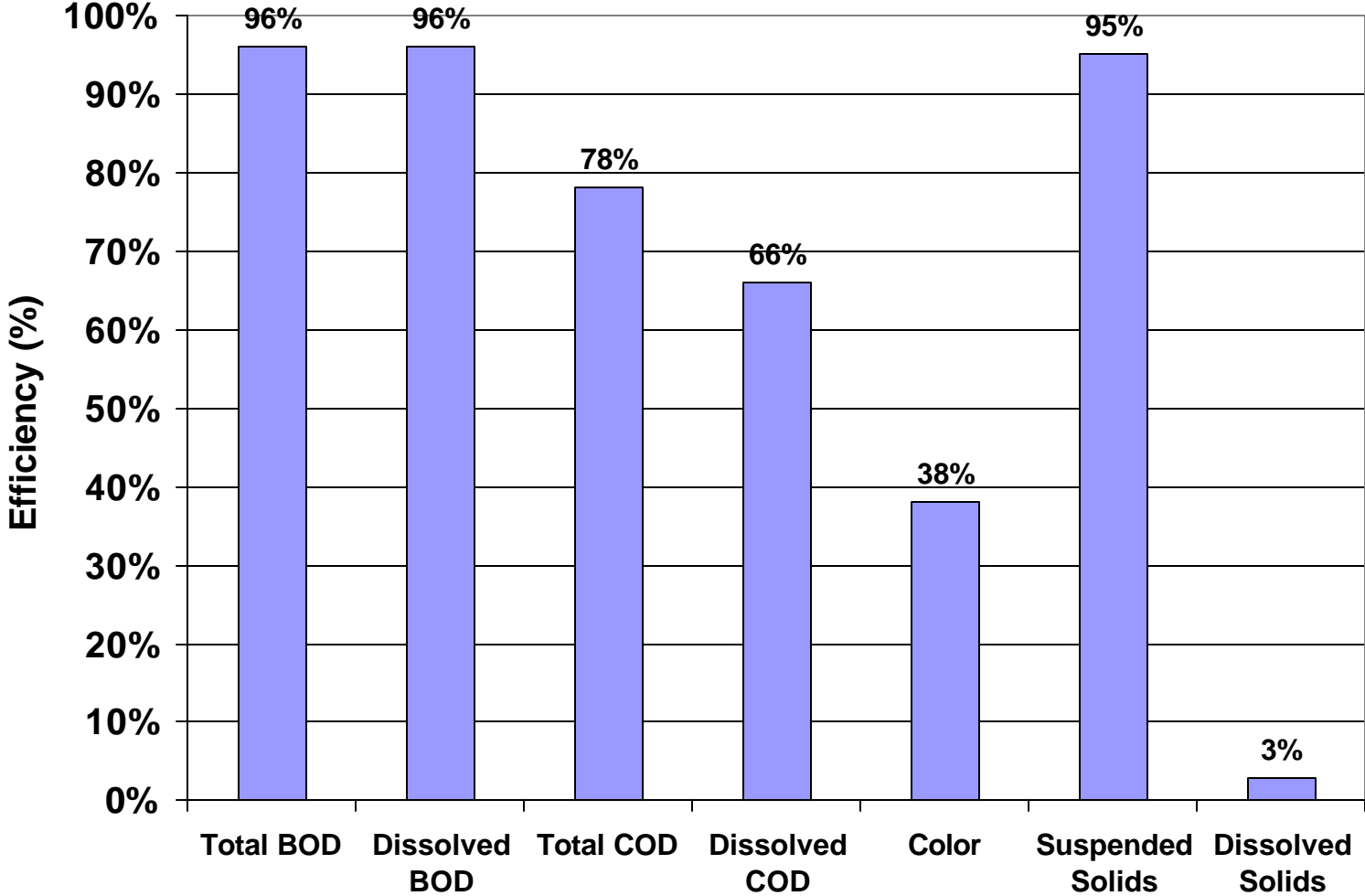


**Calculated Total Flow in Million Gallons/Day=29.75**

**Figure 3**  
**Total COD and BOD Mass Balances - Comparison of 2000 with 2001 Trial**



**Figure 4**  
**2001 Efficiency of Waste Treatment Plant**



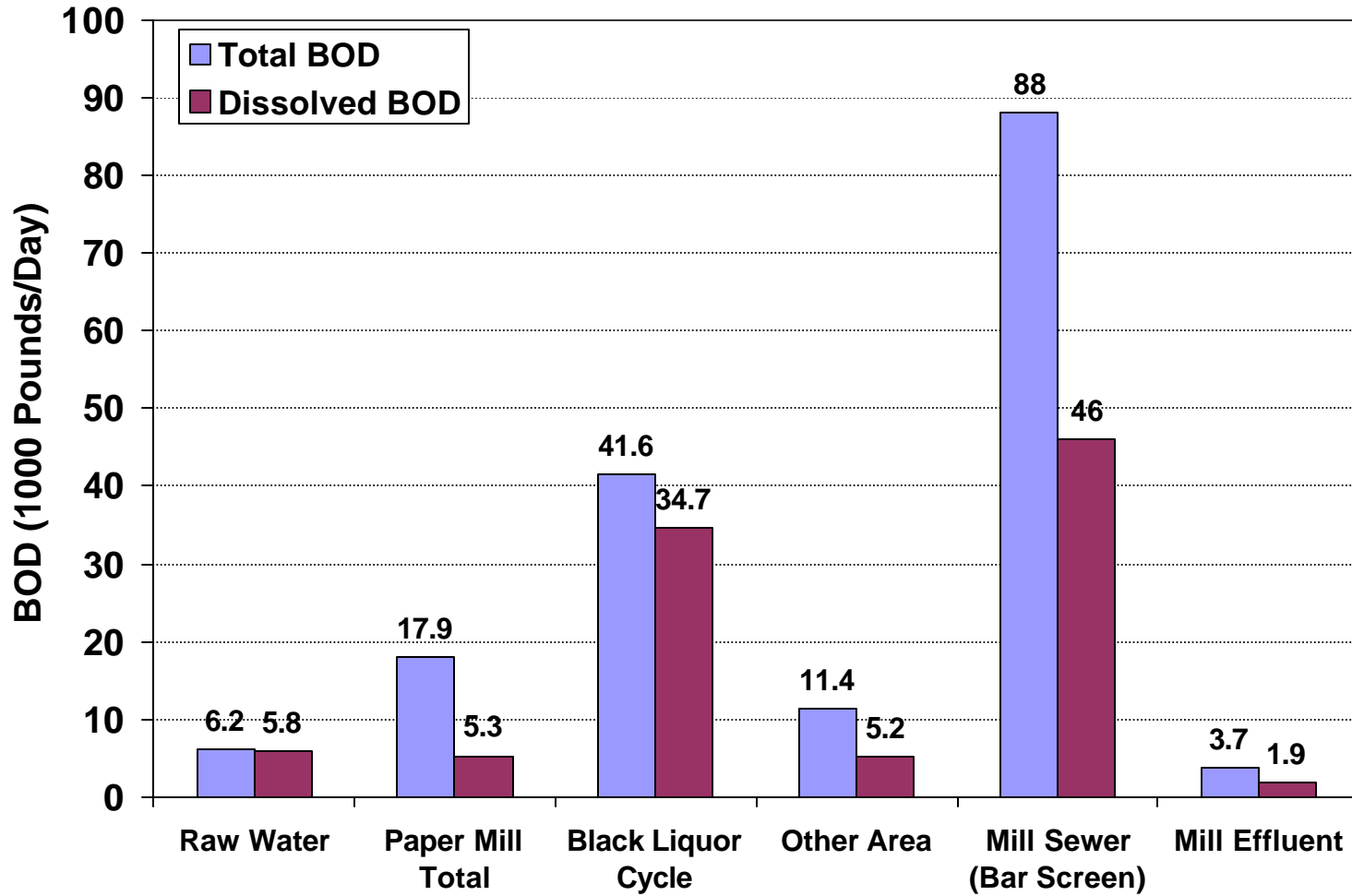


**Table 5.**  
**Removal Efficiencies in Waste Water Treatment Plant**

<b>VARIABLE</b>	<b>INFLUENT</b> (1000 lbs/day)	<b>EFFLUENT</b> (1000 lbs/day)	<b>REMOVAL</b> <b>EFFICIENCY</b> (%)
<b>Total BOD</b>	94	3.7	96
<b>Dissolved BOD<sup>(a)</sup></b>	51.8	1.9	96
<b>Total COD</b>	337	73	78
<b>Dissolved COD<sup>(a)</sup></b>	165	56	66
<b>Color</b>	143	89	38
<b>Total Suspended Solids (TSS)</b>	214	11.5	95
<b>Dissolved Solids</b>	377	367	2.6
<b>Estimated Total Solids</b>	590	379	36
<b>Flow (million gallons/day)</b>	40.8	42.5	

(a) Samples were filtered through a 0.8 micron filter.

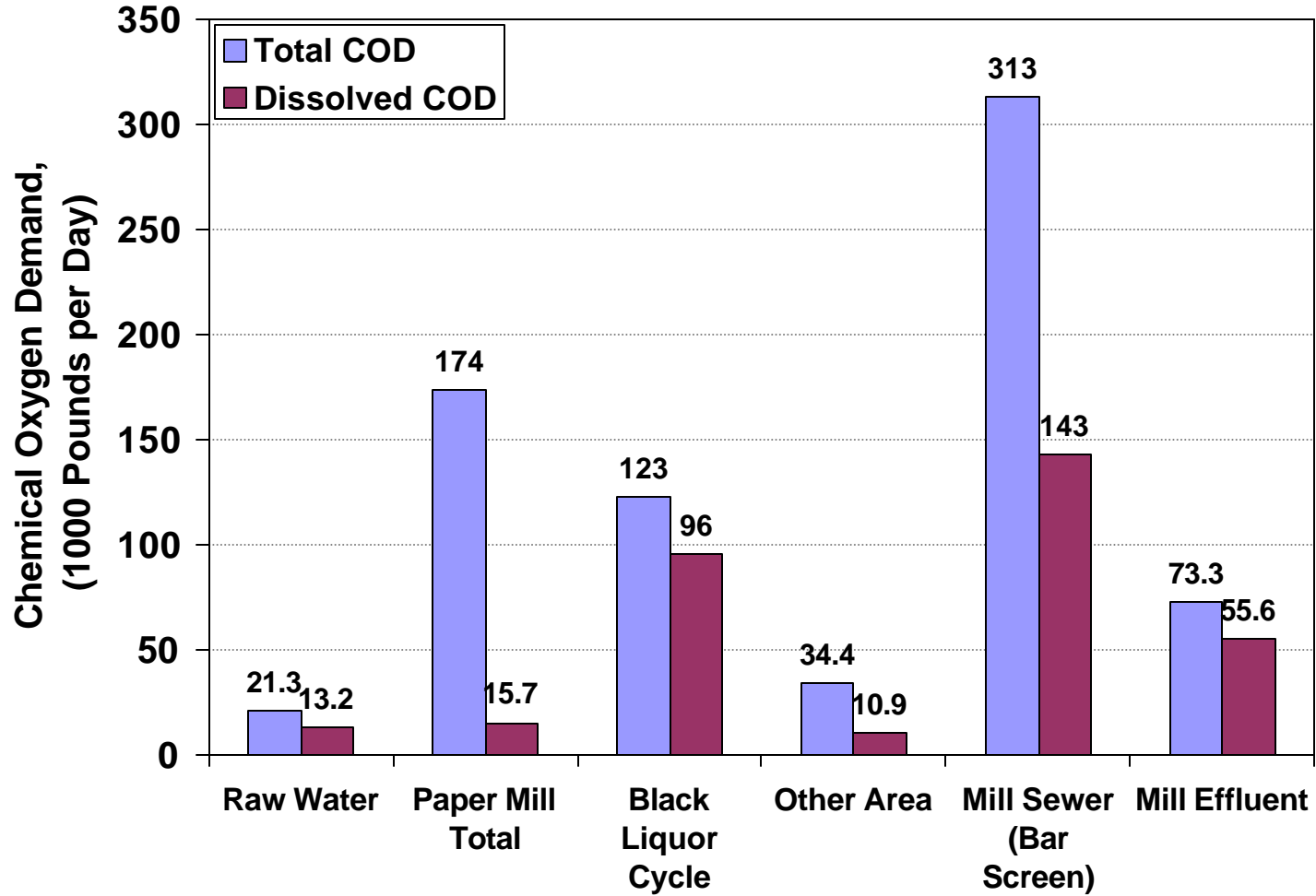
**Figure 5**  
**Comparison of 2001 Average Total and Dissolved BOD**



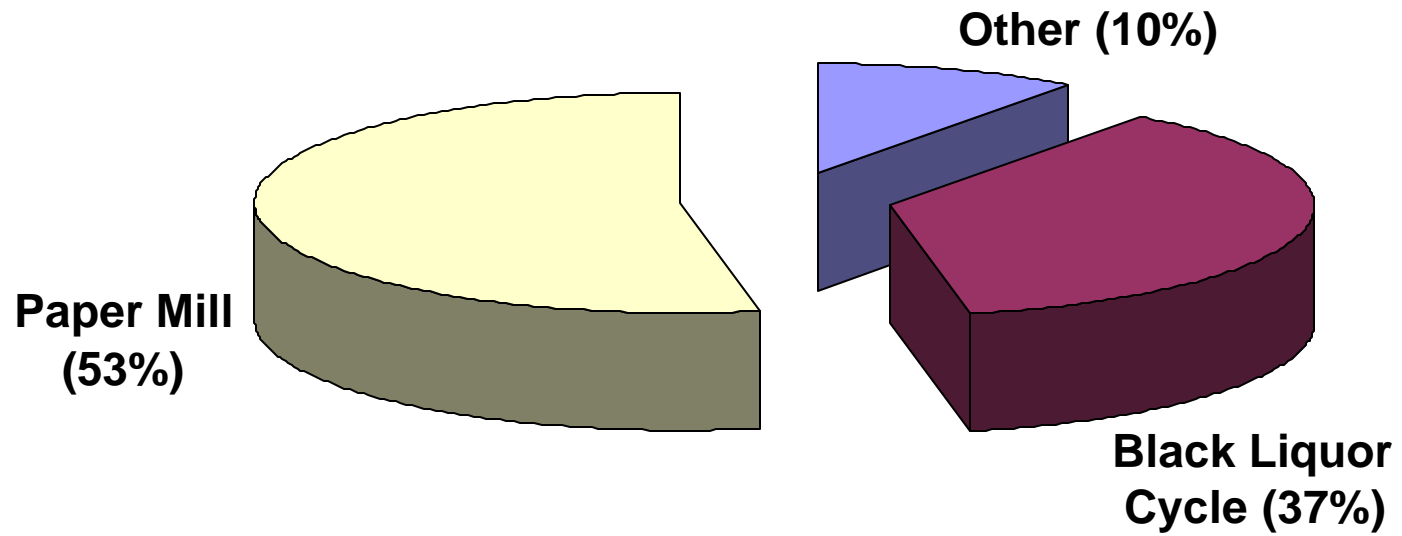
**Table 6.**  
**COD Removal Efficiencies Due to Sample Filtration**

<b>AREA DESCRIPTION</b>	<b>TOTAL COD</b>	<b>DISSOLVED COD</b>	<b>COD REMOVAL EFFICIENCY BY FILTRATION (%)</b>
	<b>(1000 lbs/day)</b>		
<b>Total Paper Mill</b>	174	15.7	91
<b>Total Black Liquor Cycle</b>	123	96	22
<b>Total Others</b>	34.4	10.9	68

**Figure 6**  
**Comparison of 2001 Average Total and Dissolved COD**

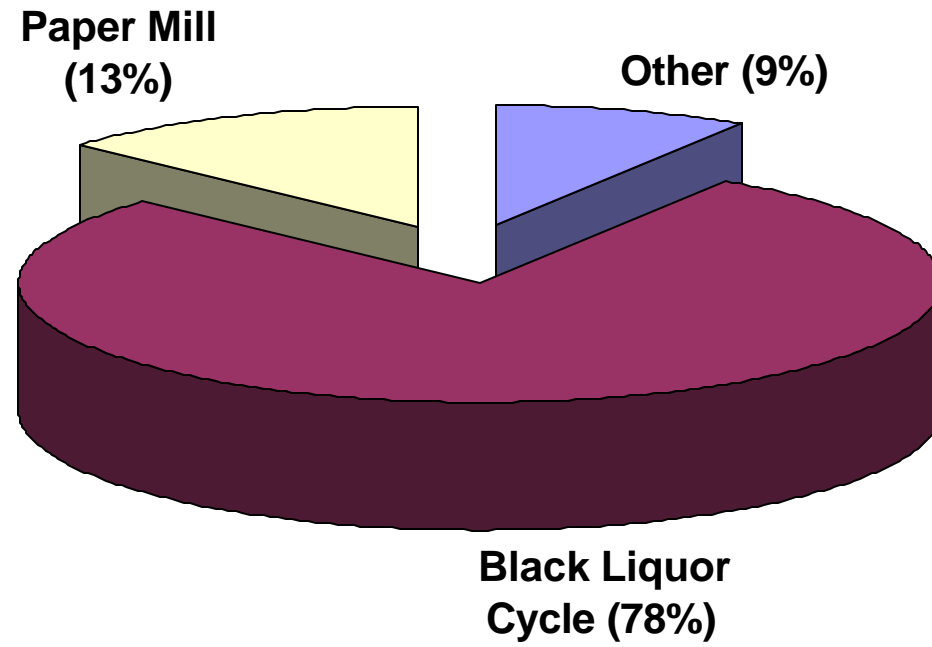


**Figure 7**  
**2001 Total COD by Area**



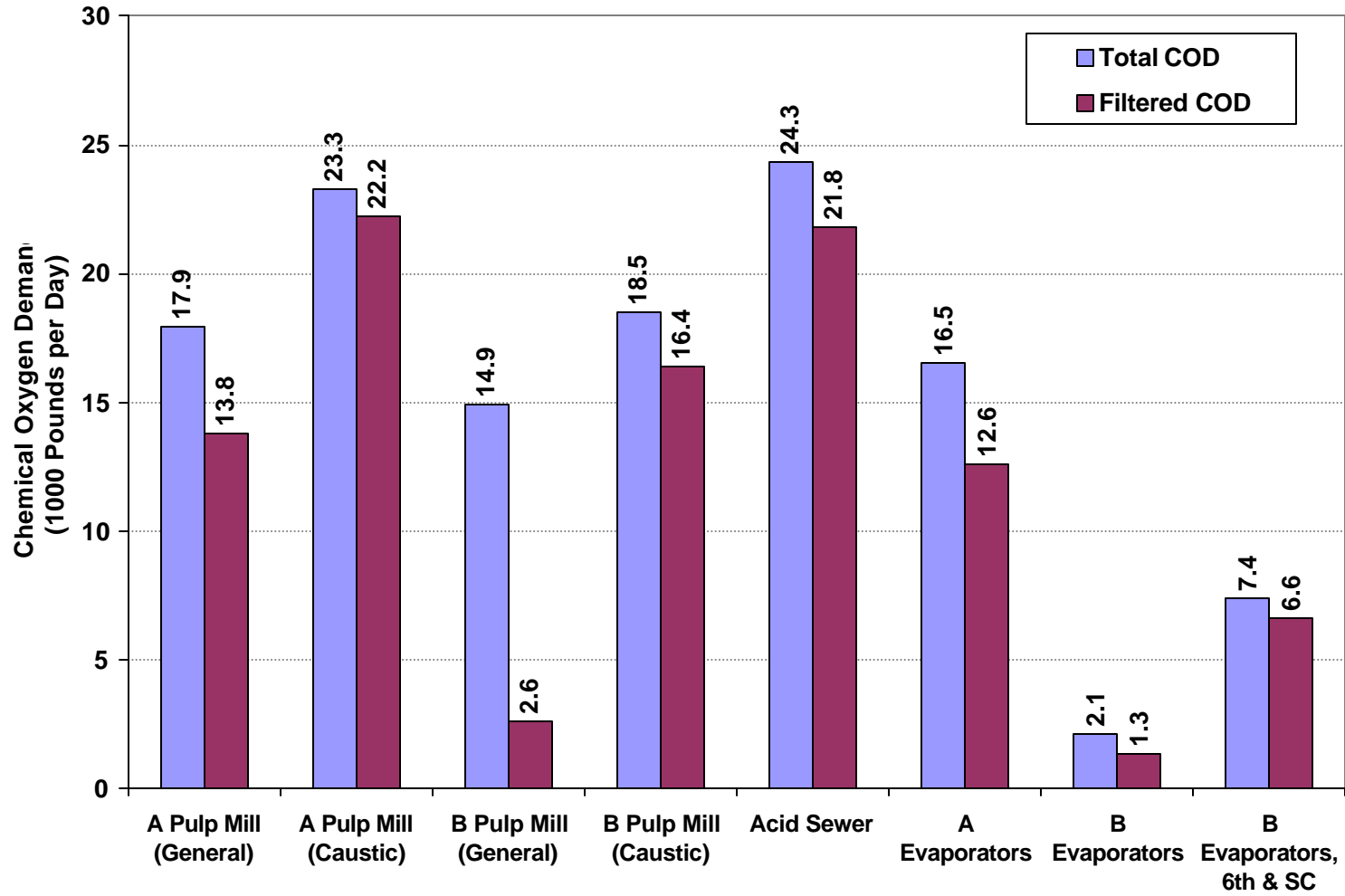
**Calculated Total COD = 331,000 lbs/day**

**Figure 8**  
**2001 Dissolved COD by Area**

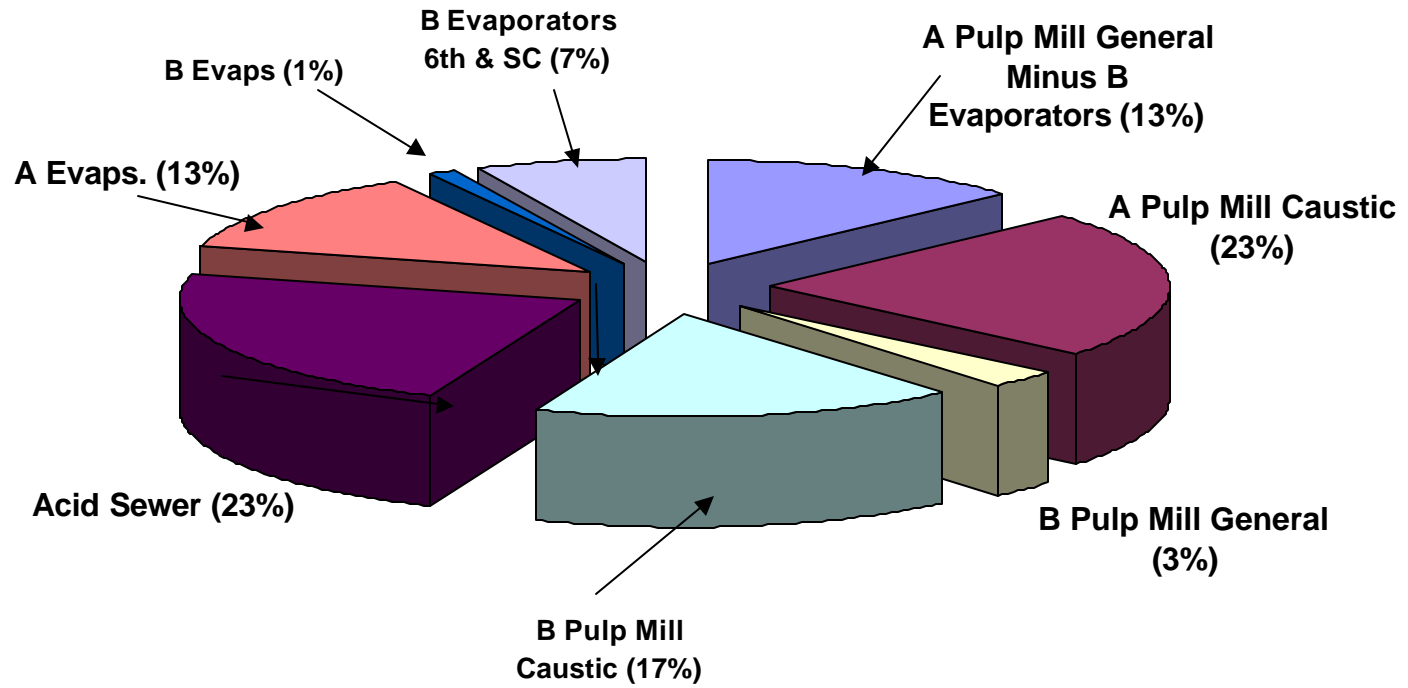


**Dissolved COD = 123,000 Pounds per Day**

**Figure 9**  
**2001 Average Black Liquor Cycle Total and Dissolved COD**

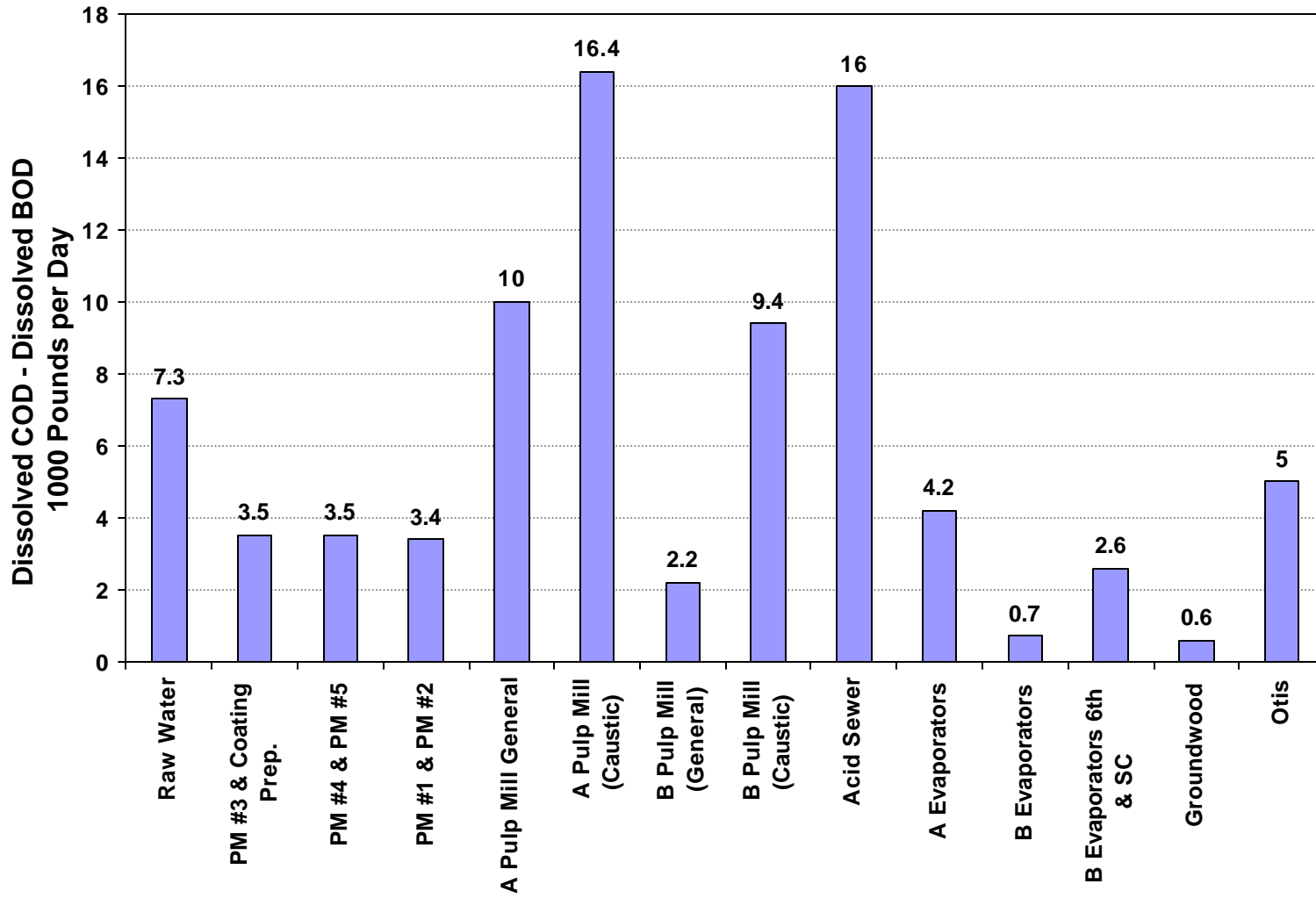


**Figure 10**  
**2001 Dissolved COD of Black Liquor Cycle**

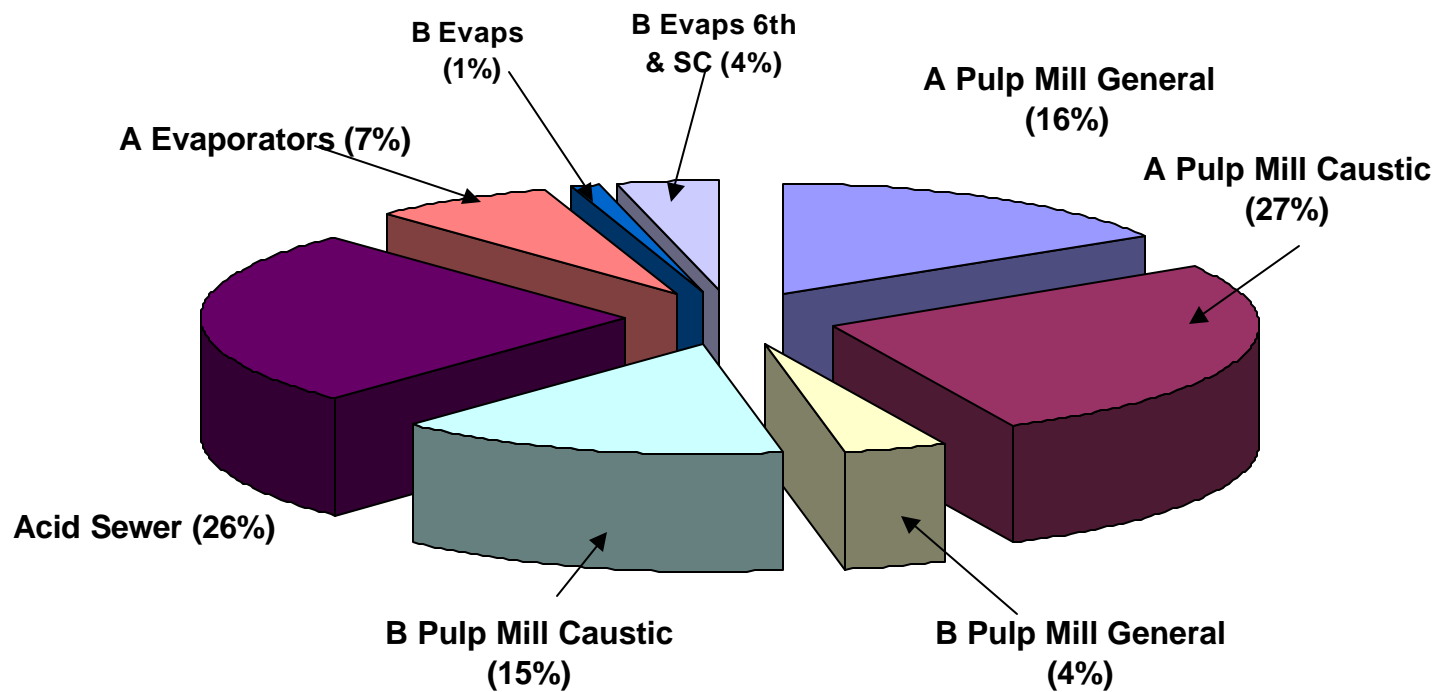




**Figure 11**  
**2001 (Dissolved COD - Dissolved BOD)**



**Figure 12**  
**2001 (Dissolved COD - Dissolved BOD) of Black Liquor Cycle as Percentage (%)**



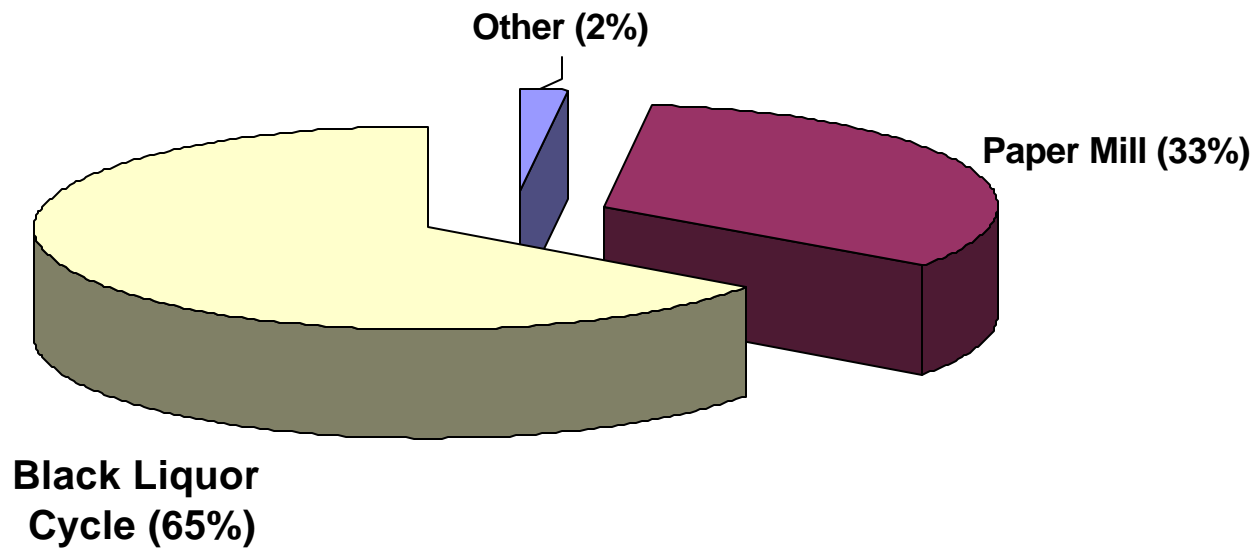
(Dissolved COD - Dissolved BOD) of Black Liquor Cycle = 61.4 (1000 Pounds per Day)

**Table 7.**

**Contribution of the Different Areas of the Pulp Mill to (Dissolved COD-Dissolved BOD) Of The Total Black Liquor Cycle**

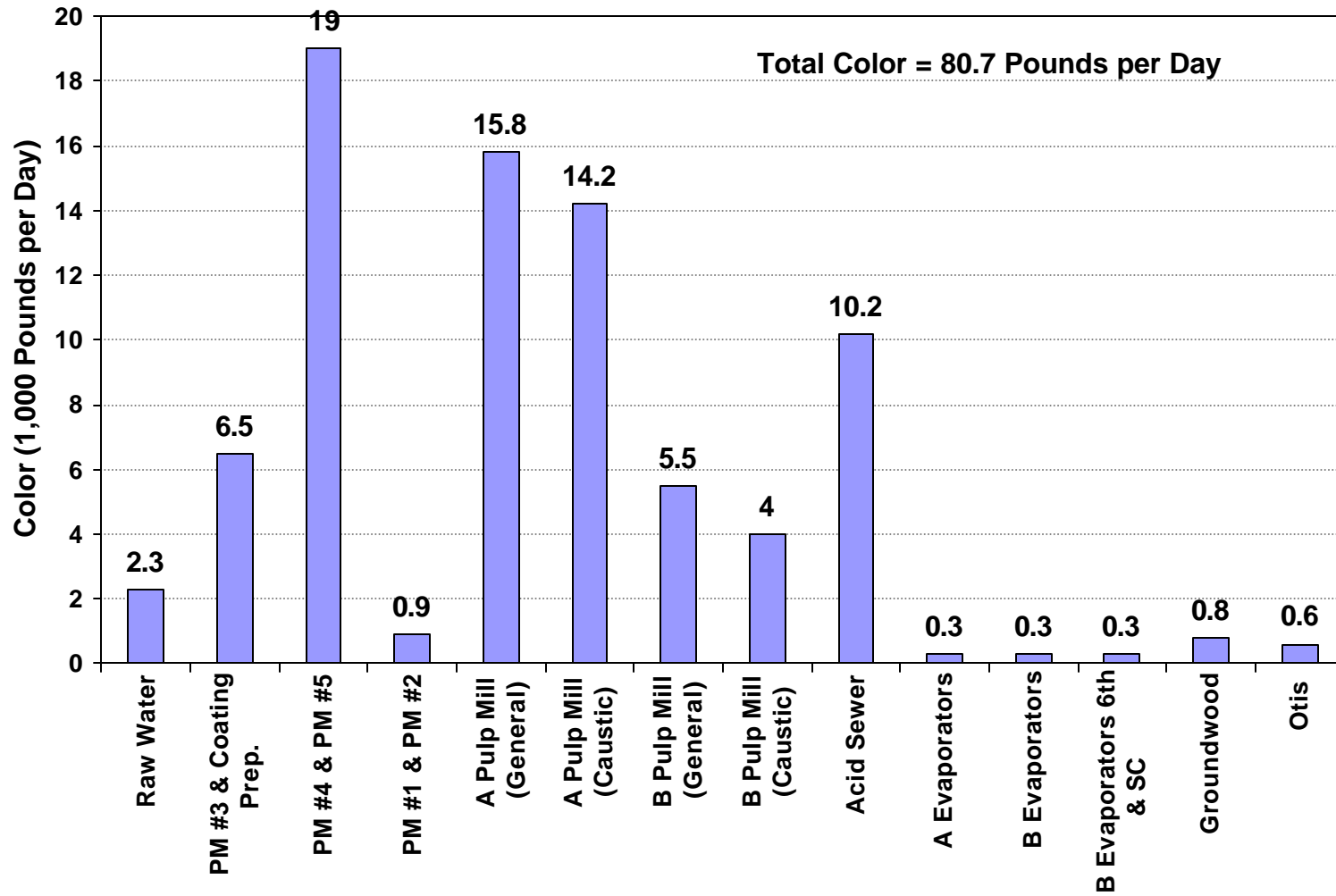
<b>AREA DESCRIPTION</b>	<b>DISSOLVED COD – DISSOLVED BOD (1000 lbs/day)</b>	<b>PERCENTAGE OF TOTAL BL CYCLE (%)</b>
<b>A Pulp Mill General Sewer</b> <i>(excludes B Evaporators)</i>	10.0	16
<b>A Pulp Mill Caustic Sewer</b>	16.4	27
<b>B Pulp Mill General Sewer</b>	2.2	4
<b>B Pulp Mill Caustic Sewer</b>	9.4	15
<b>Acid Sewer</b>	16.0	26
<b>A Evaporators</b>	4.2	7
<b>B Evaporators</b>	0.68	1
<b>6<sup>th</sup> and SC of B Evaporators</b>	2.6	4
<b>Black Liquor Cycle</b>	61.38	100

**Figure 13**  
**Color by Area**

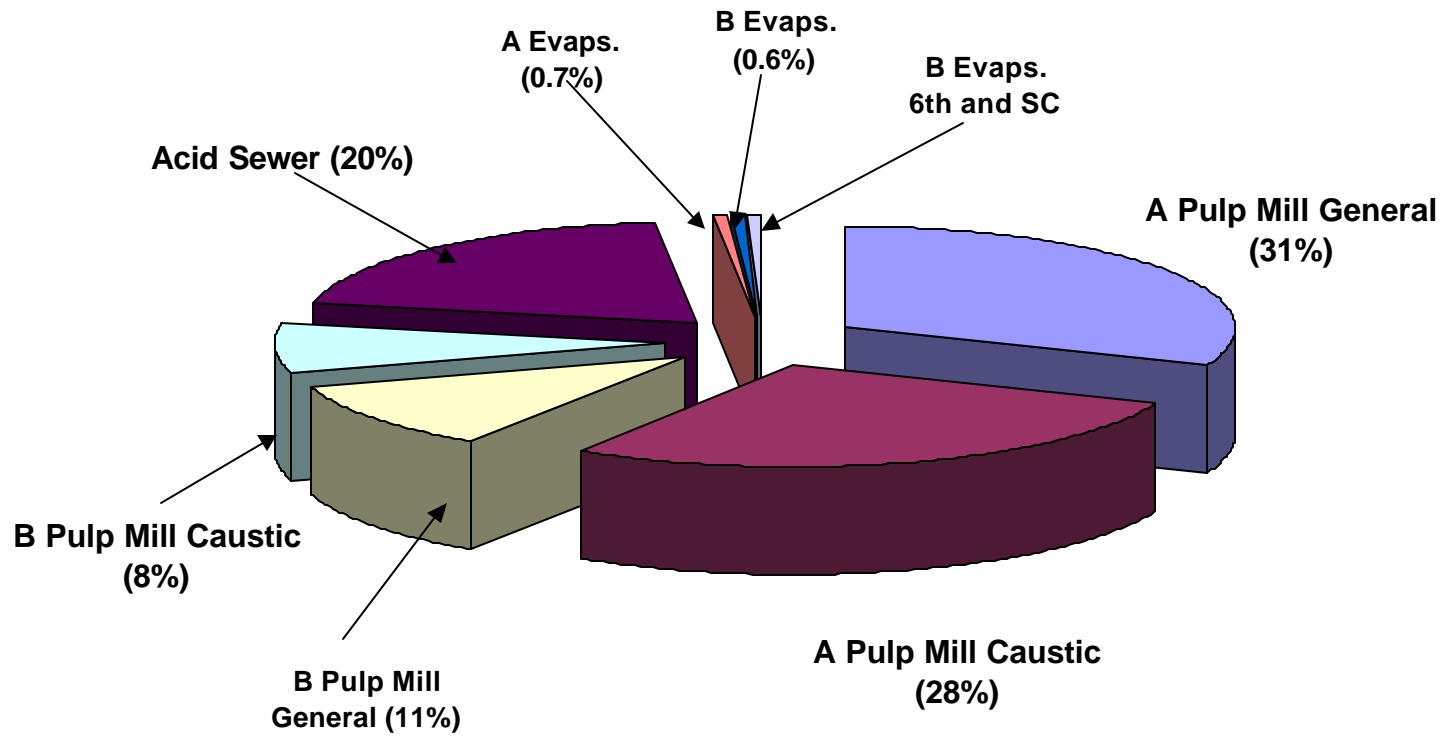


**Total Color = 78.2 (1000 Pounds per Day)**

Figure 14  
Color by Department



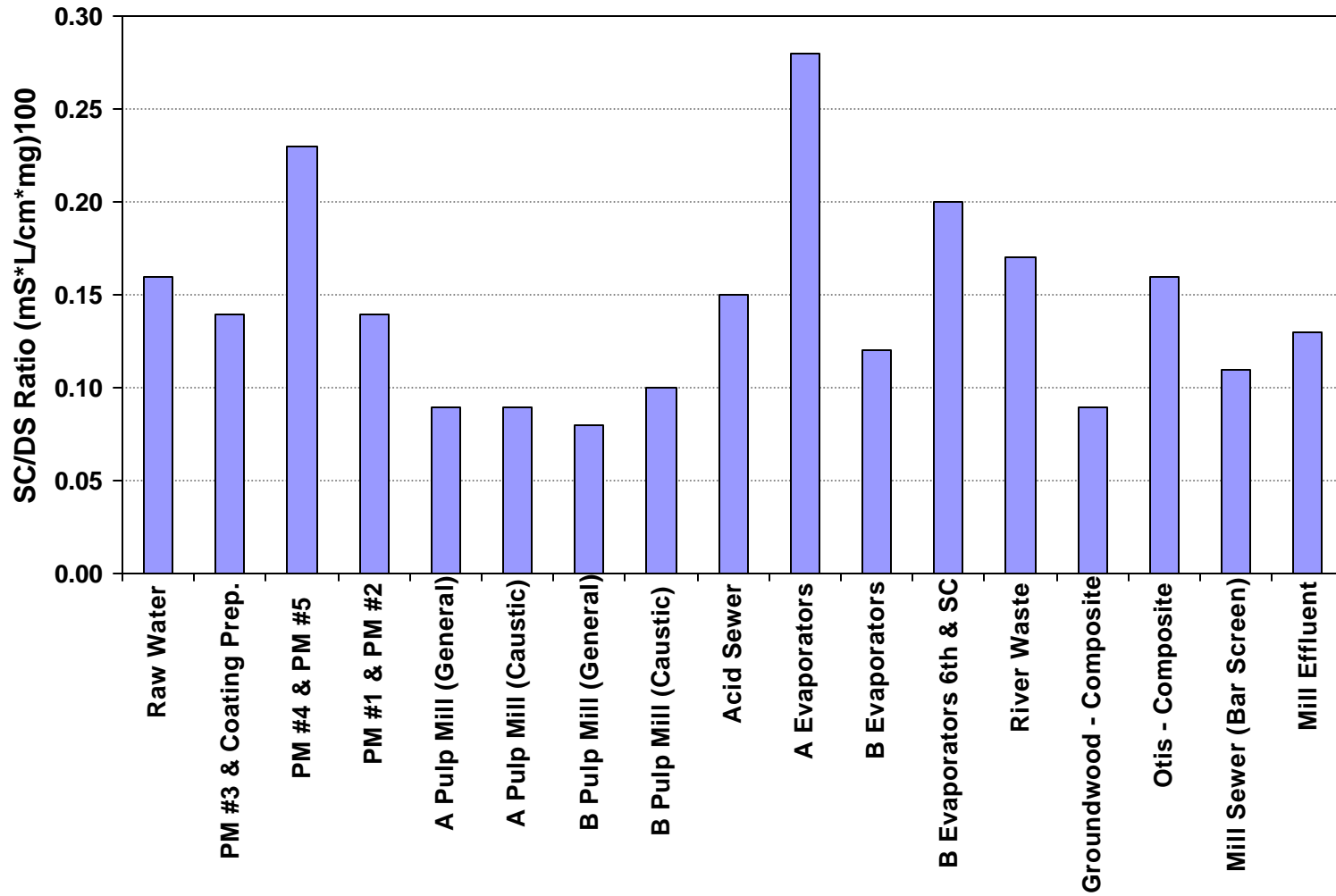
**Figure 15**  
**Percentages (%) of 2001 Color in Black Liquor Cycle**



**Table 8.**  
**Percentage Contributions to Black Liquor Cycle**

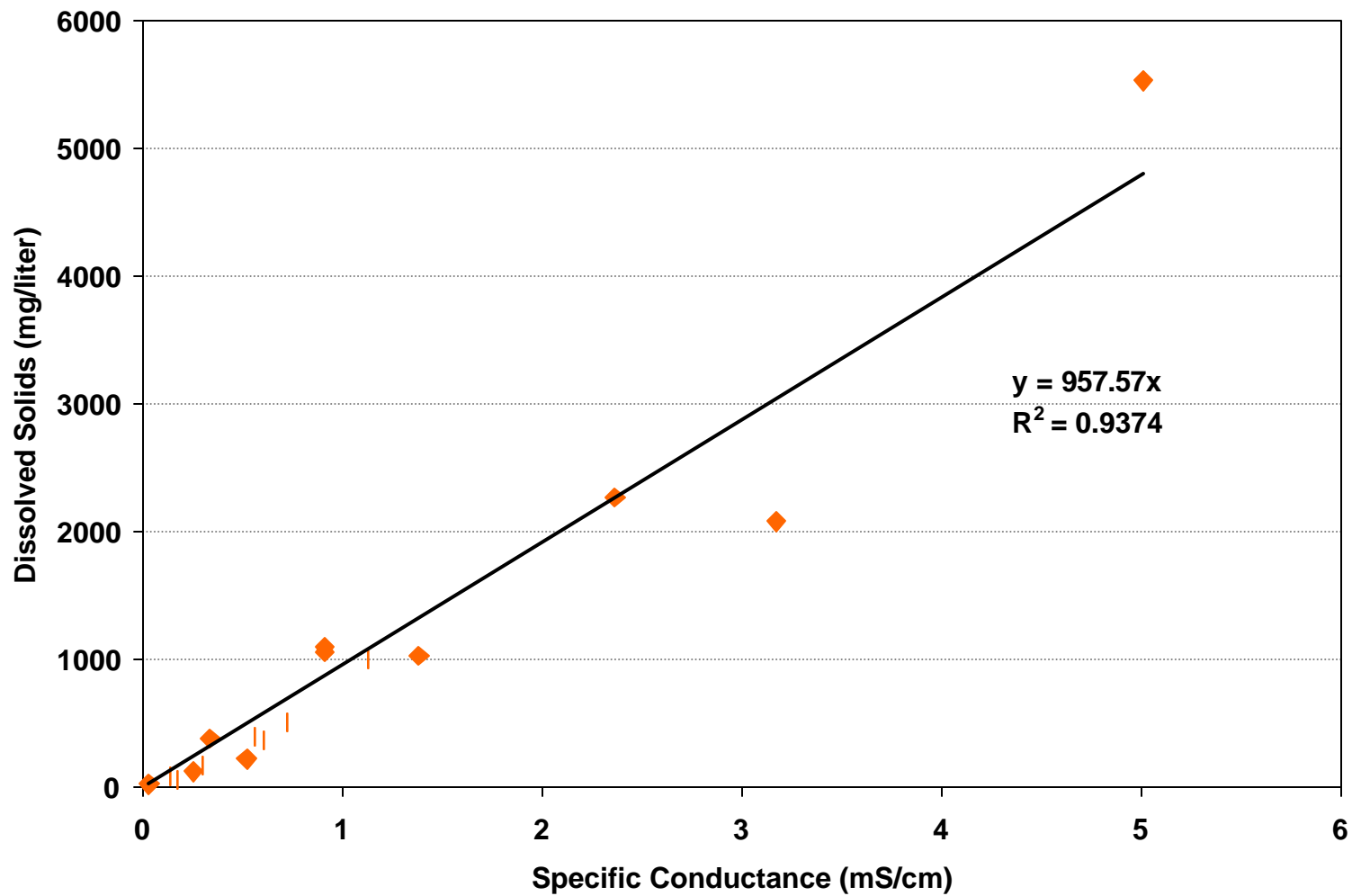
<b>AREA DESCRIPTION</b>	<b>Dissolved COD (%)</b>	<b>Dissolved COD - Dissolved BOD (%)</b>	<b>Color (%)</b>	<b>Dissolved Solids (%)</b>
<b>A Pulp Mill General</b> <i>(excludes B evaps)</i>	13	16	31	15
<b>B Pulp Mill General</b>	3	4	11	2
<b>A Pulp Mill Caustic</b>	23	27	28	27
<b>B Pulp Mill Caustic</b>	17	15	8	12
<b>Acid Sewer</b>	23	26	20	43
<b>Bleach plant</b>	63	68	55	82
<b>A Evaporators</b>	13	7	1	0.5
<b>B Evaporators</b> <i>(includes 6<sup>th</sup> and SC)</i>	8	5	1	0.5
<b>Black Liquor Cycle</b> <b>(1000 lbs/day)</b>	96	61	51	153

**Figure 16**  
**Ratio of Specific Conductance to Dissolved Solids Ratio**





**Figure 17**  
**Dissolved Solids Versus Conductivity**



**Table 9**  
**(Dissolved COD - Dissolved BOD) and Specific Conductance**  
**for the Black Liquor Cycle Effluent Streams**

<b>AREA DESCRIPTION</b>	<b>Dissolved COD - Dissolved BOD (mg/L)</b>	<b>Specific Conductance (mS/cm)</b>	<b><u>Specific Conductance</u> (Dis. COD-Dis. BOD) (mS*L/cm*mg)</b>
A Pulp Mill (General)	482	0.911	0.19
B Pulp Mill (General)	783	0.914	0.12
A Pulp Mill (Caustic)	2169	5.010	0.23
B Pulp Mill (Caustic)	1188	2.367	0.20
Acid Sewer	508	3.170	0.62
A Evaporators	432	0.175	0.04
B Evaporators	114	0.032	0.03
B Evap, 6th + SC	693	0.252	0.04

**Table 10.**  
**Summary of Toxicity Data**

<b>SAMPLE DATE</b>	<b>LOCATION</b>	<b>A-NOEC</b>	<b>LC-50</b>
9/4/2001	Bar Screen	35%	47.5%
9/7/2001	No. 3 PM	100%	>100
9/4/2001	A Caustic Sewer	<5%	4.7%
9/10/2001	Acid Sewer	25%	40%

