Publication No. 79-e11

STATE OF WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, Olympia, Washington 98504 206/753-2353

MEMORANDUM

January 19, 1979

seg 11-2402

To: Douglas Houck

From: Eric Egbers EBE

Subject: South Bend STP Class II Survey

INTRODUCTION

A Class II inspection was performed at the City of South Bend sewage treatment facility on October 24-25, 1978. The inspection was conducted by Bill Yake and Eric Egbers (Water and Wastewater Monitoring). Darrell Maple, South Bend city supervisor, was available to answer questions. Composite and grab samples were collected and transported to Department of Ecology Tumwater laboratory for analysis (Table 1). Additional grab samples were collected on November 14, 1978 by Douglas Houck (Table 2). All of the laboratory results are available in this report.

The City of South Bend lies on the left bank of the Willapa River estuary. The city's treatment facility was built on the right bank of the estuary. South Bend employs three pump stations to pump the wastewater, under the estuary, to two facultative lagoons. Lagoon number 1 lies downstream of lagoon number 2. The influent passes through a one-foot parshall flume, is split, and continues to the lagoons. After chlorination, each lagoon discharges to a collection structure where the effluents are combined, and this flow enters the Willapa River estuary, surface water segment 11-24-02, at approximate river mile 3.3. The five-year strategy identifies this segment as not meeting Class A water quality criteria for fecal coliform due possibly to inadequate sewage systems.

FINDINGS AND CONCLUSIONS

At the time of the inspection, the discharge from lagoon number 1 was substantially exceeding permit limitations for fecal coliforms (Tables 2 and 3). Suspended solids discharged (lbs/day) from lagoon number 2 exceeded permit limitations. Removal efficiencies for both suspended solids and BOD_5 were poor. Lagoon efficiencies are probably reduced by the dilute character of the influent wastewater.

The South Bend treatment facility is due to be upgraded in the near future. Several points should be carefully considered by the design consultants while planning South Bend's facility changes. The wastewater collection system is in very poor condition. Salt water, apparently from the estuary, is somehow getting into the collection system and being pumped to the facility. Figure 1 shows the correlation between the amount of flow entering the treatment facility and the high/low tides for a 48-hour period. A definite trend can be seen. Figures 2 and 3 are the charts used to calculate the flow on an hourly basis. Both charts reveal a surging action by the pump stations and this surging reaches its highest point after a high tide. It therefore appears that a substantial amount of flow entering the facility is tide water. The very high conductivities at Wet Well number 2 and in the lagoons is further evidence of the salt water intrusion. The flow entering the facility is approximately three times that which would be expected, assuming 100 gallons of wastewater per person per day[1]. The pounds of BOD_5 entering the system is less than half of what it should be[2].

Each lagoon has its own chlorine contact chamber. These chambers are poorly designed, being nothing more than an enclosed area where chlorine is administered. Chlorine feed control is a marginal manual system and feed cannot be balanced between the two lagoons. This results in either excessive chlorine addition (and toxic effects on the receiving water) or inadequate disinfection. Both problems were observed during the inspection (Table 3).

To date, South Bend has been very lax in reporting its monthly and quarterly data. Timely reporting of data is required in their NPDES permit. This deficiency should be corrected immediately.

LABORATORY PROCEDURES

Chlorine residual and dissolved oxygen are the only parameters investigated on this inspection. Both procedures and the resulting data are highly questionable. Temperature, pH, and settleable solids are also analyzed at the facility.

Chlorine Residual: Facility personnel are using an orthotolodine test kit for chlorine residual. It was explained to the operator that orthotolodine is not accepted by EPA or DOE as an approved method for determining chlorine residual. It is recommended that they purchase and use a DPD test kit as soon as possible. Table 3 shows a comparison of DPD results versus orthotolodine results.

Dissolved Oxgyen: The dissolved oxygen sample is collected from the chlorine contact chamber. The chlorine in this sample will react with the sodium thiosulfate that is added. The sample should be taken from an unchlorinated source if the Winkler method is used. Sodium thiosulfate is added to the sample using an eye dropper, each drop "equaling" one mg/l dissolved oxygen. This method cannot be very precise. Also, starch is not used as an end point indicator. If any confidence is to be put in their dissolved oxygen results, it is recommended they use a standard and accepted analytical method for dissolved oxygen analyses (Winkler Azide titration with .025 N thiosulfate or dissolved oxygen meter and probe). The results they are reporting are valueless. The dissolved oxygen samples we took revealed a large amount of dissolved oxygen in the lagoons, almost twice what they are reporting on their DMR's (see Table 4).

BOD_5, TSS, and fecal coliform are sent to Alsid Snowden and Assoc. in Bellevue for analysis. Current results were not available.

LITERATURE CITED

(1) Joint Committee of the Water Pollution Control Federation and the American Society of Civil Engineers, 1977. MOP/8 Wastewater Treatment Plant Design, Lancaster Press. P. 5

(2) McGoughey, P. H., 1968. Engineering Management of Water Quality, McGraw-Hill Inc., P. 36

Class II Field Review and Sample Collection
24 Hour Composite Sampler Installations

Sampler	Date and Time Installed	Location
1. Influent aliquot - 250 ml/30 minutes	10/24/78 @ 1020	Head end of Parshall Flume
2. Chlorinated Eff. aliquot - 250 ml/30 minutes	10/24/78 @ 1040	#2 pond effluent collection structure
3. Chlorinated Eff. aliquot - 250 ml/30 minutes	10/24/78 @ 1030	#1 pond effluent collection structure

Grab Samples

	Date and Time	Analysis	Sample Location
1.	10/23 @ 1405	Fecal Coliform	Chlorine contact chamber #2
2.	10/23 @ 1415	Fecal Coliform	Chlorine contact chamber #1
3.	10/23 @ 1425	Fecal Coliform	#1 pond effluent collection structure
4.	10/23 @ 1430	Fecal Coliform	#2 pont effluent collection structure
5.	10/23 @ 1425	COD	Influent
6.	10/23 @ 1045	Fecal Coliform	#1 pond effluent collection structure
	10/23 @ 1045	Fecal Coliform	#2 pond effluent collection structure

Flow Measuring Device

1. Type - Parshall flume on influent, but is not being used to measure flow.
2. Dimensions - 12" throat width
   a. Meets standard criteria /x/ Yes - Seems to meet standard criteria but complete flume dimensions not taken
   / / No Explain:

b. Accuracy check

	Actual Instan. Flow	Recorder Reading	Recorder Accuracy (% of inst. flow)
1.	N/A	N/A	N/A
2.			
3.			

/ / is within accepted 15% error limitations

/ / is in need of calibration

Field Data

Parameter	Date and Time	Sample Location	Result
pH	10/24/78 @ 1020	Influent	6.4
Conductivity	10/24/78 @ 1020	Influent	4000
temperature	10/24/78 @ 1020	Influent	14.6°C
pH	10/24/78 @ 1030	Chlorinated Effluent #1	7.9
Conductivity	10/24/78 @ 1030	Chlorinated Effluent #1	7550
temperature	10/24/78 @ 1030	Chlorinated Effluent #1	7.0°C
pH	10/24/78 @ 1040	Chlorinated Effluent #2	7.6
Conductivity	10/24/78 @ 1040	Chlorinated Effluent #2	7550
temperature	10/24/78 @ 1040	Chlorinated Effluent #2	6.9°C

Table 1

The following table is a comparison of laboratory results from 24 hour composite(s) together with NPDES permit effluent limitations. Additional results pertinent to this inspection have also been included.

Date: 10/24-25/78	Influent	DOE Chlorinated Effluent #2	DOE Chlorinated Eff. #1	10/24/78 Grab Unchlorinated Eff. #2	NPDES (Monthly average)
BOD_5 mg/l	<40	26	20	17	60
lbs/day	<192	125	96	74B	170
TSS mg/l	40	36	29	62	70
lbs/day	192	173	139	270B	170
Total Plant Flow MGD	0.575			0.522B	
pH	7.0	8.2	9.2	8.9	6.5-10.5
Turbidity (NTUs)	50	20	15	16	
Sp. Conductivity (umhos/cm)	1310	6890	7830	7000	
COD (mg/l)	82	280	228	362	
NO_3-N (mg/l)	<.1	<.1	<.1		
NO_2-N (mg/l)	<.1	<.1	<.1		
NH_3-N (mg/l)	3.6	0.6	0.4		
o-PO_4-P (mg/l)	1.6	1.0	1.2		
Total Phos.-P (mg/l)	2.7	1.9	2.0		
Total Solids (mg/l)	738	4457	5049	4470	
Total Non. Vol. Solids (mg/l)	622	3732	4270	3770	
Total Sus. Non. Vol. Solids (mg/l)	18	6	7	12	
BOD_2 (mg/l)	<40				
BOD_9 (mg/l)	56				
BOD_{15} (mg/l)	76				
BOD_{20} (mg/l)	116				

* Field Analysis "<" is "less than" and ">" is "greater than"
B = approximate

Table 2

	Pump Station Wet Well #2	DOE Influent	Chlorinated Effluent #1	Chlorinated Effluent #2	NPDES (Monthly Average)
pH	7.2	7.2	7.3	7.0	6.5-10.5
Spec. Conductivity (umhos/cm)	5940	25000	5800	5090	
BOD_5 (mg/l)	11	14	11	4	60
Fecal Coliform (Col/100 ml)			6800B	25B	200
NO_3-N (mg/l)	<0.5	0.3	0.3	0.3	
NO_2-N (mg/l)	<0.3	<0.3	<0.3	<0.3	
NH_3-N (mg/l)	6.2	0.8	1.5	0.7	
$OP\text{-}O_4$-P (mg/l)	0.3	0.5	1.0	1.0	
Total Phos. P (mg/l)	2.5	0.8	1.8	1.5	
Total Solids (mg/l)	4020	21460	5335	4470	
Total Non. Vol. Solids (mg/l)	3390	17940	4450	3740	
Total Sus. Solids (mg/l)	18	90	30	21	70
Total Sus. Non. Solids (mg/l)	14	65	15	14	

* Field Analysis
B - approximate

"<" is "less than" and ">" is "greater than"

Table 3 Fecal Coliform/Chlorine Residual

Date	Time	Location	Fecal Coliform Col/100 ml	Chlorine Residual DPD	Chlorine Residual O.T.
	Lagoon #1				
10/23	1415	Chlorine contact chamber	70B	0.3	
	1425	Effluent collection structure #1	1,400	0.0	
10/25	1045	Effluent collection structure #1	270B	0.6	0.3
	Lagoon #2				
10/23	1405	Chlorine contact chamber	<10	2.5	
	1430	Effluent collection structure #2	<10	2.75	
10/25	1045	Effluent collection structure #2	5B	2.75	0.8

NPDES permit limitation for fecal coliform is 200 col/100 ml
B = estimate

Table 4 Dissolved Oxygen

Date	Time	Location	Method	Results
10/23	1405	Chlorine contact chamber #2	Winkler	25.5
	1415	Chlorine contact chamber #1	Winkler	23.3
10/24	1105	Lagoon #2 - 45 feet from weir	Winkler	17.6
			IBC	>15
	1115	Lagoon #1 - 45 feet from weir	Winkler	20.0
			IBC	>15
10/25	1045	Lagoon #1 (DOE analysis)	Winkler	18.7
		Lagoon #1 (South Bend analysis)	Winkler (Hach)	11.0

Figure 1 Influent Flow Recorded at South Bend Sewage Treatment Facility

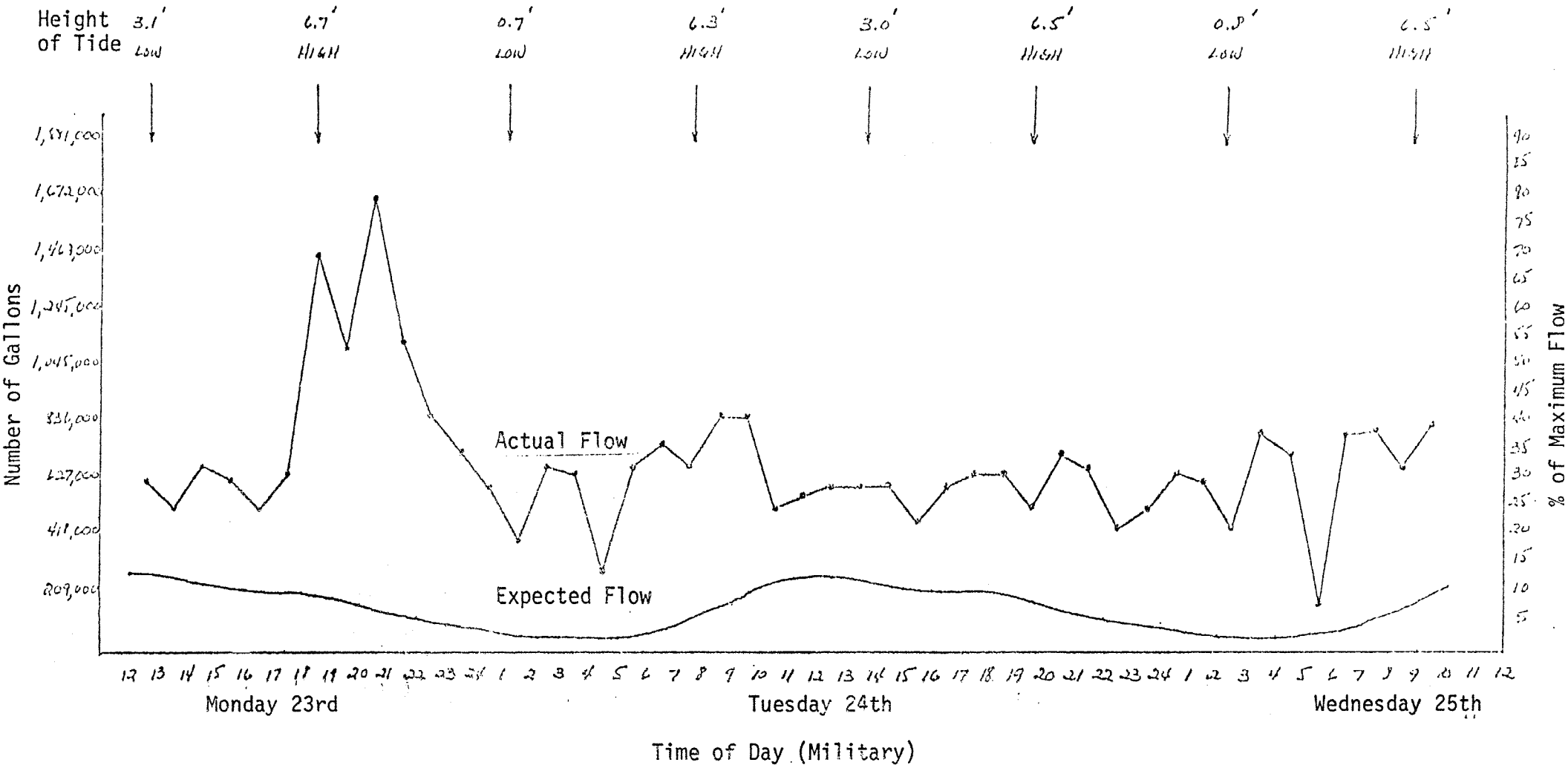


Figure 2

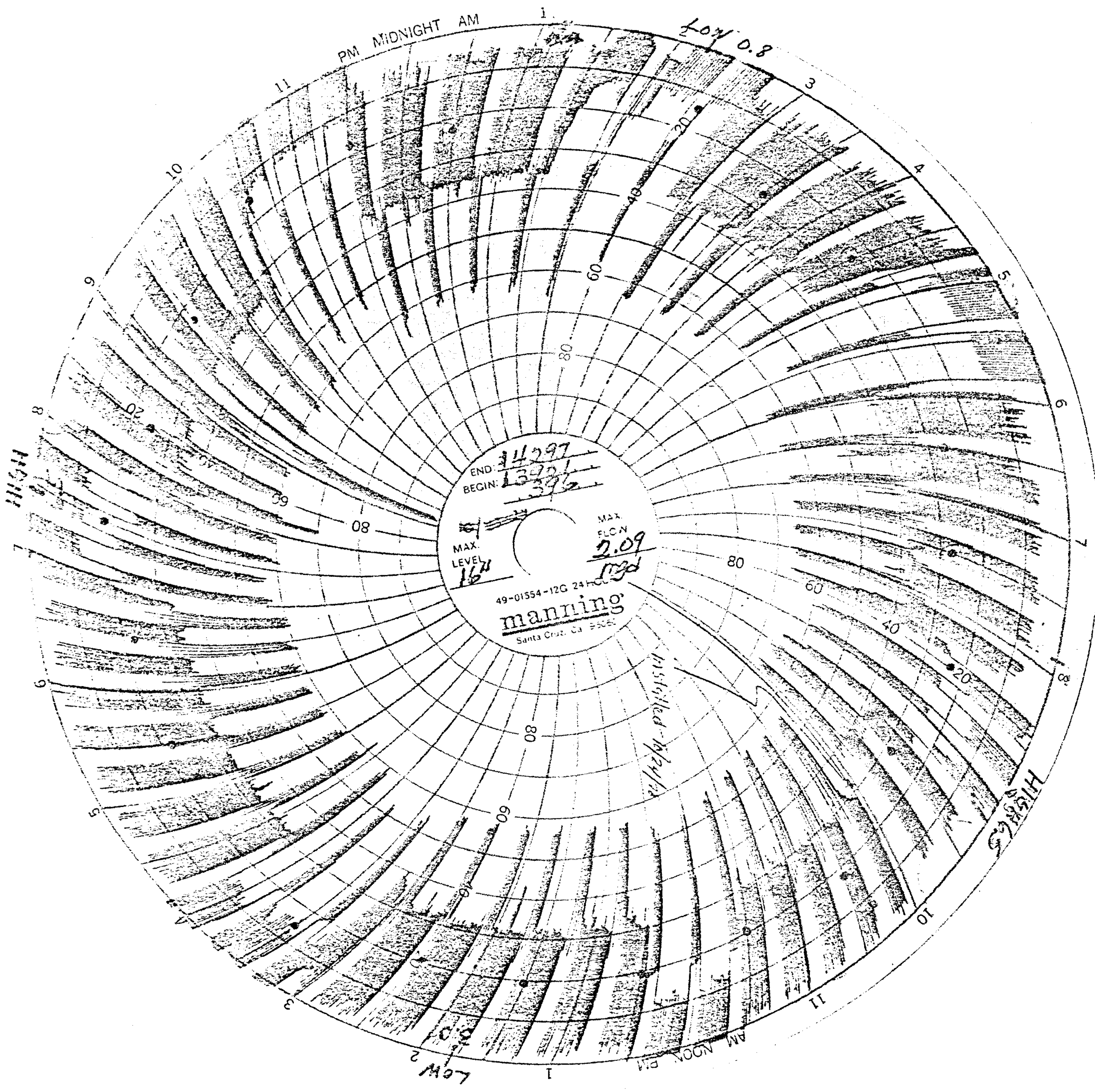
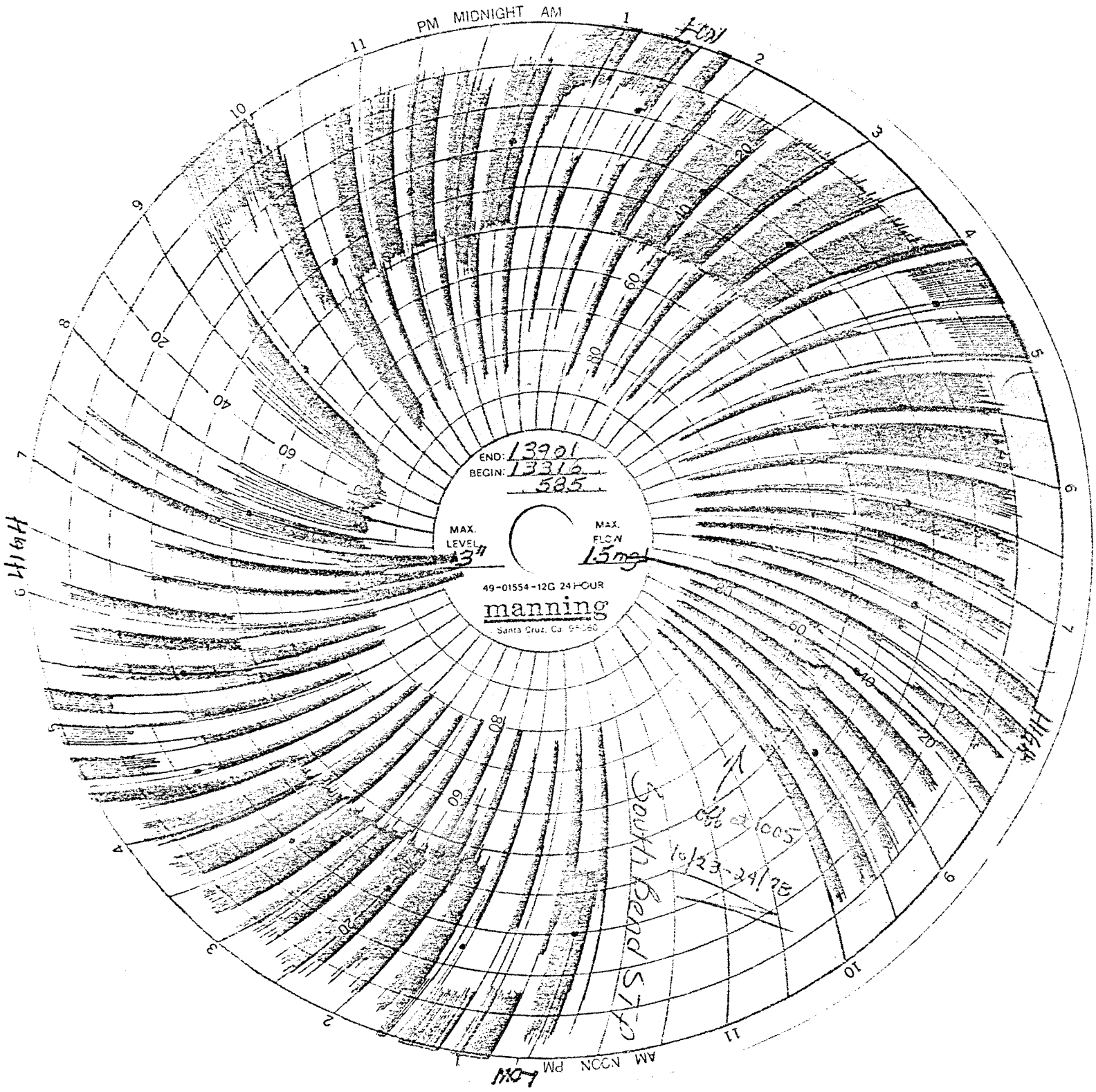

PM MIDNIGHT AM
AM NOON PM
END:
BEGIN:
MAX. LEVEL
MAX. FLOW
2.09
49-01554-12G 24 HOUR
manning
Santa Cruz, Ca.
LOW 0.8
HIGH

Figure 3


PM MIDNIGHT AM
AM NOON PM
END: 13901
BEGIN: 13316
585
MAX. LEVEL 13"
MAX. FLOW 1.5mgd
49-01554-12G 24 HOUR
manning
Santa Cruz, Ca.
High
High
Low
South Beach St.
11/23-24/82