Publication No. 83-e35

WA-13-0030

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, LU-11 • Olympia, Washington 98504 • (206) 753-2353

MEMORANDUM

June 20, 1983

TO: Frank Monahan, District Supervisor

FROM: Rick Pierce, District Engineer

SUBJECT: Status of LOTT as of May 1983

The purpose of this report is to establish positions on various issues the Washington Department of Ecology (WDOE) assumes to be critical with respect to revisions to the existing General Sewer Plan for the LOTT service area. My sections of the report deals with current sewage treatment plant (STP) loadings. The status of the current STP is important in that it will give a perspective from which to view past and future data analysis.

My specific objectives are to:

1. Look at current influent loadings, with special emphasis on Olympia Brewing Company.

2. Look at permit compliance.

3. Look at differences in nutrients being discharged:

   a. as a primary STP.

   b. as a new secondary STP.

4. Look at assessing the ultimate capacity of LOTT STP.

This brief review is expected to raise questions, rather than answer them as a full Class II inspection would endeavor.

Initially, I decided to limit the scope of my review to plant loadings (BOD_5, TSS, nutrients) only. I did not analyze plant flow because under normal flows, the plant has significant additional hydraulic capacity. This was designed into the plant, using conservative design parameters and an equalization basin, because of large storm flows entering the collection system in the combined sewered downtown area of Olympia. I also did not have time to analyze inflow and infiltration (I/I) impacts during wet weather periods; however, again I have assumed I/I to be of lesser importance at this time.

To support my assumption about hydraulic capacity, there was only one significant discharge of raw, yet chlorinated, sewage this past year. The plant was designed for this type of discharge, occurring during a 1-in-10 year storm event, with inflow of 65 million gallons per day (MGD). The STP is designed to handle 13 MGD on the average, but Tom Kolby (STP Superintendent) asserts that 35 MGD can be effectively treated by the plant, for limited periods of time (the average wet weather flow for the last year was 13.01 MGD).

Although not a limitation in a strict sense, the 30-inch diameter (far) outfall cannot carry the total daily flow volume. Under daily peak flows and/or high tides, the 48-inch diameter (near) outfall must be used. There are no flow meters on either outfall to describe exactly how much leaves which discharge pipe. Since the near outfall is in a poorer location (for many reasons), an evaluation should be undertaken. This is also a permit question in that the discharge locations were not specifically defined. I had always assumed that the far outfall was designed to handle all average daily flows.

In an effort to evaluate current data and data containing both extreme and average loading events, May 1983 was chosen. May was generally a dry month and falls under the Low Flow conditions of the NPDES permit for LOTT (Attachment I). May had double the BOD_5 and TSS loadings of the previous four months. The loading increase is known to be caused by Olympia Brewing. Figures I and II (attached) show influent BOD_5 and TSS loadings to LOTT (and effluent loadings from Olympia Brewing).

Let me briefly mention Olympia Brewing's impact on the STP. Olympia Brewing was recently bought by Pabst Brewing Company, which immediately started increasing production from about 60% of production capacity to full production capacity. Table I compares anticipated design levels with May 1983 levels:

TABLE I

Influent Loading
(Percent Olympia Brewing as part of Total Inflows)

	Design (Annual Average)	May 1983 Average	Comments
Flow	15%	13%	
BOD_5	59%	67%	Up 32% from Feb. 1983
TSS	21%	27%	Up 57% from Feb. 1983
Inorganic-N	---	approx. 7%	Up approx. 50% from Feb. 1983
Total-P	---	approx. 28%	Up approx. 30% from Feb. 1983

Olympia Brewing is currently exceeding its NPDES permit limits (see Attachment II); however, the brewery is negotiating with LOTT for additional capacity.

Figure I shows that Olympia Brewing is the major input of BOD_5 to LOTT, yet influent levels are not exceeding Design Values. Olympia Brewing does seem to be the major cause of the widely fluctuating loadings. The range of these fluctuations is far wider than normal and could potentially cause shock upsets without intense operational care.

Let us now turn to NPDES permit compliance. Figures III and IV (attached) illustrate how well the treatment plant is able to meet its effluent limits, even under high loading. A question that remains to be seen is how well will the STP operate with high loading and wet weather high flow. I anticipate that wet weather flows may cause periodic solids carryover or washouts. However, the effluent is of such high quality that I assume short term, poor quality discharges will not cause LOTT to violate its permit. I will be working with Olympia Brewing to reduce and stabilize their impact to LOTT, especially with respect to shock loads.

Next, I want to look at nutrients. Typically, brewery wastes are low in nutrients and since the brewery is a major source of wastewater, it could cause imbalances in the treatment process. Therefore, there is good reason to look at nutrients and any limiting effects on bio-mass growth (and therefore treatment effectiveness).

Based on an approximate method for assessing theoretical nutrient needs in an STP (from Benefield and Randall, page 189), there were excess nutrients available in May 1983, on the average. However, because Olympia Brewing inputs such large spikes of loading to the STP, there is a possibility of short term nutrient deficiencies. There is not enough data to confirm this, but effluent ammonia levels in May vary widely and do periodically go down to low levels.

Nutrients are also important from a receiving water quality basis. Other portions of this report will analyze effects of nutrients on Budd Inlet. Much of the Budd Inlet data was gathered while the STP was operating as a primary STP. I want to compare nutrients discharged under the old primary mode with nutrients being discharged under the current secondary treatment mode. Since there was a limited amount of nutrient data gathered previous to the new STP being built, I chose an intensive sampling survey conducted by Ken Mauermann and collected during February through March 1982, to compare with current data. Table II (attached) presents the data used to develop Figure V (attached). As shown, there are no significant changes over the periods compared. Note the expected drop in nutrient levels between influent and effluent.

Finally, I want to assess the ultimate capacity of the STP. There are normally two yardsticks used to measure STP capacity: theoretical design capacity and actual ultimate capacity. They may be the same, but generally are not. There are signs that the STP is close to design capacity. Over the last 12 months, flows are approximately 20% below design levels. During May 1983, BOD_5 was 20% below design average levels and TSS was 40% above design average levels. Even though there are signs the STP is approaching maximum theoretical design capacity, there are few signs that the STP is at the actual ultimate capacity. Tom Kolby has noted that poor setting secondary sludge, which occurs during high BOD_5 periods, has caused operational problems. But other than this, there have been few actual signs that the STP is reaching ultimate capacity. However, the above information only tells me at the STP is operating nicely and only hints that the plant may be close to ultimate capacity.

I cannot establish a real ultimate capacity value with the data at hand and given the very limited time available. The major variables that prevent an accurate prediction are:

1. Olympia Brewing with its widely fluctuating loading to the STP.

2. A very conservative design that, in effect, gives extra capacity during dry flow periods.

3. An operating staff that is still adjusting to a new plant.

I recommend the WDOE conduct an intensive Class II inspection which should look thoroughly at operational efficiencies at the STP. But an inspection should not be made until all process components are operational (e.g., ozonator and the centrifuge). The inspection should also evaluate water quality implications of the near and, to a lesser extent, the far outfalls.

In conclusion, I would say that the plant is close to 80 to 90% of ultimate capacity. Olympia Brewing's loading should be reduced from current levels (I will start action soon) with emphasis on dampening shock loading. Any revisions to LOTT's NPDES permit should address the location of the discharge (near or far).

RP:si

Attachments:

--Attachment I - LOTT NPDES Waste Discharge Permit
No. WA-003706-1, Pages 1, 2 and 3
--Attachment II - Olympia Brewing Co. NPDES Waste Discharge
Permit No. WA-000130-9, Pages 1 and 4
--Table II - LOTT Effluent and Influent Composites/Mauermann Data
--Figures I Through V

Permit No. [illegible]
Issuance Date April 11, 1980
Effective Date April 11, 1980
Expiration Date April 11, 1985

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

WASTE DISCHARGE PERMIT

State of Washington
DEPARTMENT OF ECOLOGY
Olympia, Washington 98504

In compliance with the provisions of
Chapter 90.48 RCW as amended
and
The Clean Water Act as amended
Public Law 95-917

City of Olympia
8th Ave. & Plum St.
Olympia, WA 98507

Plant Location: North Adams & East "A"
Olympia, Thurston Co.

Receiving Water: Budd Inlet

Waterway Segment No.: 06-13-03

Discharge Location: 001 - Lat. 47° 3' 30" N
Long. 122° 53' 45" W
002 - Lat. 47° 02' 47" N
Long. 122° 53' 53" W

---

is authorized to discharge in accordance with
the special and general conditions which follow.

Elmer C. Vogel, Deputy Director
Department of Ecology (3)

SPECIAL CONDITIONS

S1. INTERIM EFFLUENT LIMITATIONS

Through December 31, 1982 the permittee is authorized to discharge subject to the following limitations:

The monthly average quantity of effluent discharge shall not exceed 15.3 mgd. Treatment Design Flow is 9.1 mgd.

	EFFLUENT LIMITATIONS	
Parameter	Monthly Average	Weekly Average
Biochemical oxygen demand (5 day)	704 mg/l, 57,800 lb/day	1,056 mg/l, 86,700 lb/day
Suspended solids	210 mg/l, 18,100 lb/day	315 mg/l, 27,100 lb/day
Fecal coliform bacteria	700/100 ml	1,500/100 ml
pH	Shall not be outside the range 6.0 - 11.0	

The monthly and weekly averages for BOD and Suspended Solids are based on the arithmetic mean of the samples taken. The averages for fecal coliform are based on the geometric mean of the samples taken.

Effluent limitations on BOD_5, Suspended Solids are not valid during periods of excessive infiltration when monthly average flows exceed 14 mgd. When the daily flow is above 9.1 mgd, the Chlorine Residual shall be monitored four times daily.

S2. FINAL EFFLUENT LIMITATIONS

After December 31, 1982 the permittee is authorized to discharge subject to meeting the following limitations:

The monthly average quantity of effluent discharge shall not exceed the flow of 16.3 mgd.

a. Low Flow Effluent Limitations

During periods when the monthly average flow is equal to or less than 11.8 mgd. the following limitations shall not be exceeded:

Parameter	Monthly Average	Weekly Average
Biochemical oxygen demand* (5 day)	30 mg/l, 2,950 lb/day	45 mg/l, 4,430 lb/day
Suspended solids*	30 mg/l, 2,950 lb/day	45 mg/l, 4,430 lb/day
Fecal Coliform	200/100 ml	400/100 ml
pH	Shall not be outside the range 6.0 - 9.0	

*The monthly average effluent concentration limitations for BOD_5 and Suspended Solids shall not exceed 30 mg/l or 15 percent of the respective influent concentrations, whichever is more stringent.

b. High Flow Effluent Limitations

During periods when the monthly average flow is greater than 11.8 mgd., the following limitations shall not be exceeded:

Parameter	Monthly Average	Weekly Average
Flow	16.3 mgd	
BOD_5	30 mg/l 4,080 lbs/day	45 mg/l 6,120 lbs/day
SS	30 mg/l 4,080 lbs/day	45 mg/l 6,120 lbs/day
Fecal Coliform Bacteria	200/100 ml	400/100 ml
pH	Shall not be outside the range of 6.0 - 9.0	

The monthly and weekly averages for BOD_5 and Suspended Solids are based on the arithmetic mean of the samples taken. The averages for fecal coliform are based on the geometric mean of the samples taken.

Monthly average for BOD_5 and SS is the arithmetic mean of samples taken for 30 consecutive days.

Weekly average for BOD_5 and SS is the arithmetic mean of samples taken for seven consecutive days.

Monthly and weekly average for fecal coliform bacteria are the geometric mean of samples taken of 30 and seven consecutive days, respectively.

S3. SCHEDULE OF COMPLIANCE

a. The permittee shall complete construction of the secondary facility by July 6, 1982.

b. The permittee shall achieve compliance with the effluent limitations specified in Special Condition S2 by December 31, 1982.

c. Where the department approves a change order or orders extending the date for completion of construction, the dates specified in S3.(a) and (b) are automatically extended by an equal time period up to a maximum of 90 days total. Such extensions will be limited to delays caused by circumstances beyond the reasonable control of the permittee.

d. The permittee shall submit a progress report each nine months commencing on January 1, 1980 until the final effluent limitations can be met.

Permit . WA-000130-9
Issuance Date January 9, 1978
Expiration Date January 9, 1983

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

WASTE DISCHARGE PERMIT

State of Washington
DEPARTMENT OF ECOLOGY
Olympia, Washington 98504

In compliance with the provisions of
Chapter 90.48 RCW as amended
and
The Federal Water Pollution Control Act as Amended

Olympia Brewing Company
P.O. Box 947
Olympia, WA 98507

Plant Location: Tumwater, WA

Receiving Water: Budd Inlet via Olympia STP
Deschutes River via outfalls

Industry Type: Brewing & packaging beer

Discharge Location:
Outfall 001
Lat. 47° 01' 00"
Long. 122° 54' 09"
Outfall 002
Lat. 47° 00' 54"
Long. 122° 54' 07"
Outfall 003
Lat. 47° 00' 53"
Long. 122° 54' 05"
Outfall 004
Lat. 47° 00' 46"
Long. 122° 54' 06"

Waterway Segment No.: 06-13-03 (Budd Inlet)
06-13-04 (Deschutes River)

---

is authorized to discharge in accordance with
the special and general conditions which follow.

Elmer C. Vogel

Elmer C. Vogel, Deputy Director
Department of Ecology (3)

REVISED 2/25/80

S3. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

After January 2, 1982 and lasting through the expiration date of this permit, the permittee is authorized to discharge subject to the following limitations:

	EFFLUENT LIMITATIONS	MONITORING REQUIREMENTS**	
Parameter	Daily Average	Minimum Frequency	Sample Type
Sanitary Waste, Process Wastewater And Cleaning Wastewater May Be Discharged to the Municipal Sanitary Sewer System			
Flow	2,000,000 gallons (daily & instantaneous maximum)	Continuous	Recorded
BOD_5	18,000 pounds	Daily	24 hr. composite
	(938 pounds peak hourly rate)	Monthly, rotating between days of the week	12 separate hourly composite samples equally spaced over 24 hours*
Total Suspended Solids	3,300 pounds	Daily	24 hr. composite
	(172 pounds peak hourly rate)	Monthly, rotating between days of the week	12 separate hourly composite samples equally spaced over 24 hours*
pH	Shall be within the range of 6.0 - 10.0	Continuous	Recorded

*Hourly composite samples shall consist of at least six representative samples.

Waste paper from the bottle washer is to be screened from the effluent and disposed of on land.

Before discharge of more than 2,000 gallons/day of non-merchantable products, approval is to be obtained from this Department. Requests for such approval must contain the volume of product to be discharged and method of disposal. Concurrently, the permittee shall obtain approval of the water/sewer superintendant or his designee at the municipal sewage treatment plant prior to discharge.

All requirements and ordinances of the Cities of Tumwater and Olympia pertaining to the discharge of waste into the city sewerage system are hereby made a condition of this permit.

All process and sanitary wastes shall be routed through a common collection point for sampling and flow monitoring prior to discharge to the Tumwater system.

Composite samples shall be flow-proportional.

Discharge of chlorine, algicides, disinfectants and other chemicals shall be below levels which will inhibit biological treatment at the municipal treatment facilities. No discharge of floating oils is permitted.

**Monitoring requirements may be reduced if determined by the Department to be appropriate after the new municipal facilities have been in operation.

The daily maximum is defined as the greatest allowable value for any calendar day.

June 1983
R. Pierce

TABLE II

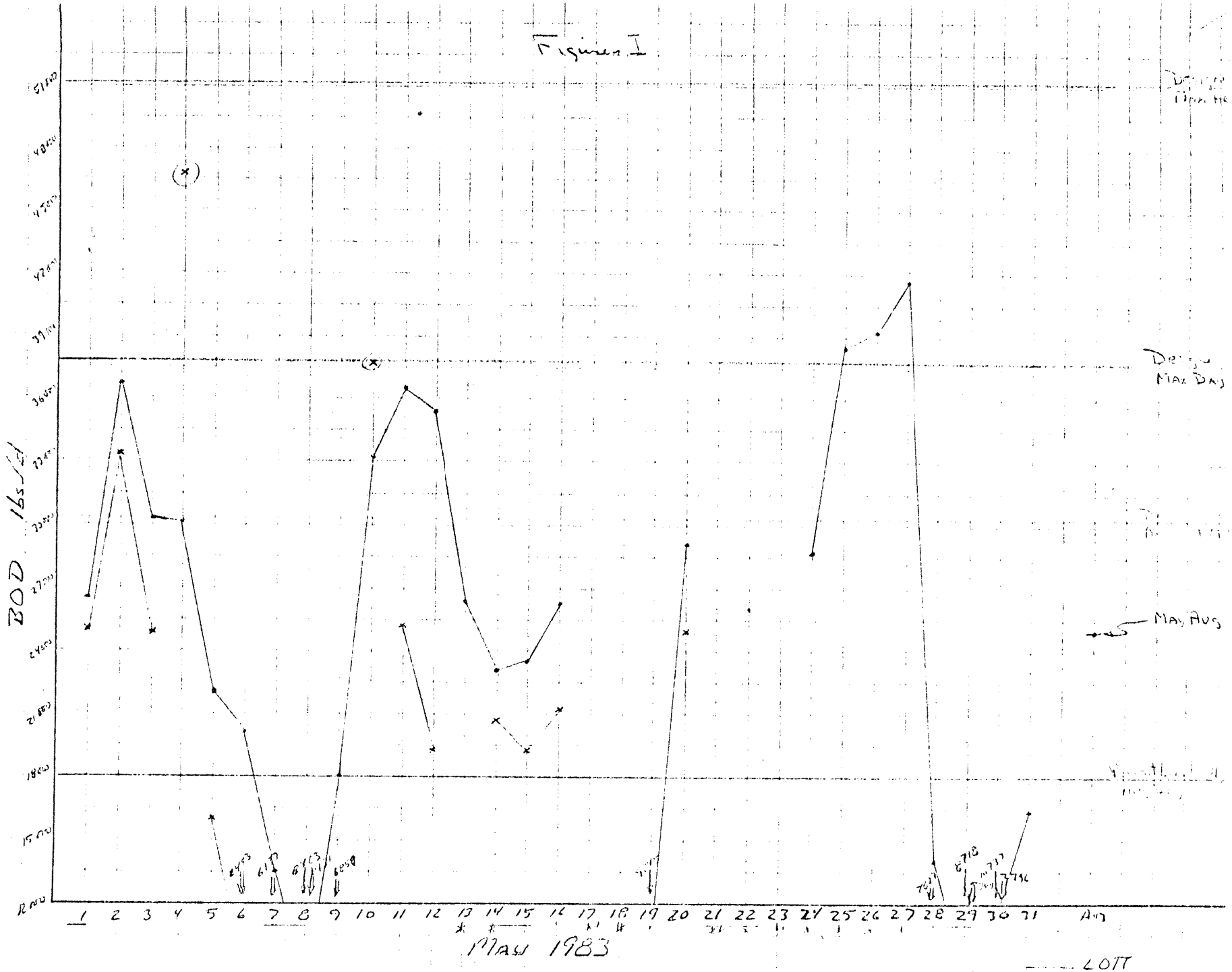
LOTT Effluent and Influent Composites
(Data Compiled By Ken Mauermann)

	2/3/82	2/14/82	2/17/82	2/24/82	3/1&2/82
Flow (Effluent)	10.53	23.91	21.19	14.43	15.52-13.73 Avg. 14.63
(Est. Influent*)	11.58	25.30	23.30	15.87	16.09
*Assume 10% increase (May differed by 19%)					
Inorganic-N					
Effluent (mg/l)	12.3	5.9	5.3	9.5	10.4
Effluent (lb/d)	1080	1172	937	1143	1269
Influent (mg/l)	13.30	7.1	5.9	8.2	10.3
Influent (lb/d)	1284	1498	1147	1085	1382
Total-P					
Effluent (mg/l)	4.4	2.2	2.3	3.7	5.3
Effluent (lb/d)	386	439	406	445	647
Influent (mg/l)	5.1	3.0	2.9	3.3	6.3
Influent (lb/d)	493	637	564	437	845

LOTT Data - Effluent Only

	1/83	2/83	3/83	4/83	5/83
Flow	13.23	12.7	11.99	8.8	8.01
Inorganic-N					
(mg/l)	9.04	11.21	10.74	13.89	15.72
(lb/d)	997	1187	1074	1019	1050
Total-P					
(mg/l)	2.42	3.15	4.3	4.49	5.1
(lb/d)	267	334	430	330	341

Figure I



LOTT Influent (Plus Old Brew Effluent)

June 8

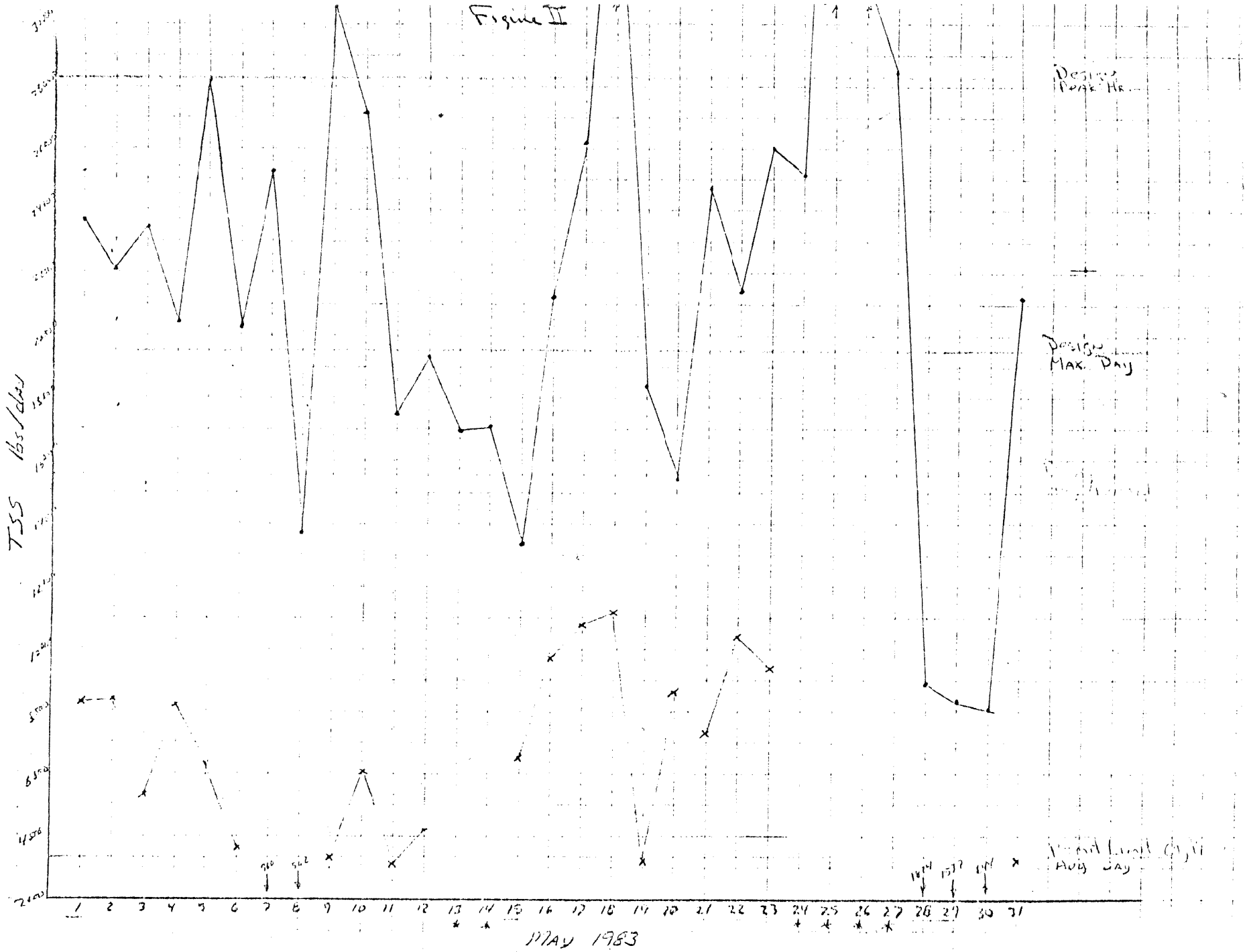
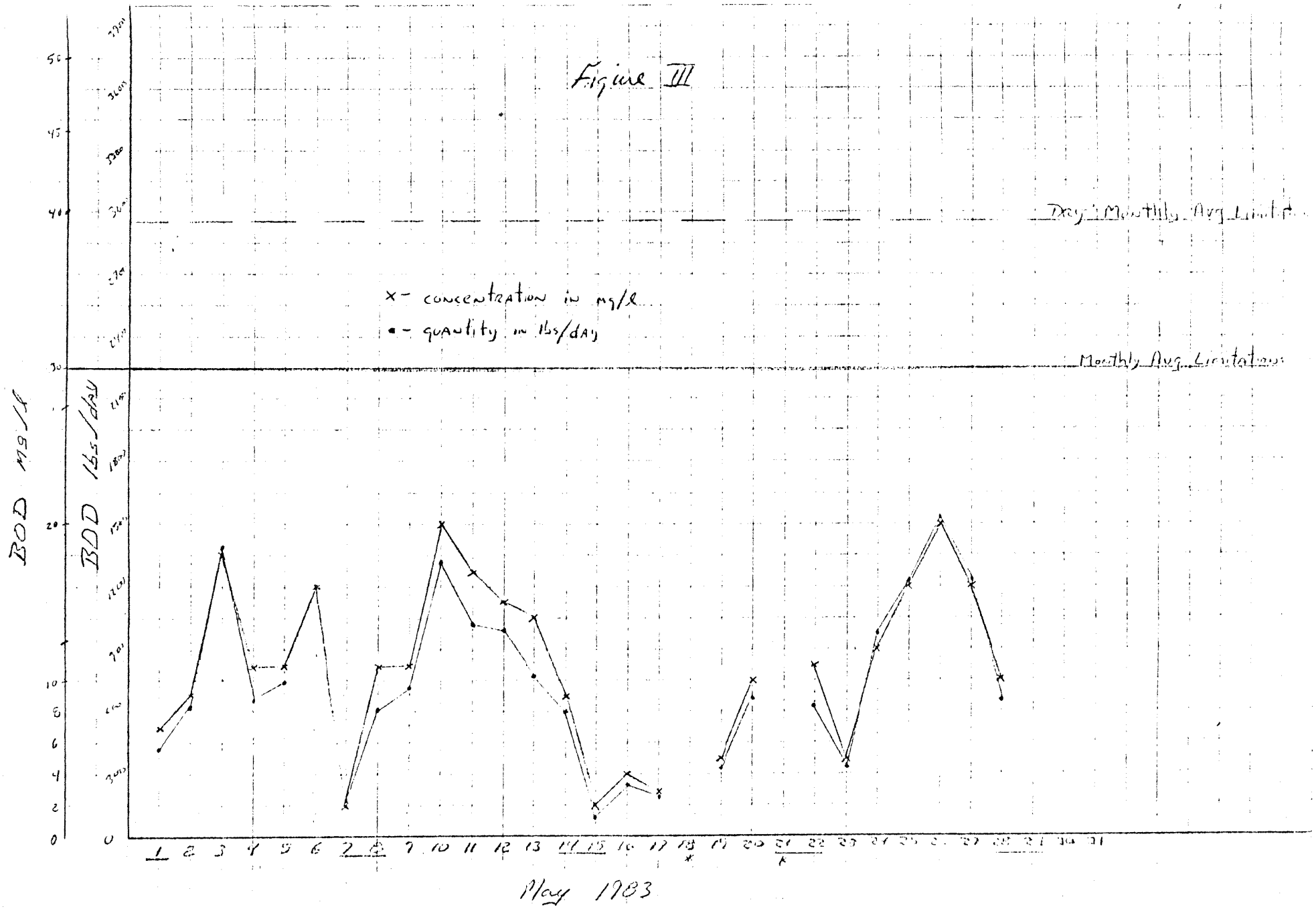


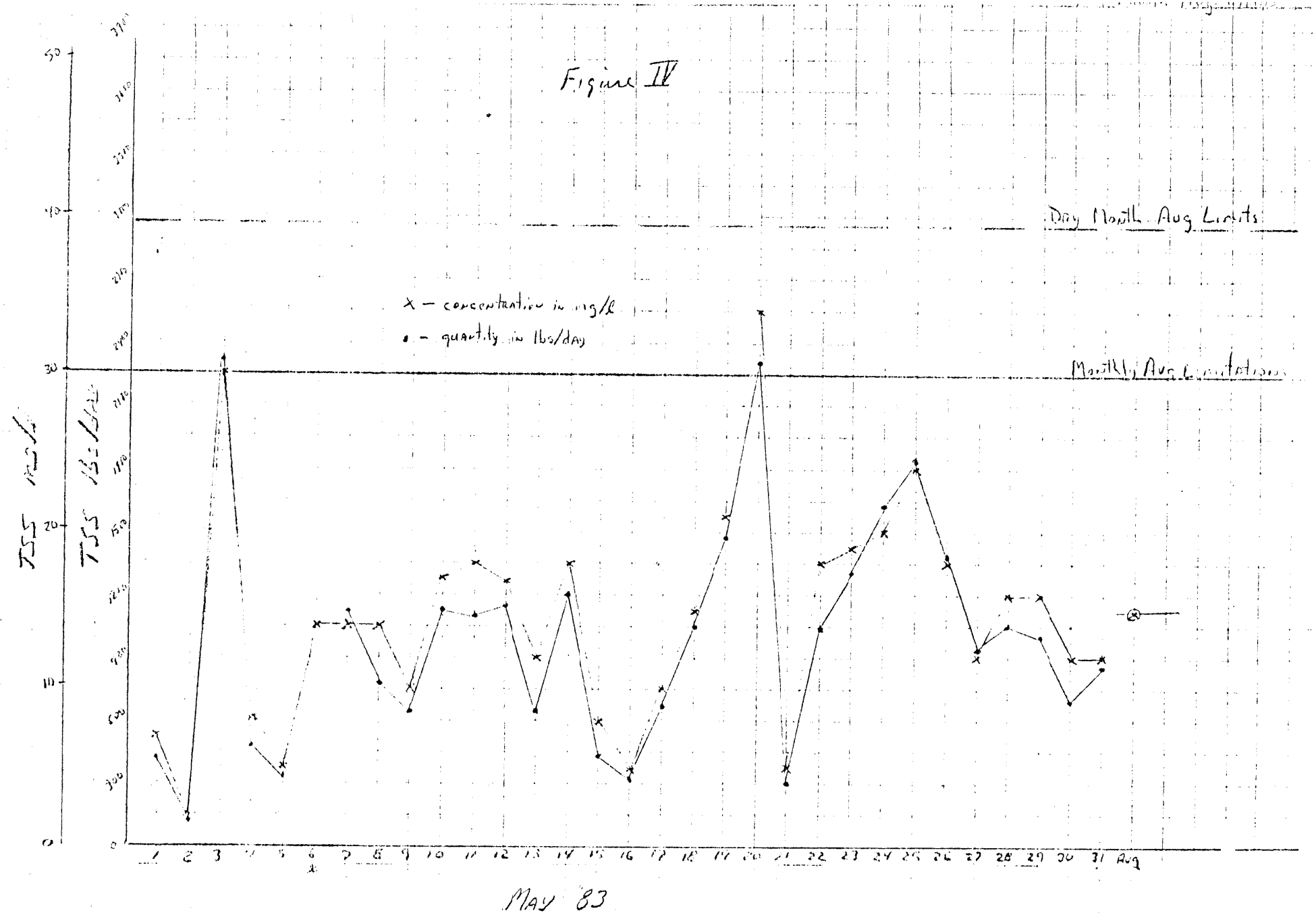
Figure II
TSS lbs/day
Design Peak Hr.
Design Max. Day
Avg Day
MAY 1983
LOTT Influent (Plus Olympia Effluent)
LOTT
City

June 87



Effluent Data from LOTT

* no data



Effluent TSS Data from LOTT

June 83
BDP

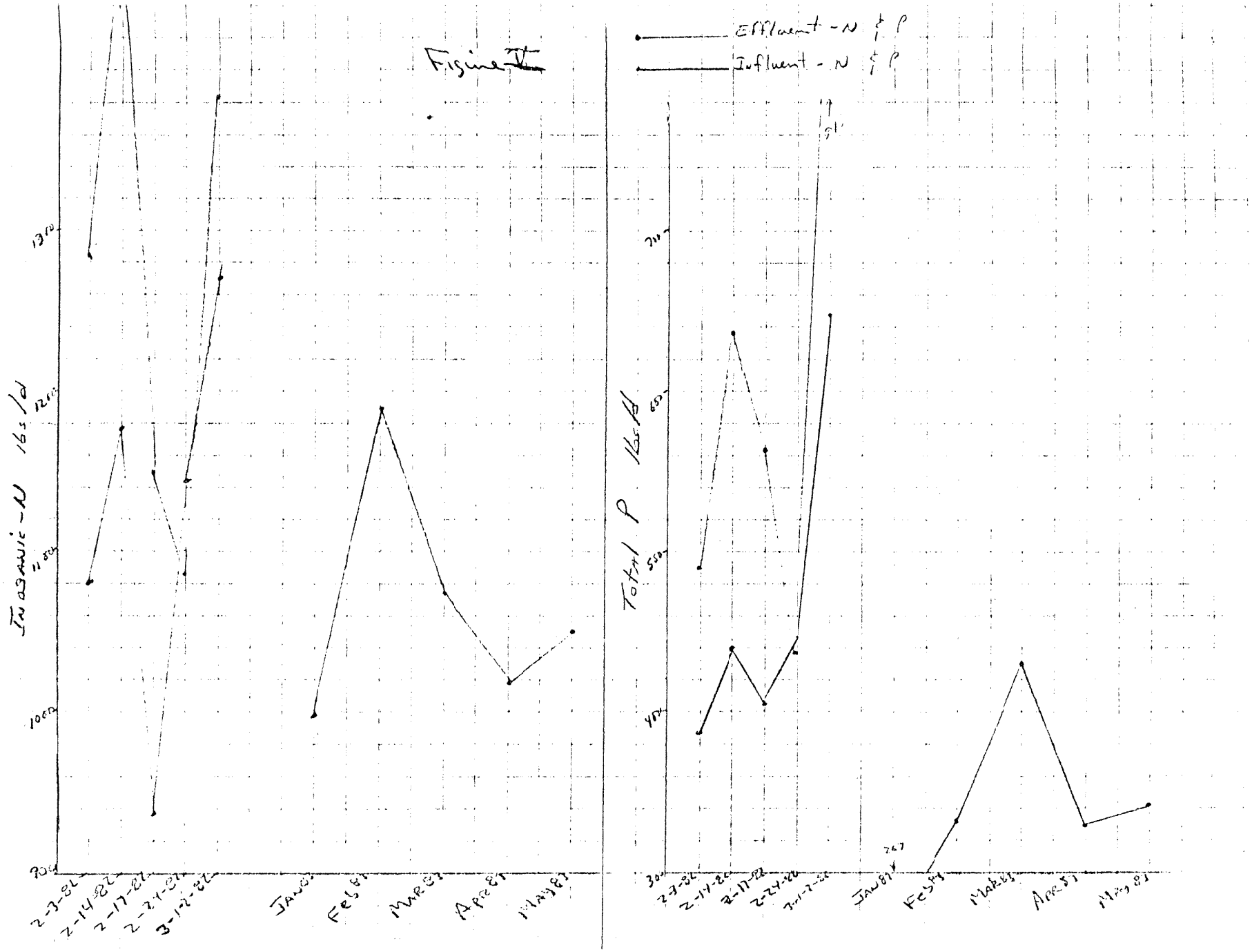


Figure V
Effluent - N & P
Influent - N & P
Inorganic - N lbs/d
Total P lbs/d
1300
1200
1100
1000
900
700
650
550
450
300
2-3-82
2-14-82
2-17-82
2-24-82
3-1-2-82
JAN 83
FEB 83
MAR 83
APR 83
MAY 83

June 83
RDP