

TO: Mike Price

FROM: Pat Lee

SUBJECT: Efficiency Study at Tacoma General STP #1

DATE: October 16, 1973

State of
Washington
Department
of Ecology



An efficiency study was conducted on Tacoma General STP (#1 plant) on September 11, 1973. The influent and effluent were composited on the half hour, proportionate to flow for eight hours. The plant grounds were very neat and clean but the plant itself could have used some maintenance. Part of this problem is due to the age of the plant. Although Superintendent Lyman Ketcham told me that all parts of the plant were operating, one of the operators told me he had just started up one of the clarifiers the day before my visit.

The field and laboratory results (summarized on the efficiency study form) show a plant that is certainly not operating at design efficiency. While the BOD was reduced by 50%, total solids were only reduced by 12%. I sampled for coliform at a point where the effluent enters the Puyallup River. There was no chlorine contact chamber as the effluent to the river is only about fifty yards from chlorine application point with no baffles in between. The lack of contact time is readily apparent in the high coliform values reported. The levels were so high that they exceeded the microbiologist's dilutions and thus at four different times total coliform density exceeded 1.6 million colonies per 100 ml.

PL:jmh

cc: Ron Pine
Ron Devitt
Files

STP SURVEY REPORT FORM

(EFFICIENCY STUDY)

100,000 +

City Tacoma General Plant Type Primary Population Industrial Design 210,000
Central Served Capacity

Receiving Water Puyallup River Engineer Mike Price

Date Sept. 11, 1973 Survey Period 0800-1600 hrs. Survey Personnel Pat Lee

Comp. Sampling Frequency 1/2 hr. Weather Conditions Warm
 (last 48 hours)

Sampling Alequot 800 mls. to 1200 mls.

PLANT OPERATION

Total Flow 8 Million gallons How Measured Totalizer

Max. (Flow) 30 MGD Time of Max. 1230 Min. 15 MGD Time of Min. 0900

Pre Cl₂ ----- #/day Post Cl₂ 2,000 #/day

FIELD RESULTS

Influent

Effluent

9 Determinations

	Max.	Min.	Mean	Median	Max.	Min.	Mean	Median
Temp. °C	21.8	19.7	20.9	21.1	21.4	19.1	20.3	20.4
pH	7.4	6.9	---	7.0	7.2	7.1	-----	7.1
Conductivity (umhos/cm)	1450	650	1100	1100	1400	1100	1250	1300
Settleable Solids	12.0	7.0	9.1	9.0	0.4	0.1	0.2	0.2

LABORATORY RESULTS ON COMPOSITE IN PPM

Laboratory Number	Influent	Effluent	% Reduction
	73-3292	73-3293	
5-Day BOD	330	165	50
COD	540	380	30
T.S.	955	844	12
T.N.V.S.	591	612	0
T.S.S.	238	69	71
N.V.S.S.	24	0	100
pH	6.8	6.7	
Conductivity	1300	1400	
Turbidity	90	54	30

BACTERIOLOGICAL RESULTS

Na₂S₂O₃ added to sample Before _____ After _____ Sampling _____ min.

LAB #	SAMPLING TIME	COLONIES/100 MLS (MF)		Cl Residual	
		Total	Fecal	ppm	(after secs)
73-3294	0830	<20000	<10000	71.0	3 minutes
3295	0930	1 X 10 ⁶	<10000	↓	↓
3296	1030	>1.6 X 10 ⁶	>1.6 X 10 ⁵	↓	↓
3297	1130	>1.6 X 10 ⁶	140000	↓	↓
3298	1230	>1.6 X 10 ⁶	>1.6 X 10 ⁵	↓	↓
3299	1330	>1.6 X 10 ⁶	17500	↓	↓

Operator's Name Lyman Ketcham Phone # 593-4237

Parameters:	Influent	Effluent
Color	415	355
Chlorides	240	270

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SEWAGE TREATMENT PLANT OPERATION AND MAINTENANCE
PRACTICES QUESTIONNAIRE

FORM APPROVED
BUDGET BUREAU NO. 42-R1527

CHECK ONE <input type="checkbox"/> 1ST AUDIT <input checked="" type="checkbox"/> RE-AUDIT	DATE OF AUDIT 9-11-73	PLANT DESCRIPTION CODE (For Official Use Only)
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A. GENERAL INFORMATION

1. PROJECT (State, Number) Washington	SCOPE OF PROJECT (new plant, additions, etc.) Routine
2. PLANT LOCATION (City, county) Tacoma General #1 (Central)	IDENTIFICATION OF AREAS SERVED Central Tacoma

3. POPULATION

3A. FRACTION OF AREA POPULATION SERVED (%) 90%	3B. PLANT DESIGN (population equivalent) 150,000 210,000	3C. SERVED BY PLANT (domestic) 100,000 100,000 + Industrial
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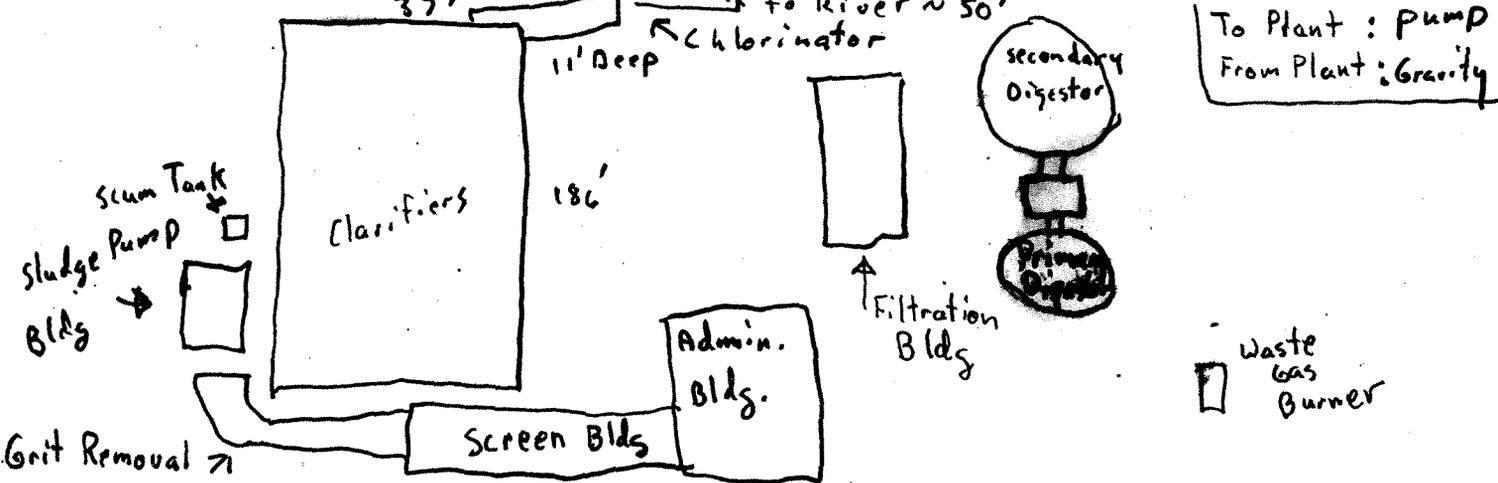
4. TYPE OF COLLECTION SYSTEM

4A. <input type="checkbox"/> COMBINED <input checked="" type="checkbox"/> SEPARATE <input type="checkbox"/> BOTH 95%	4B. ESTIMATE FLOW CONTRIBUTED BY SURFACE OR GROUND WATER (infiltration, mgd) up to 40mgd in storms
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5. YEAR COMMUNITY BEGAN SEWAGE TREATMENT 1952	6. YEAR PRESENT SYSTEM PLACED IN OPERATION		
	6A. SEWER 1900~	6B. PLANT 1952	6C. ANCILLARY WORKS none

7A. SIZE OF PLANT SITE (acres) 5	7B. APPROXIMATE AREA LEFT FOR EXPANSION (acres) 2 1/2
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8A. IN THE SPACE PROVIDED BELOW FURNISH A SIMPLIFIED FLOW DIAGRAM OR A WRITTEN DESCRIPTION OF THE PLANT UNITS IN FLOW SEQUENCE. INCLUDE THE METHOD OF ULTIMATE SLUDGE DISPOSAL. SHOW APPROXIMATE SURFACE AREA OF STABILIZATION PONDS AND NUMBER OF CELLS. INDICATE WHETHER FLOW TO AND FROM PLANT IS BY PUMPING OR GRAVITY.



8B. NOTE ANY SIGNIFICANT OR UNIQUE PROCESSING CONDITIONS.

Primary Plant

9. RECEIVING STREAM

9A. NAME OF STREAM Puyallup River	9B. STREAM FLOW IS	
<input checked="" type="checkbox"/> PERENNIAL <input type="checkbox"/> INTERMITTENT	<input checked="" type="checkbox"/> NATURAL <input type="checkbox"/> REGULATED	<input type="checkbox"/> INTERSTATE <input checked="" type="checkbox"/> INTRASTATE <input type="checkbox"/> COASTAL

B. CURRENT PERFORMANCE AND PLANT LOADING INFORMATION

1A. ANNUAL AVERAGE DAILY FLOW RATE (mgd) 20 mgd	1B. PEAK FLOW RATE (mgd)	1C. MINIMUM FLOW RATE (mgd)
	DRY WEATHER 20	WET WEATHER 60
2. AVERAGE BOD OF RAW SEWAGE (5 DAY 20°C) (ppm) 490	3. AVERAGE SETTLEABLE SOLIDS OF RAW SEWAGE (mgd) (ml/l) 15	
4. AVERAGE SUSPENDED SOLIDS OF RAW SEWAGE (mgd) (ml/l) 380	5. AVERAGE COLIFORM DENSITY OF RAW SEWAGE (mpn/100 ml) 43 X 10⁶	
5. ANNUAL AVERAGE PLANT REDUCTION		
6A. BOD (%) 40	6B. SETTLEABLE SOLIDS (%) 97	6C. SUSPENDED SOLIDS (%) 85
		6D. COLIFORM (%) 96%

7A. DOES PLANT HAVE STANDBY POWER GENERATOR FOR MAJOR PUMPING FACILITIES? YES NO

7B. ADEQUATE ALARM SYSTEM FOR POWER OR EQUIPMENT FAILURES? YES NO

8. ARE CHLORINATION FACILITIES PROVIDED? YES NO
 IF YES, ANSWER 8A THRU G

IF YES, IS CHLORINATION CONTINUOUS? YES NO
 IF NO, EXPLAIN REASON FOR INTERMITTENT CHLORINATION

8A. PURPOSE OF CHLORINATION
Disinfection

8B. TYPE OF CHLORINATOR
Wallace + Tiernan

8C. POINT OF APPLICATION OF CHLORINE
At End of Clarifiers

8D. CAN BYPASSED SEWAGE BE CHLORINATED?
 YES NO

8E. AVERAGE FEED RATE OF CHLORINE (lb/day)
2000

8F. CHLORINE RESIDUAL IN EFFLUENT
.5 PPM AT END OF _____ MINUTES

8G. MINIMUM SUPPLY OF CHLORINE STORED ON PREMISES (lb)
2 Tons

9. ARE FACILITIES PROVIDED FOR COMPLETE BYPASS OF RAW SEWAGE?
 YES NO IF YES, ANSWER A THRU G BELOW, ANSWER H IN EITHER CASE.

9A. FREQUENCY (times monthly)
1/year

9B. AVERAGE DURATION (hours)
24

9C. REASON FOR BYPASSING
Cleaning

9D. ESTIMATED FLOW RATE DURING BYPASS IS
 WITHIN HYDRAULIC CAPACITY OF PLANT
 BEYOND HYDRAULIC CAPACITY OF PLANT BY _____

9E. DOES SEWAGE OVERFLOW IN DRY WEATHER?
 YES NO

9F. TYPE OF DIVERSION STRUCTURE
overflow weir

9G. AGENCIES NOTIFIED OF BYPASS ACTION
Ecology

9H. DO OPERATORS HAVE OPTION TO BYPASS INDIVIDUAL PLANT UNITS? (If no, has this caused any operational problems?)
 YES NO

10A. ARE BACK FLOW DEVICES PROVIDED AT ALL CONNECTIONS TO CITY WATER SUPPLY? (If no, explain)
 YES NO

10B. CHECK TYPE OF BACK FLOW PREVENTION DEVICE
 DOUBLE CHECK VALVE PRESSURE OPERATED PHYSICAL DISCONNECT OTHER (specify)
air gap

11. USES OF TREATMENT PLANT EFFLUENT
None

12. USES OF RECEIVING STREAM WITHIN 10 MILES OF OUTFALL
Fishing

13. HAVE THERE BEEN ANY ODOR COMPLAINTS BEYOND THE PLANT PROPERTY? (If yes, explain)
 YES NO

14. OBSERVED APPEARANCE AND CONDITION OF EFFLUENT, RECEIVING STREAM, OR DRAINAGE WAY
Muddy - Murky

15. STABILIZATION PONDS

A. WEEDS CUT AND VEGETATIVE GROWTH IN PONDS ELIMINATED?

YES NO

B. BANKS AND DIKES MAINTAINED (erosion etc.)?

YES NO

C. FENCING AND "WARNING - POLLUTED WATER" SIGNS PRESENT AND IN GOOD REPAIR?

YES NO

D. FREQUENCY OF INSPECTION BY OPERATOR

Daily

E. WATER DEPTH (feet)

37 x 11

___ HIGH

___ LOW

___ MEDIUM

42 180 x 37

F. ADEQUATE CONTROL OF DEPTH?

YES NO

G. SEEPAGE REPORTED?

YES NO

H. ANY REPORTS OF GROUND WATER CONTAMINATION FROM POND (if yes, give details)?

YES NO

I. MOSQUITO BREEDING PROBLEM?

YES NO

IF YES, NAME OF SPECIES IF KNOWN

J. CAN SURFACE RUN-OFF ENTER POND?

YES NO

C. SUPERVISORY SERVICES

1. IS A CONSULTING ENGINEER RETAINED OR AVAILABLE FOR CONSULTATION ON OPERATING AND MAINTENANCE PROBLEMS?

YES NO IF YES IS IT ON: CONTINUING BASIS OR UPON REQUEST BASIS

IF CONTINUING BASIS, WHAT IS THE FREQUENCY OF VISITS:

2. DO OPERATORS AND OTHER PERSONNEL ROUTINELY ATTEND SHORT COURSES, SCHOOLS OR OTHER TRAINING ACTIVITIES?

YES NO

IF YES, CITE COURSE SPONSOR AND DATE OF LAST COURSE ATTENDED

IF NO, DO YOU KNOW OF ANY COURSES AVAILABLE TO SERVE THIS AREA?

3A. ARE ALL EQUIPMENT AND PARTS OF THE PRESENT PLANT STILL IN OPERATION?

YES NO (if no, explain)

B. ARE PROCESSING UNITS OPERATING AT DESIGN EFFICIENCY?

YES NO (if no, explain)

A. HAVE THERE BEEN ANY DIFFICULTIES WITH THE SEWAGE TREATMENT PLANT?

A. STRUCTURAL YES NO (if yes explain)

B. MECHANICAL YES NO (if yes, explain)

old equipment

C. OPERATIONAL YES NO (if yes, explain)

D. BASED ON OPERATING EXPERIENCE TO DATE WHAT IF ANY CHANGES WOULD YOU RECOMMEND TO IMPROVE OPERATION OF THE PLANT?

Modernization

5. ARE OPERATING RECORDS MAINTAINED? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <i>(If maintained, check general items included)</i>						REPORTED? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO TO WHOM? <i>Ecology</i>					
FREQUENCY	WEATHER	FLOW	SLUDGE HANDLED	CHEMICALS USED	DIGESTER	GRIT HANDLED	ELEC. USED	COST DATA	AIR USED	MAINTENANCE	OTHER
DAILY	X	X	X	X	X	X	X	X		X	
WEEKLY											
MONTHLY											
ANNUALLY											

6. ARE LABORATORY RECORDS MAINTAINED? (check appropriate box)
 NOT AT ALL DAILY WEEKLY MONTHLY ANNUALLY

IF MAINTAINED CHECK FORM OF RECORD BELOW:
 LOG BOOK TABULAR SHEET SEPARATE BY OPERATION CONTROL CHARTS GRAPHS

WHAT PLANT AND/OR LABORATORY EQUIPMENT, GAGES AND METERS ARE CALIBRATED PERIODICALLY?
pH meter, colorimeter

7. IS LABORATORY TESTING ADEQUATE FOR THE CONTROL REQUIRED FOR THIS SIZE AND TYPE OF PLANT?
 YES NO (If no, explain)

B. INDUSTRIAL WASTES DISCHARGED TO MUNICIPAL SYSTEM:	A. NUMBER AND TYPES OF INDUSTRIES DISCHARGING TO SYSTEMS <i>Meat + Food Packing</i>
B. POPULATION EQUIVALENT (BOD) OF INDUSTRIAL WASTES (pe) <i>100,000 p.e.</i>	C. POPULATION EQUIVALENT (SS) OF INDUSTRIAL WASTES (pe) <i>?</i>
D. VOLUME OF INDUSTRIAL WASTES (mgd) <i>5 mgd</i>	E. COMPOSITION AND CHARACTERISTICS OF INDUSTRIAL WASTES <i>high ss. + BOD + grease</i>
F. MAIN DIFFICULTY EXPERIENCED WITH INDUSTRIAL WASTE (explain) <i>large solid particles + grease</i>	

G. HAVE INDUSTRIAL EFFLUENT PROBLEMS BEEN SOLVED? YES NO (If yes, how?)

9A. METHOD OR METHODS USED TO ASSESS INDUSTRIAL WASTE TREATMENT COST (check appropriate box)

NO CHARGE BY CITY PROPERTY TAX WATER USE ASSESSMENT CHARGE BASED ON FLOW
 CHARGED BASED ON BOD CHARGE BASED ON SS OTHER METHODS (describe)

COMMENT ON HOW CHARGE IS COLLECTED (fixed charge, sliding scale, etc.)
\$35/Ton

9B. IS INDUSTRIAL WASTE ORDINANCE IN EFFECT AND ENFORCED? YES NO

10. WHO PROVIDED INITIAL INSTRUCTION IN THE OPERATION OF THE PLANT?
Consulting Engineers Kennedy

11. IS A MANUAL OF PRACTICE OR INSTRUCTIONS AVAILABLE? YES NO
 IF YES, WHO WROTE AND PROVIDED IT?
Kennedy

12. ESTIMATE OF MAN-HOURS PER WEEK DEVOTED TO LABORATORY WORK AND MAINTENANCE OF RECORDS AND REPORTS
80 man hours

D. PLANT PERSONNEL (Annual Average Staff for Most Recent Year Reported in Section "F")

JOB CATEGORY	NUMBER	TOTAL MAN-HOURS PER WEEK	TOTAL NUMBER CERTIFIED OR LICENSED	RANGE IN YEARS EMPLOYED AT PRESENT PLANT	RANGE IN YEARS OF EXPERIENCE IN TREATMENT
1. SUPERINTENDENT	1	40	1	20+	20+
2. OPERATORS	9	360	6	45+	45+
3. LABORATORY TECHNICIANS	1	40	1	1	1
4. LABORERS	2	80	0	2	2
5. PART-TIME LABORERS	2	<i>Summer Interns</i>	0	3	3
6. TOTAL	15	520	9	70++	70++

E. LABORATORY CONTROL

Enter test codes opposite appropriate items. If any of the below tests are used to monitor industrial wastes place an "X" in addition to the test code.

CODES

- 1 - 7 or more per week 3 - 1, 2, or 3 per week 5 - 2 or 3 per month 7 - Quarterly 9 - Annually
 2 - 4, 5 or 6 per week 4 - as required 6 - 1 per month 8 - Semi-Annually

ITEM	RAW	PRIMARY EFFLUENT	MIXED LIQUOR	FINAL	SLUDGE			RECEIVING STREAM
					RAW	SUPER-NATANT	DIGESTOR	
1. BOD	3	3				3		
2. SUSPENDED SOLIDS	3	3						
3. SETTLEABLE SOLIDS	2	2						
4. SUSPENDED VOLATILE								
5. DISSOLVED OXYGEN	2	2						
6. TOTAL SOLIDS					3		3	
7. VOLATILE SOLIDS					3		3	
8. pH	2	2					2	
9. TEMPERATURE	2	2					1	
10. COLIFORM DENSITY								
11. RESIDUAL CHLORINE		1						
12. VOLATILE ACIDS							3	
13. M. B. STABILITY								
14. ALKALINITY							2	
15. Gas % CH ₄							3	
16.								
17.								
18.								
19.								

F. OPERATION AND MAINTENANCE COST FOR PLANT

YEAR OF OPERATION	SALARIES/WAGES	ELECTRICITY	CHEMICALS	MAINTENANCE	OTHER ITEMS	TOTAL
MOST CURRENT YEAR 1973	150,000			130,000		280,000
PRIOR YEAR 19 72	160,000			110,000	—	270,000
PRIOR YEAR 19 71	125,000			70,000	5,000	200,000
PRIOR YEAR 19						

EVALUATION PERFORMED BY	TITLE	ORGANIZATION

INFORMATION FURNISHED BY	TITLE	ORGANIZATION	DATE
David Hufford	Aquatic Biologist	City of Tacoma	9-11-73
Lyman Hetcham	Superintendent	"	"

G. NOTATIONS BY EVALUATOR

1. ADDITIONAL REMARKS (If remarks refer to a particular item, identify by number)

2. GENERAL COMMENTS ON HOUSEKEEPING AND MAINTENANCE

Neat + clean

3. REQUIREMENTS OF HIGHER AUTHORITY

3A. DOES THE PLANT PROVIDE THE DEGREE OF TREATMENT PRESENTLY REQUIRED BY THE STATE? (If no, explain)

YES NO

3B. ARE THERE ANY PENDING ACTIONS (enforcement conferences, change in water quality standards, etc.) THAT WOULD REQUIRE UPGRADING OF TREATMENT BY THIS PLANT?

YES NO (If yes, explain)

3C. NUMBER OF STATE INSPECTIONS OF PRESENT PLANT TO DATE.

4. IS ANY FOLLOW-THRU ACTION REQUIRED TO (1) CORRECT DEFICIENCIES IN THE PLANT OR ITS OPERATION OR (2) RESOLVE INDUSTRIAL WASTE PROBLEMS? (If yes, describe required corrective action) YES NO