APPENDIX – A

(Request for Interim Capacity Increase Technical Memorandum)

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City of Warrenton

Wastewater Treatment Facilities

TECHNICAL MEMORANDUM

REQUEST FOR INTERIM CAPACITY INCREASE

NPDES Permit Oregon # 100874

August 20, 2002

Edited responding to:
August 6, 2002 comment letter
From: David s. Mann, P.E., NW Region,
Oregon Department of Environmental Quality

REGISTERED PROFESSIONAL ENGINEER
66975PE
OREGON
July 09, 2001
H. RICHARD ESVELT

8/20/02

EXPIRES: 12/31/03

1.0 INFLUENT LOADING INCREASE REQUEST/REQUIREMENTS

1.1 Influent Loading Increase and Associated Requirements

The City of Warrenton is requesting that the Oregon Department of Environmental Quality (DEQ) approve an increase in the flows and loadings to the existing wastewater treatment facility on an interim basis. The recommended improvements to the City's lagoon treatment facilities recommended in this report are intended to provide the additional interim treatment capacity needed for treatment of these added waste loads, while meeting the interim effluent requirements as agreed to in the Mutual Agreement and Order (MAO), dated December 24, 2001 [these interim wastewater treatment plant (WWTP) discharge limits are shown on Table 2, from paragraph 8 B of MAO].

The requested interim increase in sewage flows and loadings is for additional sewer connections, beyond the anticipated growth over the time period, until completion of the Facility Plan recommended secondary treatment facility (required in the MAO by September 2005, with full operation by December 2005). See Table 1 for current, anticipated growth and additional connection flows and loadings during the interim period until construction of the Facility Plan recommended wastewater treatment facility.

<u>Requested influent interim increase</u>:

EDU's = 400
Flows: ADF = 0.085 mgd;
MWMF = 0.121 mgd;
BOD_5 loading: annual daily average = 180 lb/day
max monthly avg. = 240 lb/day

The South Lagoon is full of sludge/biosolids to the point where little treatment is provided by this lagoon other than settling of solids. Any aeration added for increasing the loading to the plant will be taken up by lack of treatment that should be provided in the South Lagoon. Therefore, only a portion of the capacity added by aeration can be achieved until the biosolids are removed from the South Lagoon. Furthermore, it is difficult to estimate added treatment capacity as long as the biosolids remain in the South Lagoon. In order to achieve the total additional treatment capacity indicated above, the following steps are required:

1. Removal of biosolids from the South Lagoon <u>must be completed by October 1, 2003</u>.
2. During biosolids removal, in order to prevent additional loading from the "stirred up biosolids" during removal (as per discussions with DEQ), either:
   a) South Lagoon should be drawn down by pumping the lagoon down and plugging the overflow to the North Lagoon during daily sludge removal operation (the lagoon would be pumped down far enough to provide a volume to allow for anticipated inflow for the duration of the biosolids removal during that day plus four (4) hours after stopping operations for the day in order to allow for stirred up solids to settle). The plug to the North Lagoon should be removed 4 hours after stopping sludge removal operations for the day; or

b) an area of the South Lagoon should be diked-off for use as a "primary clarifier" or solids settling area during sludge/biosolids removal operations and the effluent from the primary clarifier area pumped to the North Lagoon.

Treatment capacity for an additional 240 pounds per day of BOD, average maximum month, (approximately 400 equivalent dwelling units, see Table 1) will be made available with the addition of the recommended aeration and removal of the accumulated biosolids from the South Lagoon. It is difficult to establish the additional capacity from the added aeration before removal of the biosolids, but an increase of not more than 60 lb/day of BOD or 100 EDU's (connection equivalents) will be allowed until the biosolids are removed from the South Lagoon.

1.2 Purpose

This Technical Memorandum, "Request for Interim Capacity Increase", is intended for submittal to DEQ for approval for the purpose of adding influent flow and loading to the existing lagoon treatment facilities on an interim basis. The City's request is to allow additional connections to be made. The recommended interim treatment upgrade is intended to provide the added treatment capacity in the existing lagoons, for the treatment of newly added waste loads in addition to the current loadings. The approval for increased influent waste loading is for the interim period of time only, until completion of the secondary treatment facility upgrade. The time schedule for facility upgrade will occur in accordance with the implementation schedule set forth in the MAO (completion by fall 2005).

2.0 FLOW AND LOADING PROJECTIONS

See Table 1 for anticipated growth and additional connection flows and loadings during the interim period until construction of the Facility Plan recommended wastewater treatment facility and current flows and loadings. Table 2 shows the current and projected flows and loadings for the City of Warrenton for both the existing and the proposed expanded sewer service areas. This information is taken from the City's DRAFT Wastewater Facilities Plan, March 2002, Table 5.11, page 5-15, modified with the added interim connections.

TABLE 1 - INTERIM CAPACITY INCREASE **revision: SEP 30, 2002**

	Design Data					
	Population Equivalents	EDU's	Flows, mgd[3] ann avg	Flows, mgd[3] max mon	BOD, lb/day[3] ann avg	BOD, lb/day[3] max mon
Anticipated sewer system mass load increase through 2005:						
City of Warrenton Service Area						
Hidden Estates Subdivision [2]	95	38	0.008	0.011	17	22
Clatsop Co. Corrections Facility[5]	35	14	0.003	0.005	6	9
Miles Crossing District						
Oct - Nov 2003	600	240	0.051	0.072	108	144
Possible by 2008	150	60	0.013	0.018	27	36
Allowance for growth[1]	120	48	0.010	0.015	22	29
Total Interim Increase	1,000	400	0.085	0.121	180	240
City of Warrenton Service Area						
Current service	5,600	2,240	0.70	1.1	1,000	1,500
(Ft. Stevens, of current[4]		*150*	*0.025*	*0.041*	*67*	*105)*
Total at plant startup	6,600	2,640	0.785	1.221	1,180	1,740

NOTES:

1. Allowance for growth is included for campgrounds and other expansion, including Fort Clatsop (See Facility Plan Section 3). See note 4 for Fort Stevens. The actual number of potential connections is unknown at this time since no actual applications have been received. Additional capacity for 1000 PE is readily available with the blowers sized for the SBR aeration basins, therefore, 120 PE = 1000 PE minus other known connections.
2. Development is the one currently approved development awaiting approval for sewer connection; any additional will be handled in "Allowance for City Growth".
3. 2.5 persons per equivalent dwelling unit (EDU) was used as the planning average in the City's Facilities Plan. Flows are derived from unit flows used in Miles Crossing Sanitary Sewer District Draft Wastewater Facilities Plan (since a majority of the connections are from this source), Tables 4-1 and 4-2, for new conventional sewer areas:

   AAF = 2.5 x 70 gpcd x 1.2 = 210 gpd/EDU

   MWWMF = 2.5 x 70 gpcd x 1.76 = 300 gpd/EDU

   Loading, BOD, are estimated based upon:

   annual average = 0.18 ppcd x 2.5 persons/EDU = 0.45 lb/day/EDU

   max month average = 1.33 x annual average = 0.60 lb/day/EDU
4. Fort Stevens existing flows and loading were derived from: "Fort Stevens State Park Wastewater Sampling Project", Spring Technologies, LLC., March 2002. This monitoring was conducted after their scheduled expansion of the number of campsites, restrooms and RV dumps (expanded from 1 dump station to 2). *(Included in current service) numbers.*
5. County Correctional Facility was planned with 30 beds, however, the project is currently held up without funding, but they hope some facility will go at the site. (Personal correspondence: Jeff Harrington, HLB & Assoc. with project personnel) The project is included as additional growth to reserve this capacity or for other currently unknown expansion.

TABLE 2 - DESIGN CRITERIA

Design Data	Current	Combined at WWTP startup[2,4]	2022 New Areas	w/ new areas Design year[3] 2022
POPULATION EQUIVALENTS	5,600	6,600[2]	1,000	9,500
FLOWS, million gallons/day, mgd				
Annual average	0.70	0.785	0.10	1.1
Maximum Month Avg, winter	1.1	1.22	0.13	1.6[1]
Maximum day	1.5	1.7	0.16	2.3[1]
Hydraulic, PIF	3.4	3.6	0.25	4.7
LOADING, pounds per day				
BOD, annual average	1,000	1,180	180	1,720[2]
Max. mon. avg, summer	1,500	1,740	240	2,500
TSS, annual average	1,300	1,480	180	2,000
Max. mon. avg	1,900	2,190	240	2,900
Ammonia, max. mon. avg	150	170	23	250

NOTES:

1. Increases in flows are not proportional to population growth since new sewers and mains will be much tighter with much lower infiltration and inflow than existing.
2. Includes future growth within the City, and new service areas (See Table 1). All of this future growth is proposed to be connected to the City's upgraded and expanded WWTP.
3. Includes future City service area growth and new service areas.
4. Interim plant influent increase data shown in Table 5, are based upon this column.

TABLE 3 – State of Oregon MUTUAL AGREEMENT & ORDER, City of Warrenton INTERIM LIMITS FOR WASTEWATER TREATMENT FACILITY

	composite samples			
	monthly average		weekly max	
BOD concentration	75 mg/L	469 lb/day	100 mg/L	704 lb/day
TSS concentration	75 mg/L	469 lb/day	120 mg/L	704 lb/day
BOD removal efficiency shall not be less than 70% monthly average				
TSS removal efficiency shall not be less than 65% monthly average				
PH shall be within the range	6 – 9			
Fecal Coliform	200 MPN/100mL		400 MPN/100mL	

[From: State of Oregon/City of Warrenton Mutual Agreement and Order, paragraph 8B]

2.1 State of Oregon Environmental Quality Commission MUTUAL AGREEMENT ORDER

The Oregon DEQ issued two Notices of Noncompliance to the City of Warrenton for NPDES Permit violations. The DEQ believes that the City is having difficulty meeting permit limits because the facility remains overloaded by influent BOD and TSS. Further, the DEQ believes that due to the overloaded facility, the City will likely continue to violate discharge limits in the future. As a result of these issues, the DEQ and the City of Warrenton, wishing to limit any past and future violations, entered into a Mutual Agreement and Order (MAO), dated December 24, 2001. [Source: Mutual Agreement and Order, State of Oregon Environmental Quality Commission, and City of Warrenton]

The MAO allows additional connections to be made to the treatment facility, subject to the effluent limits shown on Table 2, and provided that a plan to maintain interim discharge limits is approved by DEQ [paragraph 8 A (7) of MAO]. This Technical Memorandum and Request For Interim Capacity Increase Report presents such a plan. The MAO required compliance schedule is included later in this memorandum.

3.0 PACIFIC SURIMI

The Pacific Seafood Group (Pacific Seafood) processes surimi in their Warrenton seafood processing facility. In a letter to the City of Warrenton, dated July 26, 2001, (and in subsequent correspondence) Pacific Seafood requested that the City of Warrenton include the joint treatment of wastewater from Pacific Seafood's Warrenton processing facility in with the City's wastewater treatment facility.

It is the author's understanding (based upon verbal conversations with representative's of Pacific Seafood) that Pacific Seafood has been ordered by the DEQ to stop discharge of excessive waste loads directly into the Skipanon River (the exact nature of the State mandated items were not available). The City then requested that the evaluation of treatment options for Pacific Seafood's wastewater be included in this interim capacity increase evaluation, in order to assist Pacific Seafood in their evaluation of alternatives to comply with the DEQ's requirements.

The surimi processing plant is in production from mid-June to mid-September. Wastewater discharge data was submitted by Pacific Seafood to establish the wastewater flows and loadings for the facility. SECOR International Inc., Pacific Seafood's engineer, conducted approximately 19 days of sampling during 2000 and similar sampling during 2001. Pacific Seafood's engineer indicated that the data obtained from that sampling is representative of the wastewater discharged 24 hours per day seven days per week from the surimi processing operation for the time period as noted above.

The following is a summary of Pacific Seafood's wastewater from the data presented:

Operation Time Period		**mid-June through mid-September**
Flows		
	Season average day	**570,000 gallons per day (same for 2000 & 2001)**
	Maximum day	**750,000 gallons per day**
Loading, BOD_5		
	Season average day	**28,200 pounds per day – 2000 season**
	" " "	**16,000 pounds per day – 2001 season**
	Maximum day	**45,800 pounds per day – 2000 season**
	" "	**23,000 pounds per day – 2001 season**

The City of Warrenton is projected to have 2,500 pounds per day of waste loading measured in BOD5 in 20 years. After construction of the recommended alternative WWTP Sequencing Batch Reactor (SBR) secondary treatment process, it may be feasible for the North Lagoon (cell 2) to be available to pretreat the Pacific Seafood's wastewater loading. The purpose of pretreatment is to reduce the wastewater loading to a lower concentration that would be compatible for treatment in a municipal wastewater treatment facility. Pacific Seafood would be required to commit to the significant capital cost to construct the necessary pretreatment and treatment facility modifications to accommodate their wastewater treatment, if the Warrenton facility could be modified to treat the Pacific's Seafoods waste. However, the biota available in the lagoon in June would be very limited due to not being "fed" from September to June and would be predominantly biota decomposing the remaining sludge and, consequently, could take up to a couple of months to grow adequate mixed liquor to begin decomposing the incoming waste loading. There is not adequate volume in this lagoon (volume at 5 feet depth approximately 21.5 million gallons, or approximately 37 days detention time), for adequate reduction in BOD before the lagoon is filled and discharge to the SBR treatment plant is required. Therefore, adequate pretreatment is not possible in conversion of the North Lagoon to an aerated lagoon.

All components of the City's existing wastewater treatment facility will be required to treat the municipal wastewater to meet the MAO discharge limits until the recommended plant upgrades can be constructed. Therefore, at this time, there is no space available for pretreatment for Pacific Seafood's wastewater during this interim time period until plant construction. Likewise, no capacity is currently available for pre-treatment of Pacific Seafood's wastewater directly in the existing treatment plant footprint without extensive pretreatment of some other type than aerated lagoons.

It is not feasible to treat Pacific Seafood's wastewater in the interim or after construction of a new secondary treatment plant, due to the intermittent, high strength waste load.

4.0 INTERIM TREATMENT INCREASE

4.1 Guidelines for development of Interim Alternative Capacity Increase

Development Guidelines/Goals:

1. Provide interim improvements for treatment to remove the additional loading, to be connected in the interim time until completion of the City of Warrenton's secondary treatment facility upgrade. The alternatives, in combination with removal of biosolids from the South lagoon, are based upon removal of at least the additional loading of 170 to 240 lb/day of BOD_5 and TSS, and 20 lb/day of ammonia as Nitrogen, that the City is requesting.
2. The equipment and improvements for the interim increase need to also be utilized in the proposed facility upgrade to the greatest extent practical.
3. The interim improvements need to be cost effective and environmentally sound.
4. The operation of the interim improvements needs to be continued through construction of the proposed facility upgrade, without interruption of operation of the plant.

4.2 Development of Alternatives

4.2.1 Alternative No. 1a – Install floating surface aerators in the North Lagoon, located near the transfer pipe from the South Lagoon, to provide dissolved oxygen (DO) necessary to provide for increased biological activity to treat the increase in waste loading. This alternative includes the following detailed improvements:

1. install overhead three-phase power to a new future control building area (the West end of the South Lagoon, along NE Fifth Avenue),
2. add new power transformers (sized for future WWTP use), service and power distribution center, and control panels with timed controls, post mounted for each aerator,
3. construct a new control building for electrical (expandable for future WWTP use),
4. add temporary wiring from main panel to control panels,
5. construct mooring system for aerators,
6. construct gravel or concrete pads under aerator locations to prevent scouring of the lagoon bottom,
7. install aerators (4 aerators at 5 horsepower, each) with anti-erosion plates in the North Lagoon, adjacent to the influent pipe from South Lagoon, and
8. provide standby generator with manual transfer switch to run influent flow meter and recorder, sampler, and lights.

Operation and maintenance costs for this project will include 1) electrical power for the four aerators, 2) added maintenance for aeration equipment, and 3) costs for monitoring of DO levels in the lagoon. Automatic timers will be used to turn the aerators on/off during times of lower loading and higher DO concentrations (winter).

4.2.2 Alternative No. 1b – Add blowers and four diffusers in the North Lagoon, with the diffusers located near the transfer pipe from the South Lagoon, to provide dissolved oxygen (DO) necessary for increased biological activity to treat the increase in waste loading. This alternative includes the following detailed improvements:

1. install overhead three-phase power to a new future control building area (the West end of the South Lagoon),
2. add new power transformers, (sized for future WWTP use), service and power distribution center, and control panels with control for lead blower,
3. construct a new building for electrical and blowers (for future use, possibly expandable),
4. install an aeration air line from blowers to coarse bubble diffusers,
5. install coarse bubble diffusers (with weights to keep the pipe on the bottom of the North Lagoon, adjacent to the transfer pipe from the South Lagoon), and
6. install two blowers, one lead and one standby, located in the new building.
7. install dialer for alarms, including power outage and emergency single phase power generator with manual starting and power transfer, for operating flow measurement, lights, sampler, and chlorinator.

4.23 Alternative No. 2 – Chemical Addition for BOD Removal. Adding chemicals into mixing tanks and then into the flow between the South Lagoon and the North Lagoon or at the effluent of Cell 2 (North) to the chlorine contact chamber. After extensive research and discussion with chemical engineers knowledgeable in the use of chemicals in the wastewater treatment industry, it was determined that the use of chemicals to remove BOD is not feasible or cost effective. This alternative was not evaluated further.

4.3 Comparison of Alternatives 1A & 1B

The estimated project costs for Alternatives 1a and 1b are detailed in Attachment 1. The project costs and annual added operation and maintenance costs are shown in Table 3.

TABLE 4 - ALTERNATIVES 1a & 1b - COMPARISON OF CAPITAL & OPERATING COSTS

	1a – floating aerators	1b – blowers and diffused air
Estimated project capital cost	$ 391,000	$ 385,000
Estimated increase in O&M costs		
manpower at $30/hour	$ 6,300/year	$ 6,300/year
electrical power at $0.065/kW-hr	8,600/year	6,400/year
total annual increase in O&M	$ 14,900/year	$ 12,700/year
Present worth, at 4% interest/20 years, of annual increase in O&M	$ 202,700	$ 172,800
Comparison of alternatives: capital + PW	$ 593,700	$ 557,800

4.4 Recommended Interim Alternative

For both alternatives 1a and 1b, the following components of the interim improvements would be utilized in the recommended SBR secondary treatment plant:

1. 3-phase electrical power service and transformer,
2. main service breaker, 3-phase distribution panel, and transformer to 1-phase 120/240 volt (see electrical component breakdown in attachment), and
3. electrical building required for electrical components (sized to accommodate the electrical needs of the future plant upgrade and expandable for other plant components).

For Alternative 1a, the following components of this alternative can be used in the SBR secondary treatment plant:

- floating aerators, control panels and appurtenances (mooring cables, etc.)

For Alternative 1b, the following components of this alternative can be used in the SBR secondary treatment plant:

- blowers, sized for use in the recommended SBR secondary treatment plant,
- air piping to interim diffusers,
- air piping in sludge holding basins, and
- control panels

Based upon the foregoing analysis, it is the conclusion of this report that Alternative No. 1b, (the addition of positive displacement blowers, and coarse bubble aeration) is recommended for implementation for adding interim treatment capacity to the existing lagoons until construction of the SBR secondary treatment plant. The lagoon treatment data with the interim improvements, up to and during construction, is shown in Table 5.

A telephone dialer will call out with alarm conditions including power outage. An emergency standby generator to operate the full plant and blower should not be required, since the historical power outages have been short when compared to the detention times (see letter from power company on power outages at treatment plant site, under separate cover).

The flows and loadings for the data presented in Table 5, are shown on Table 2, page I-4, in the column titled "Combined at WWTP Startup".

A detailed cost estimate is included in the attachment. A rough sketch of the aeration coarse bubble diffuser installation area is at the end of this text.

TABLE 5 - Recommended Alternative 1b, ADD DIFUSSED AIR TO NORTH LAGOON– DESIGN DATA

Influent Structure, purpose	flow proportional sampling & flow measurement	
Parshall flume, throat width, inches	12	
flow measurement capacity	7.5 mgd	
Influent flow sampler, type	flow paced composite	
Lagoon Surface Areas	Full area	Area During Construction
Cell 1, primary lagoon	12.5 acres	10.25 acres
Cell 2, north lagoon	13.2 acres	13.2 acres
Cells (lagoons)	Cell 1 (South Lagoon)	Cell 2 (North Lagoon)
Liner type	clay	
Average height of dike	7 to 9 feet	
Internal side slopes	uneven but average 3 horiz to 1 vertical	
Outside side slopes	uneven but average 2 horiz to 1 vertical	
Volume at 5', min. depth	16.7 mg[1]	21.5 mg
Detention time at 5' depth		
Annual Average Flow, 0.76 mgd	22 days	28 days
Max Mon Avg Flow,1.06 mgd	16 days	20 days
Aeration in North Lagoon, type	coarse bubble	
Blowers, no.	2, 1 is standby	
Aeration air, at 6.5 psig	900 scfm required for increase	
Installed blower, sized for SBR plant	1,100 scfm at 6.5 psig	
Total lagoon area aerated	1 acre +/-	
No. of aeration air lines	22	
Total length with diffuser holes	4,840 feet	
Detention time in aerated area[2]:		
At ADF (w/MMA BOD), 0.785 mgd	2.5 days	
At MWMF (w/ minimum BOD), 1.22 mgd	1.6 days	
Chlorine contact tank	buried 60" ID pipe	
Volume	25,000+/- gallons	
Telemetry, alarm	telephone dialer	
Emergency power generator	single phase, manual start for flow measurement, lights, sampler, chlorinator	

Notes: mg = million gallons; mgd = million gallons per day

1. Volumes and detention times are after installation of dikes in the South Lagoon for the construction of aeration basins.
2. Flows and Loadings for Interim Design are shown on Table 2, page I-4, under column "Combined at WWTP Startup".

5.0 IMPLEMENTATION SCHEDULE

revision: Nov 13, 2002

5.1 Biosolids Removal from South Lagoon

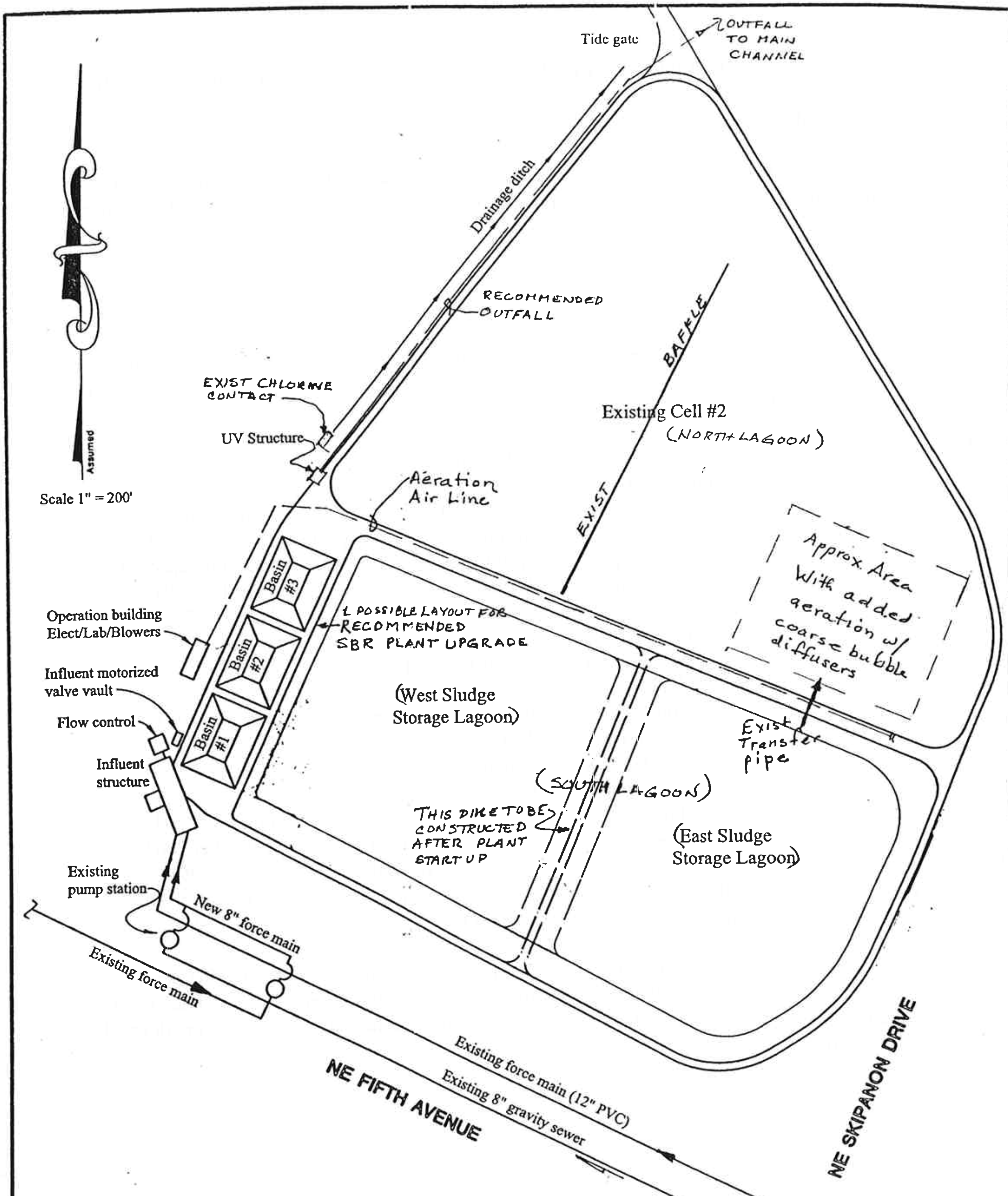
It is imperative that the removal of biosolids proceeds as scheduled, as presented in Section 1. Obtaining the requested increase in influent mass loading limits (with the addition of the recommended aeration) and meeting interim effluent requirements is dependent upon the removal of these biosolids.

5.2 Schedule

In order for the City of Warrenton to accommodate the schedule set forth in the MAO and for the City of Warrenton to be able to accept flows from the Miles Crossing Sanitary Sewer District, the following schedule will need to be met:

Submit Revised Memorandum to ODEQ for approval	August 21, 2002
Concept approval by ODEQ	*November 2002*
Equipment procurement bids for purchase by City	*January 2003*
Complete plans & specifications for interim improvements project	*February 2003*
After City review approval, submit to ODEQ	*Feb 2002/Mar 2003*
ODEQ review/revisions/publish final P/S for bids	*Mar/Apr 2003*
Bid electrical installation for 3-phase power system	*Mar/Apr 2003*
Contract(s) award by City	*April 2003*
After award, ODEQ approve Hidden Estates P.S.	*April 2003*
City approve Hidden Estates home construction	*April 2003*
Design team construction management/inspection	*May-Sep 2003*
Design team completion of Draft O&M Manual	*July 2003*
ODEQ review of final O&M Manual	*Aug/Sep 2003*
Startup biosolids removal from South Lagoon per approved Management Plan	June/July 2003
Completion of biosolids removal in South Lagoon	September 2003
ODEQ review of facilities start-up report & initial operations	*Sep/Oct 2003*
Facilities Plan, final, submitted to ODEQ for approval	*December 2003*
City resume submittal of sewer plans to ODEQ	August 2003

Due to occurrences outside of the control of the City of Warrenton (such as obtaining permits and receipt of funding) and the schedule constituting a "best estimation" of time line, the City maintains the right to revise the proposed schedule, either to accelerate or delay the implementation, based
upon real time events and requirements.



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Proposed SBR System
SHOWN FOR INFORMATION ONLY

INTERIM CAPACITY INCREASE

AERATION AREA SKETCH

City of Warrenton Wastewater Treatment Facilities

Construction cost estimate for addition of aeration Interim Capacity Increase

Process Component				8/19/2002
Item Description	***Estimated Quantity***	***Units***	***Unit Cost***	***Amount with OH&P***
1a - add floating aerators in North lagoon				
floating aerators with anti-erosion plates	4	ea	9,000	36,000
aerator installation	15	%	36,000	5,400
power service (3ph sized for SBR plant)(1)	1	ls	40,000	40,000
aerator control panels	4	ea	5,000	20,000
building for elect panels & blowers	432	sf	80	34,600
Electrical Alter 1a, see attached (2)				69,989
gravel pads below aerators	120	cy	30	3,600
mobilization for crane to place gravel	1	ls	6,000	6,000
Contractor Overhead	12	%	215,589	25,000
Total Construction from above			**Subtotal**	240,589
Contingency, 30% of construction	30	%	240,589	72,200
Engineering, survey, permits, 25% of above	25	%	312,789	78,200
TOTAL ESTIMATED ALTER 1a COST				**391,000**
1b - add blowers and diffused aeration in North lagoon				
blowers, sized for SBR plant	2	ea	15,000	30,000
blower installation	15	%	30,000	4,500
power service 3ph (sized for SBR plant) (1)	1	ls	40,000	40,000
building for elect panels & blowers	432	sf	80	34,600
Air pipe & header to diffuser pipes	1,300	lf	20	26,000
Electrical Alter 1b, see attached (2)				35,417
diffuser air lines in lagoon	5,400	lf	4	21,600
weights for pipe & corp stops/taps to header	1	ls	13,000	13,000
air piping at blowers & fittings	1	ls	6,000	6,000
Contractor Overhead	12	%	211,117	25,300
Total Construction from above			**Subtotal**	236,417
Contingency, 30% of construction	30	%	236,417	71,000
Engineering, survey, permits, 25% of above	25	%	307,417	76,900
TOTAL ESTIMATED ALTER 1b COST				**385,000**

Note: 1. Rough estimate; had not received quote from PP&L as of this date.
2. Electrical estimate by R. L. Sample Engineering, attached.

RICHARD SAMPLE ENGINEERING

DATE: JUNE 17, 2001
TO: H.R. ESVELT, P.E.
FROM: RICHARD A. SAMPLE, P.E.
PROJECT: CITY OF WARRENTON WWTP RENOVATION
SUBJECT: PRELIMINARY ENGINEERING REPORT - ELECTRICAL

At your request, I have performed a review of the proposed treatment plant mechanical equipment loading and have contacted the power utility company representative, George Balmer, to discuss service requirements. Based on the proposed maximum future plant load of 230KW and my conversation with George, it is my recommendation that an electrical power service, sized for the future loading at 400A, 277/480V, 3-phase be provided at this time.

The following is a description of the proposed electrical scope of work, divided into two categories: work to be provided by the power utility company, Pacific Power and Light, and work to be provided by the Contractor. The work scope to be provided by the Contractor is further divided into two options as follows:

> Alternative 1a - consisting of electrical based on the provision of (4) floating aerators.
> Alternative 1b - consisting of electrical based on the provision of (2) blowers

POWER UTILITY COMPANY WORK SCOPE

1. Provide (1) wood pole located 15 feet west of the existing pump station service dead end pole, for mounting new plant service transformers and secondary service riser conduit. The existing pump station service pole and associated 120/240V, 1-phase transformers are to remain.
2. Provide approximately 750 feet of primary overhead conductor on existing poles to extend three phase primary service to the new plant service pole
3. Provide 277/480V, 3-phase transformers and secondary service riser conduit on the new plant service utility pole.
4. Provide quad 350 KCM secondary service conductors routed in underground conduit to new operations building location
5. Provide current transformers and meter.

CONTRACTOR WORK SCOPE

1. Provide trenching, backfill, paving and associated site work required for routing secondary underground power service feeder approximately 200 feet from the new plant service pole to the operations building.
2. Provide 4 inch Schedule 40 PVC conduit between new service pole and operations building.
3. Provide CT enclosure, metering enclosure, 400A service disconnect switch and associated conduit and wire, mounted on the new operations building exterior.

4. Provide a 100A, 277/480V power distribution panel board, mounted inside the operations building, to be used during the first stage of construction for plant power distribution, with breakers serving feeders to:

   - 480-120/240V, 1-phase transformer
   - Aeration equipment control panel (Alternative 1a)
   - Blower control panel feeder (Alternative 1b)

5. Provide a 100A, 120/240V, 1-phase distribution panel board, mounted inside the operations building, to be used during the first and second stages of construction to provide plant power distribution, with breakers serving feeders to:

   Building interior and exterior lighting
   Building HVAC equipment
   Building receptacle loads

6. Provide building interior lighting and associated circuitry consisting of (6) industrial fluorescent light fixtures with manual switching.

7. Provide building exterior lighting and associated circuitry consisting of (2) wall mounted HID light fixtures with automatic photoelectric control.

8. Provide building ventilation consisting of a wall mounted blower, thermostat and associated circuitry (Alternative 1b only).

9. Provide (4) 120V receptacles and associated circuitry.

10. Provide conduit and wire to blowers (Alter 1b) or floating aerators (Alter 1a).

CONSTRUCTION COST ESTIMATES

Charges for work performed by Pacific Power and Light will be significantly covered by future plant revenue. Charges not covered by revenue will be billed directly to the owner. George Balmer will furnish an estimate of PP & L charges to the Owner.

See attached estimates for Alternative 1a and Alternative 1b Contractor work.

1197 Magnolia Avenue, Redding, CA 96001 rse@integrity.com Voice: 530-242-1134 Fax: 530-242-1136

ELECTRICAL CONSTRUCTION COST ESTIMATE

Richard Sample Engineering

PROJECT: WARRENTON WWTP - Alternative 1a DATE: 6/17/02 JOB NO: 0206
OWNER: CITY OF WARRENTON
ESTIMATE BY: RICHARD A. SAMPLE, P.E. ESTIMATE PHASE: ENGR. REPORT
BASE RATES: CONTRACTOR: $44/HR, INTEGRATOR: $65/HR
2002 RSMeans city cost index multiplier city: Seattle WA

NO	DESCRIPTION	QUANTITY		MATERIAL		LABOR		TOTAL
		MEASURE	UNIT	PER UNIT	TOTAL	PER UNIT	TOTAL	
1	**GENERAL - MISCELLANEOUS**							
a	Trenching & backfill - utility service	200	LF	5.00	1,000	5.00	1,000	2,000
b	Trenching & backfill - aerator feeders	2,300	LF	3.00	6,900	4.00	9,200	16,100
c	Asphalt roadway paving	1	JOB	500.00	500	1,400.00	1,400	1,900
d	aerator connection post, box, concrete	4	EA	80.00	320	350.00	1,400	1,720
2	**RACEWAY**							
a	Conduit: Schedule 40 PVC- 4"	210	LF	6.25	1,313	6.30	1,323	2,636
b	Conduit: Schedule 40 PVC - 1"	1,500	LF	1.11	1,665	2.27	3,405	5,070
c	Conduit: Schedule 40 PVC - 3/4"	1,000	LF	0.77	770	1.96	1,960	2,730
d	Conduit: GRC - 1"	100	LF	2.73	273	4.36	436	709
e	Conduit: GRC - 3/4"	300	LF	1.94	582	3.55	1,065	1,647
3	**CONDUCTORS**							
a	Wire: THHN, copper - No. 2	50	LF	0.60	30	0.63	32	62
b	Wire: THHN, copper - No. 10	13,500	LF	0.08	1,121	0.29	3,848	4,968
c	Wire: THHN, copper - No. 12	600	LF	0.04	24	0.22	132	156
4	**UTILITY SERVICE EQUIPMENT**							
a	CT Enclosure	1	EA	206.00	206	355.00	355	561
b	Metering enclosure	1	EA	150.00	150	88.00	88	238
c	277/480V, 400A fused disconnect switch	1	EA	1,900.00	1,900	355.00	355	2,255
5	**DISTRIBUTION EQUIPMENT**							
a	277/480V panelboard, 100A MB, 24 pole	1	EA	1,700.00	1,700	400.00	400	2,100
b	120/240V panelboard, 100A MB, 24 pole	1	EA	710.00	710	450.00	450	1,160
c	480-120/240V, 7.5 kva transformer	1	EA	570.00	570	260.00	260	830
d	20A receptacle, box, SS plate	4	EA	15.00	60	44.00	176	236
6	**LIGHTING**							
a	2-lamp, 40W industrial fluorescent	6	EA	100.00	600	66.00	396	996
b	70W HPS wallpack	2	EA	150.00	300	88.00	176	476
c	20, 1-pole switch	1	EA	15.00	15	44.00	44	59
d	photo electric control	1	EA	50.00	50	88.00	88	138

NO	DESCRIPTION	QUANTITY		MATERIAL		LABOR		TOTAL
		MEASURE	UNIT	PER UNIT	TOTAL	PER UNIT	TOTAL	
7	**CONTROLS**							
a	Packaged aerator control panel install	1	EA	50.00	50	350.00	350	400
8	**GENERAL SERVICES**							
a	Electrical permit	1	JOB				150	150
b	Startup and testing	1	JOB				704	704
c	Product submittals	1	JOB				352	352
	SUBTOTAL				20808		29544	50,352
	RS Means city multiplier: Seattle				1.06		1.11	
	SUBTOTAL				22056		32794	54850
	OVERHEAD @ 16%						8776	8776
	PROFIT @ 10%				2206		4157	6363
	Alter 1a - ELECTRICAL SUBCONTRACTOR TOTAL							**$69,989**

ELECTRICAL CONSTRUCTION COST ESTIMATE

Richard Sample Engineering

PROJECT: WARRENTON WWTP - Alternative 1b DATE: 6/17/02 JOB NO: 0206
OWNER: CITY OF WARRENTON
ESTIMATE BY: RICHARD A. SAMPLE, P.E. ESTIMATE PHASE: ENGR. REPORT
BASE RATES: CONTRACTOR: $44/HR, INTEGRATOR: $65/HR
2002 RSMeans city cost index multiplier city: Seattle WA

NO	DESCRIPTION	QUANTITY		MATERIAL		LABOR		TOTAL
		MEASURE	UNIT	PER UNIT	TOTAL	PER UNIT	TOTAL	
1	**GENERAL - MISCELLANEOUS**							
a	Trenching & backfill	200	LF	5.00	1,000	5.00	1,000	2,000
b	Asphalt roadway paving	1	JOB	500.00	500	1,400.00	1,400	1,900
2	**RACEWAY**							
a	Conduit: Schedule 40 PVC- 4"	210	LF	6.25	1,313	6.30	1,323	2,636
b	Conduit: GRC - 1"	100	LF	2.73	273	4.36	436	709
c	Conduit: GRC - 3/4"	300	LF	1.94	582	3.55	1,065	1,647
3	**CONDUCTORS**							
a	Wire: THHN, copper - No. 2	50	LF	0.60	30	0.63	32	62
b	Wire: THHN, copper - No. 10	300	LF	0.08	25	0.29	86	110
c	Wire: THHN, copper - No. 12	600	LF	0.04	24	0.22	132	156
4	**UTILITY SERVICE EQUIPMENT**							
a	CT Enclosure	1	EA	206.00	206	355.00	355	561
b	Metering enclosure	1	EA	150.00	150	88.00	88	238
c	277/480V, 400A fused disconnect switch	1	EA	1,900.00	1,900	355.00	355	2,255
5	**DISTRIBUTION EQUIPMENT**							
a	277/480V panelboard, 100A MB, 24 pole	1	EA	1,700.00	1,700	400.00	400	2,100
b	120/240V panelboard, 100A MB, 24 pole	1	EA	710.00	710	450.00	450	1,160
c	480-120/240V, 7.5 kva transformer	1	EA	570.00	570	260.00	260	830
d	20A receptacle, box, SS plate	4	EA	15.00	60	44.00	176	236
6	**LIGHTING**							
a	2-lamp, 40W industrial fluorescent	6	EA	100.00	600	66.00	396	996
b	70W HPS wallpack	2	EA	150.00	300	88.00	176	476
c	20, 1-pole switch	1	EA	15.00	15	44.00	44	59
d	photo electric control	1	EA	50.00	50	88.00	88	138
7	**HVAC**							
a	300 CFM wall mounted blower	1	EA	250.00	250	176.00	176	426
b	Thermostat	1	EA	75.00	75	44.00	44	119

NO	DESCRIPTION	QUANTITY		MATERIAL		LABOR		TOTAL
		MEASURE	UNIT	PER UNIT	TOTAL	PER UNIT	TOTAL	
8	**CONTROL & INSTRUMENT**							
a	Custom blower control panel - integrator	1	EA	2,040.00	2,040	3,175.00	3,175	5,215
b	Custom blower control panel - contractor	1	EA	30.00	30	300.00	300	330
9	**GENERAL SERVICES**							
a	Electrical permit	1	JOB				150	150
b	Startup and testing	1	JOB				704	704
c	Product submittals	1	JOB				352	352
	SUBTOTAL				12402.4		13162	25,564
	RS Means city multiplier: Seattle				1.06		1.11	
	SUBTOTAL				13147		14610	27756
	OVERHEAD @ 16%						4441	4441
	PROFIT @ 10%				1315		1905	3220
	Alter 1b - ELECTRICAL SUBCONTRACTOR TOTAL							**$35,417**

H. R. ESVELT ENGINEERING
Environmental Engineering

September 13, 2002

City of Warrenton
Department of Public Works
147 S. Main
Warrenton, Oregon 97146

ATTN: L. Alan Johansson, P.E., Director

CC: Jeff Harrington, P.E.

REF: City of Warrenton
Interim Capacity Increase Technical Memorandum - Addendum

SUB: Estimate of Costs for recommended interim improvements with addition of electrical/blower building, automatic transfer switch, standby generator from recommended SBR plant

The August 20, 2002 transmittal letter for the "Request for Interim Capacity Increase" technical memorandum stated:

> "A single phase generator is recommended with manual start and power transfer switch for operation of flow meter, sampler, lights and chlorinator, based upon report of short power outages (in comparison with length of detention time in the aerated area). If historical power outage lengths are longer, then a second portable standby generator or other standby generation option will need to be added to the project. A copy of the letter from the electrical power company on lengths of outages needs to be sent with the report to ODEQ."

The historical power outage lengths could not be broken down by the electrical company into service grid segments small enough to get actual outages at the treatment plant (outage lengths included small segments that could be one party out of power). Therefore, the outages appeared on the records to be much longer than anticipated. I anticipate that the ODEQ will require standby generation to operate the blowers. Since the cost would be a majority of the cost of the generator for the engineering report SBR treatment plant, it is recommended that the full generator, transfer switch and building be constructed for the interim capacity increase improvements. The revised cost estimate is attached.

Sincerely,
H. R. ESVELT ENGINEERING

H. Richard Esvelt

H. Richard Esvelt, P.E.

City of Warrenton Wastewater Treatment Facilities

Interim Capacity Increase - with installation of generator for recommended SBR WWTP
Blowers & diffused aeration in North Lagoon

Interim Capacity Increase
9/13/2002

Process Component / *Item Description*	*Estimated Quantity*	*Units*	*Unit Cost*	*Amount with OH&P*
1. Blower & Electrical Building				
Elect/Blower Bldg slab on grade wood frame	700	sf	85	59,500
blower header, valves & piping	1	ls	18,000	18,000
communications equip, phone dialer, part	1	ls	2,000	2,000
blowers, sized for SBR plant	2	ea	15,000	30,000
blower installation	15	%	30,000	4,500
Contractor Overhead	12	%	114,000	13,600
			Subtotal	**128,000**
2. Electrical				
Electrical Alter 1b (2)				35,417
standby generator, transfer switch	1	ls	84,000	84,000
power distribution, conduit, trenching, etc	1	ls	18,000	18,000
Lighting	1	ls	3,000	3,000
building heating, electrical	1	ls	4,000	4,000
Contractor Overhead	12	%	144,417	17,300
			Subtotal	**162,000**
Note: line items above are included in recommended SBR plant costs				
3. Temporary piping and diffusers in lagoon				
power service 3ph (sized for SBR plant) (1)	1	ls	40,000	40,000
air pipe to diffuser pipes	700	lf	16	11,200
diffuser air lines with weights in lagoon	2,400	lf	7	16,800
entrance road	120	cy	24	3,000
Contractor Overhead	12	%	71,000	8,500
			Subtotal	**80,000**
Total Construction from above			**Subtotal**	370,000
Contingency, 20% of construction	20	%	370,000	74,000
Engineering, survey, permits, 25% of above	25	%	444,000	111,000
TOTAL ESTIMATED ALTER 1b COST				**555,000**

Note: 1. Rough estimate; had not received quote from PP&L as of this date. If not done in interim capacity improvements would need to be added to recommended SBR plant costs.
2. Electrical estimate by R. L. Sample Engineering

H. R. ESVELT ENGINEERING
Environmental Engineering

September 23, 2002

David S. Mann, P.E.
Oregon Department of Environmental Quality
NW Regional Water Quality
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

RE: City of Warrenton File No. 93769
Wastewater Treatment Facilities "Request for Interim Capacity Increase"
Response to ODEQ comment letter, September 10, 2002/received 9/19/02

Dear David

Thank you for your prompt review.

1. Table 1 – Interim Capacity Increase, Note 1 has been revised and the revised/dated sheet is attached. Two copies of "Fort Stevens State Park Wastewater Sampling Project," Spring Technologies, LLC., March 2002, is being sent to you under separate cover from HLB, Inc.

2. Table 5 - according to a topo-map of the lagoon dikes & bottom, the top of the dike varies from elevation 9'to 11', evidently from dike settlement over the years. From the average lagoon bottom to top of dike, the depth varies from 7 to 9 feet, with an effective depth of 7 feet.

3. The schedule dates have been adjusted, but are included on the revised/dated sheet and is attached.

Please call me at 206-842-7988, if you have further comments.

Respectfully Submitted
H. R. Esvelt Engineering

H. Richard Esvelt, P.E.

CC: Scott Derickson, Manager, City of Warrenton
L. Alan Johansson, P.E., Public Works Director, City of Warrenton
Jeff Harrington, P.E.

Encl: Revised Table 1, page App -3 and Section 5.2 Schedule, page App -11, to replace the these respective pages in Technical Memorandum.

6450 N.E. Brigham Rd., Bainbridge Island, WA 98110 206-842-7988 FAX 206-780-0811

APPENDIX – B
(Mixing Zone Study)

City of Warrenton

Mixing Zone Study

Prepared for:

HLB & Associates
4253 A Hwy. 101 North
Seaside, Oregon 97138

Prepared by:

Cosmopolitan Engineering Group
117 South 8th Street
Tacoma, Washington 98402

November 2002
HLB001

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INTRODUCTION

BACKGROUND

The City of Warrenton is under Mutual and Agreed Order (MAO) No. WQ/M-NWR-01-281 with the Oregon Department of Environmental Quality (DEQ) to complete a Wastewater Facilities Plan by the end of September 2002. HLB & Associates and H.R. Esvelt Engineering are preparing the plan.

The MAO and Oregon guidelines require analysis of how the proposed facilities will comply with water quality standards, which may include the need for a mixing zone. DEQ confirmed the need for Warrenton to conduct a mixing zone study and water quality analysis in a letter from Beth Moore (DEQ) to the City dated December 13, 2001. The letter discussed the following requirements for the study:

- Mixing zone requirements per OAR 340-41-0205 were described for the existing outfall or an outfall extended to the Columbia River channel.
- Bacteria and temperature requirements based on Section 303(d) listings, including a Temperature Management Plan (TMP).
- Ammonia and chlorine water quality requirements.
- BOD and TSS mass limits
- pH limits
- Analysis of metals limits, including recommendations for effluent and ambient sampling.

PURPOSE AND SCOPE

The purpose of this report is to document the field studies, mixing zone modeling and water quality analysis required in the MAO and DEQ letter, and also to establish water quality-based

NPDES permit limits. This is conducted for both the existing outfall configuration and a new outfall extended to the Columbia River channel.

SAMPLING AND ANALYSIS PLAN

A Sampling and Analysis Plan (SAP) (Cosmopolitan, 2002) was prepared and submitted to DEQ describing the approach and methods used to complete the mixing zone and water quality studies required in the December 13, 2001 letter. The SAP documented (1) wastewater treatment facility design criteria, (2) field and laboratory methods, stations, schedule and personnel, (3) modeling methods for the mixing zone analysis for each outfall alternative, (4) development of the TMP and (5) assessment of the "reasonable potential" to exceed water quality standards and resulting NPDES permit limits. The SAP is not included in this report.

Beth Moore of DEQ approved the SAP via email on June 20, 2002.

SITE DESCRIPTION

The City of Warrenton is located on the Columbia River Estuary approximately five miles inland from Clatsop Spit, the southern entrance jetty to the Pacific Ocean. The Columbia Estuary and location of the City of Warrenton are shown in Figure 1.

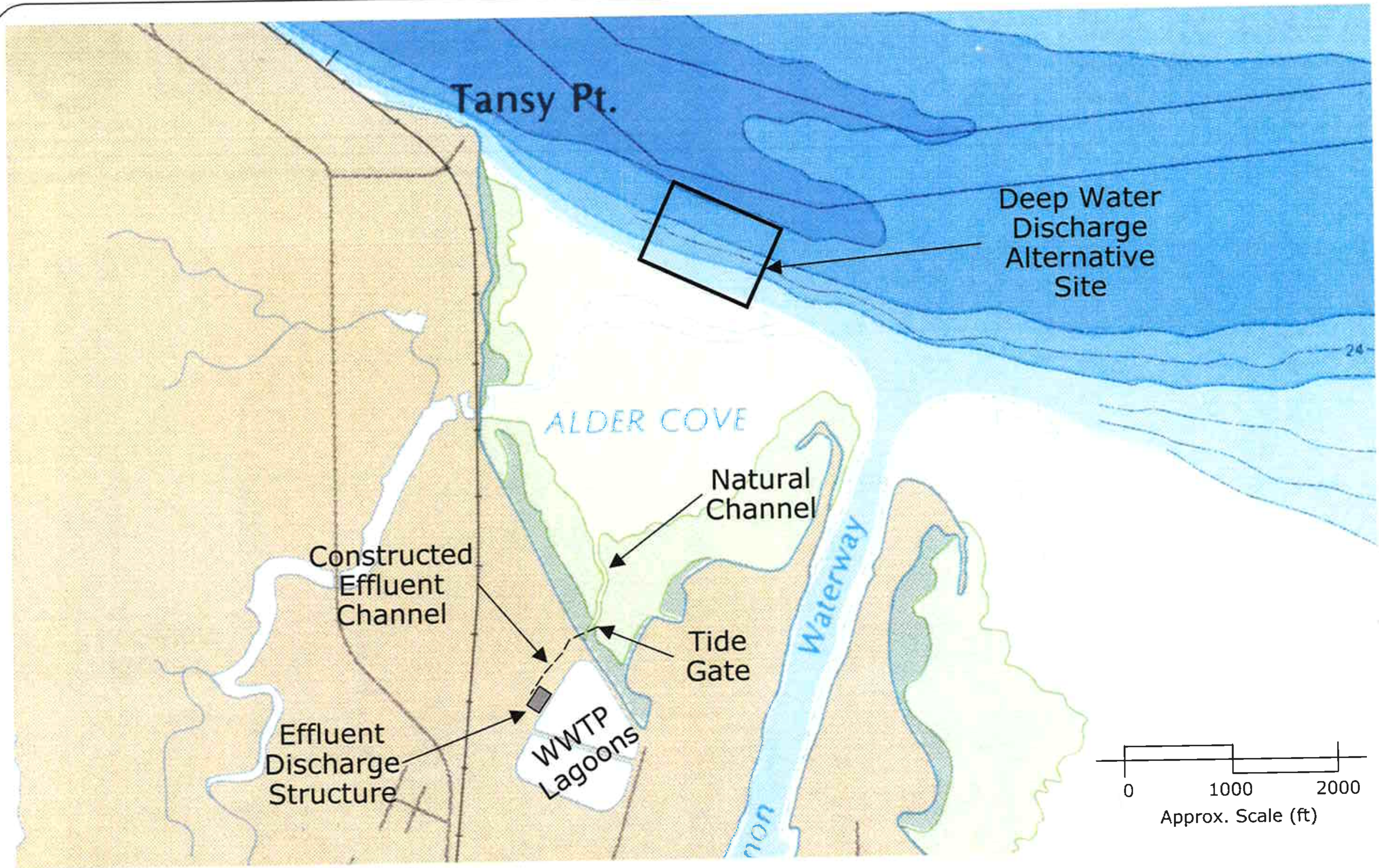
The project site map is shown in Figure 2. The WWTP lagoons are sited at the head of Alder Cove, an intertidal inlet on the south shore of the Columbia Estuary. Following chlorination, the effluent flow rate is recorded at an outlet weir (Figure 3). Effluent flows from the outlet structure approximately 15 feet to a constructed channel (Figure 4). Flow in the channel consists mainly of effluent, with minor contributions from groundwater and local site drainage. The channel flows beneath a Corps of Engineers levee through a culvert with a tide gate on the seaward side (Figure 5). After the tide gate, effluent either begins mixing with ambient estuarine water during high tide, or continues seaward through a natural channel during low tide (Figure 6). During low tide, effluent flows across the Alder Cove tide flat for approximately one-half mile while mixing with other natural drainage channels. At the outer shelf of Alder Cove, the bottom drops steeply to a maximum depth of approximately 50 feet below MLLW datum in the main navigation channel through the estuary.

Map Courtesy of Columbia River Estuary Data Development Program

FILE: HLB001 / REPORTS / FIGURES.ppt

COSMOPOLITAN ENGINEERING GROUP
Civil, Environmental, and Recreational Consulting

Figure 1: Lower Columbia River Vicinity Map



Map Courtesy of Columbia River Estuary Data Development Program

FILE: HLB001 / REPORTS / FIGURES.ppt

Figure 2: Project Site Map

COSMOPOLITAN ENGINEERING GROUP
Civil, Environmental, and Recreational Consulting

Figure 3: Effluent Discharge Control Weir

Figure 4: Constructed Effluent Channel

Figure 5: Tide Gate Beneath Levee

Figure 6: Natural Channel Seaward of Tide Gate at Low Tide

DESIGN CRITERIA

WATER QUALITY STANDARDS

Oregon's water quality standards for the North Coast – Lower Columbia Basin are promulgated in OAR 340-41-0205. Applicable water quality standards for conventional parameters are in Section 0205(2), and for toxicants (*i.e.* chlorine, ammonia and metals) in Table 20 of OAR 340-41. The Columbia Estuary water quality standards are summarized in Table 1.

Table 1 Water Quality Standards for the Lower Columbia Estuary

CONVENTIONAL PARAMETERS			
Parameter		**Standard**	
Dissolved Oxygen		6.5 mg/L	
Temperature		20°C (68°F)	
Temperature Increase		No significant increase	
pH		6.5-8.5	
Fecal Coliform		Median: 14/100 mL 90^{th} Percentile: 43/100 mL	
TOXICANTS			
Parameter	**Unit**	**Acute Criterion**	**Chronic Criterion**
Ammonia-N(1)	mg/L	3.6	0.49
Chlorine	µg/L	13	7.5
Arsenic	µg/L	69	36
Cadmium	µg/L	43	9.3
Copper	µg/L	2.9	2.9
Lead	µg/L	140	5.6
Mercury	µg/L	2.1	0.025
Nickel	µg/L	75	8.3
Silver	µg/L	2.3	–
Zinc	µg/L	95	86

(1) Based on maximum ambient pH=8.2, 90^{th} percentile temp=20.1°C, and zero salinity.

MIXING ZONE CRITERIA

Mixing zone requirements are specified in Section 0205(4) of OAR 340-41. Mixing zones are areas surrounding outfalls where water quality standards are suspended due to rapid mixing of effluent with ambient waters. Most NPDES permits authorize mixing zones around the wastewater outfalls. Water quality standards must be met outside of the mixing zones.

Existing Discharge. The existing outfall open channel falls into the discretionary category of an alternate (or extended) mixing zone. The requirements for an extended mixing zone authorization in a constructed watercourse are provided in Section 0205(4)(g)(B) of OAR 340-41. The December 13, 2001, letter from DEQ described the information that will be required to qualify for an extended mixing zone:

- History and authorization of the constructed channel between the WWTP and tide gate.
- Ownership or easement information for the constructed channel.
- Characterization of other flows entering the constructed channel.
- Channel plan view and cross-sections.
- Biological information on the constructed channel and nearby natural streams (Alder and Tansy Creeks), and a comparison of the differences.

This information has been collected and is presented in separate appendices to the Facilities Plan.

The mixing zone dimensions will be established by DEQ. However, page 72 of the *Technical Support Document for Water Quality-based Toxics Control* (EPA, 1991) recommends three criteria for establishing the acute mixing zone dimension:

- Ten percent of the distance to the chronic mixing zone boundary
- Fifty times the characteristic length scale (irrelevant here due to the tide gate)
- Five times the local water depth

For the proposed extended mixing zone, the controlling criterion would be the last. The water depth near the tide gate at low tide is approximately 2 feet deep. Therefore the acute mixing zone boundary would be a distance of 10 feet from the tide gate. Based on the first criterion, the chronic mixing zone distance would be 100 feet.

Deep Water Outfall. If the outfall is extended to the deep section of the Columbia River Estuary, the standard mixing zone dimensional criteria would apply. The determination of the mixing zone distances is at DEQ's discretion. Based on the water depth in the estuary and effluent flow rates, the projected mixing zone dimensions for a deep discharge are conservatively anticipated to be 100 feet for conventional parameters and chronic toxicants, and 10 feet for acute toxicants. These are horizontal dimensions measured from any diffuser port.

TECHNOLOGY-BASED EFFLUENT LIMITS AND ANTI-DEGRADATION REQUIREMENTS

Existing Discharge. The basin rules (OAR 340-041-0215) establish the design criteria for BOD_5 and TSS that will be applied to the facility. With no modification of the outfall, the discharge would not meet the minimum design requirement of 20:1 minimum dilution described in OAR 340-41-0215(1)(c). **Therefore, the permit limits for BOD_5 and TSS will allow no increase in mass loading unless the outfall is extended.** Increased flows would need to be compensated for with increased treatment efficiency. DEQ noted this requirement in the December 13, 2002 letter and reiterated it to the City in a meeting May 20, 2002.

Deep Water Outfall. DEQ declared that a mass load increase for BOD_5 and TSS would only be allowed if the outfall is extended to deep water in the Columbia Estuary with a minimum dilution factor of 20:1, according to OAR 340-41-0215(1)(c). If an increase in mass loading is proposed, the following information will be required according to the Anti-degradation Policy per OAR 340-41-0026(1)(a)(A) and (3)(a)(C):

- No reasonable alternative exists.
- The increase is necessary and justified by economic benefits considering environmental impacts.

- All water quality standards will be met and beneficial uses protected.
- The discharge does not significantly impact water quality parameters on the 303(d) list (bacteria and temperature).
- DO shall not be degraded below the water quality criterion of 6.5 mg/L as a result of the discharge.
- If natural background DO is below 6.5 mg/L, DO shall not be "measurably degraded," which is defined as a reduction of 0.1 mg/L.

The technology and economic evaluations required for the first two bullets are part of the Facilities Plan, and are not addressed in this appendix. The last four bullets are assessed in this appendix.

EFFLUENT FLOW

Warrenton WWTP. Design flows for the WWTP have been developed by H.R. Esvelt Engineering and are provided in the Facility Plan. The mixing zone modeling and water quality assessment in this report are based on year 2022 design flows, which are presented in Table 2. Acute dilution and water quality modeling are based on the maximum day (24-hr average) flow. Chronic dilution and water quality modeling are based on the maximum month (30-day average) flow. The peak instantaneous flow is not used in the water quality modeling, but would be used to size the outfall if it is extended to the Columbia Estuary channel.

Table 2 Effluent Flow Criteria for 2022

Design Criteria	Effluent Flow, mgd
Annual average	1.1
Maximum month	1.55
Maximum 24-hr. average	2.3
Peak instantaneous	4.7

Pacific Surimi Seafoods. One alternative that may be analyzed in the future is a combined deep water outfall with Pacific Surimi Seafoods. No design flows have been provided by Pacific

Surimi, thus they are not included in the mixing zone modeling. However, the effluent flows from Pacific Surimi occur only during the dry season. Therefore, Pacific Surimi would not affect the hydraulic capacity of the outfall, which is based on wet weather flows. If the City of Warrenton extends their WWTP outfall to the deep water site, it is expected to include sufficient capacity for Pacific Surimi if they decide to join.

EFFLUENT QUALITY DATA

NPDES Permit Parameters. BOD_5, chlorine residual, fecal coliform and pH data are readily available from daily monitoring records (DMRs). However, these data are of little relevance to this mixing zone study because the wastewater treatment facilities will be upgraded. The wastewater treatment facilities will be designed for specified BOD_5 and fecal coliform standards. Chlorine disinfection will be replaced by UV disinfection.

Temperature. Effluent temperature was monitored during summer 2002. Approximately hourly measurements were made on July 17, 2002, which was a sunny day with ambient air temperatures exceeding 75 degrees. The effluent temperature peaked at approximately 3:30 p.m. at 22.1°C. All subsequent effluent temperatures were obtained between 3 p.m. and 4 p.m. to capture the diurnal peak. The maximum measured effluent temperature was 25°C at 3:00 p.m. on August 13, 2002.

Toxicants. Effluent ammonia, hardness and metals data were obtained on three days in summer 2002. Effluent samples were analyzed for ammonia, hardness and the selected metals listed in Table 20 of OAR 340-41. Grab samples were obtained once per month during June, July and August 2002. Clean sampling techniques were employed for sample collection and delivery as established in the SAP. Laboratory analysis was conducted by Columbia Analytical in Kelso, Washington.

The concentrations of toxic parameters from the effluent sampling are summarized in Table 3. Data reports from Columbia Analytical are provided in Attachment A.

Table 3 Effluent Sampling Results

Parameter	Units	6/19/02	7/15/02	8/5/02
Ammonia-N	mg/L	0.08	0.13	0.26
Hardness, as $CaCO_3$	mg/L	52.7	55.4	59.3
Mercury	ng/L	3.9	6.4	4.8
Arsenic	µg/L	0.6	0.8	0.5
Cadmium	µg/L	ND	0.08	ND
Copper	µg/L	4.7	6.5	3.2
Lead	µg/L	0.10	0.13	ND
Nickel	µg/L	1.3	1.5	0.8
Silver	µg/L	0.05	0.04	ND
Zinc	µg/L	ND	ND	ND

ND – Not Detected

AMBIENT QUALITY DATA

Conventional Parameters. Ambient water quality data for conventional water quality parameters are shown in Table 4. Columbia River ambient water quality data were obtained from web sites by DEQ, the U.S. Geological Survey, and the U.S. Environmental Protection Agency's STORET database. The sampling stations ranged in location from the Highway 101 Bridge across the Columbia River near Astoria to the northwest tip of Oregon near the Town of Hammond. The sampling stations cited here were located near the Oregon shoreline and the sampling events occurred during the summer months between the years 1982 to 2000.

Table 4 Ambient Water Quality Data for Conventional Parameters

Value	Temperature (°C)	Dissolved Oxygen (mg/L)	Ammonia-N (mg/L)	pH
Minimum	12	7.2	0	5.8
Maximum	21.7	9.9	2.2	8.2
10th Percentile	14.2	8.2	0.02	7.0
90th Percentile	20.1	9.8	0.67	8.2
No. samples (n)	20	14	25	24

Metals. There are few reliable sources of data for ambient metals on the Columbia. Cosmopolitan Engineering conducted metals sampling using clean techniques approved by the Washington Department of Ecology for three sites near Kalama and Longview (Cosmopolitan, 1996). The results are presented in Table 5 and will be used in the evaluation of reasonable potential to exceed standards and derivation of potential permit limits for a deep water discharge.

Table 5 Ambient Water Quality Data for Metals

Water Quality Parameter	No. Samples	90th Percentile Value
Arsenic, µg/L	5	1.45
Cadmium, µg/L	13	0.05
Copper, µg/L	5	1.62
Nickel, µg/L	16	0.94
Lead, µg/L	15	0.07
Zinc, µg/L	16	2.78

MIXING ZONE STUDY FOR EXISTING OUTFALL

If DEQ grants an extended mixing zone, it will be measured as a distance from the tide gate. Limited effluent mixing occurs in the natural channel just seaward of the tide gate. There are no computer models capable of assessing dilution for this complex configuration. Therefore, dilution within the proposed extended mixing zone was directly measured using fluorescent dye as a tracer.

METHODS

Field Schedule. Rhodamine WT dye was injected continuously into the Warrenton WWTP effluent beginning at 6:30 a.m. July 16, 2002 for one tidal day (24.8 hrs) prior to conducting field measurements. This allowed concentrations in the mixing zone to reach a quasi steady state and account for reflux of effluent near the tide gate.

The dye injection continued through July 17, when tracer concentrations were directly measured at the following tide stages: high slack, early-ebb, late-ebb, low slack, early-flood and late-flood. Field measurements were made at fixed distances from the tide gate corresponding to expected dimensions of the acute and chronic mixing zones. Accepted fluorometric procedures were followed (Wilson, 1986).

Dye Injection. Rhodamine WT dye solution was injected continuously at the effluent flow meter weir (Figure 3) using an LMI chemical metering pump. The effluent flow rate during the study was a steady 0.47 mgd, which established a dye concentration of approximately 1740 ppb in the outfall. This concentration is based on the volume fraction of liquid dye compared to effluent in the mixed samples (note: Rhodamine WT liquid is a 24 percent solution, thus the actual fluorescent concentrations were approximately one-quarter of the reported concentrations).

The LMI pump was calibrated prior to the dye injection by filling up a graduated cylinder and monitoring the time it takes to fill a measured volume. The injection rate was further monitored by direct measurements during the injection period.

Monitoring Stations. Fluorescence was measured at the following locations:

- In the mixed effluent at the point of discharge to the effluent channel,
- In the effluent channel 10 feet downstream of the outfall, halfway from the outfall to the tide gate, and just upstream of the tide gate,
- At distances of 10, 20 and 30 feet (representing potential acute mixing zone distances) and 50, 100, 200, and 300 feet (representing potential chronic mixing zone distances) seaward of the tide gate.

At all tide stages, flow was constrained within the natural tidal channel, as shown typically in Figure 6. There was no stratification based on visual observation of sample coloration at several depths. Therefore, all samples consisted of grab samples at approximately mid-depth. Grabs were obtained by siphon tube and deposited in 250 mL plastic bottles and placed in a cooler. All grabs were obtained in triplicate or duplicate to assess variability.

Fluorometer. Tracer concentrations of all samples were measured with a Turner SCUFA fluorometer. Equipment specifications are detailed in Attachment B. Dye standards were prepared by serial dilution in the Cosmopolitan Laboratory prior to departure for Warrenton. The fluorometer was initially calibrated to a 186 ppb standard. The standards were re-analyzed during the field and laboratory studies to check for drift.

QA/QC DATA

Sample Collection and Data Analysis. All field samples seaward of the tide gate were taken in triplicate. All field samples between the outfall and tide gate were taken in duplicate. Samples were analyzed within 24 hours of the end of the field studies in a laboratory setting with the SCUFA fluorometer in the flow-through mode.

The measured and temperature corrected concentrations for all samples are provided in Attachment C. The data are also plotted versus stationing for each transect in Attachment C.

Field Variation. Field variation is defined as the difference between the high and low concentrations divided by the mean value of triplicate or duplicate samples. The average field variation for all stations and times was 7.2 percent.

Fluorometer Drift. Fluorometer measurements of the standard samples are shown in Table 6. Fluorometer drift during the field study was approximately 10 percent based on approximately bi-hourly measurements of the 186 ppb standard solution. The fluorometer was recalibrated for the laboratory measurements of bottled samples the following day. All fluorometer readings of the standard during both the field and laboratory studies were within the range of 186 to 168 ppb.

Table 6 Fluorometer Measurements of Standards vs. Time

Date – Time	Laboratory Standard	Effluent Standard
7/17/02 – 09:31	186	1735
7/17/02 – 09:33	–	1740
7/17/02 – 09:40	–	1730
7/17/02 – 10:45	183	1700
7/17/02 – 12:20	173	1720
7/17/02 – 13:30	173	1700
7/17/02 – 15:30	168	1725
7/18/02 – 11:00	186	1740
7/18/02 – 18:00	183	1760

Quenching. The City of Warrenton maintained a chlorine residual of 0.6 mg/L during the dye studies. Quenching of the tracer due to chlorine in the effluent was assessed by creating a dye standard of known effluent concentration and measuring its fluorescence over time. The measurements are shown in Table 6. All of the measurements were within the percentage of instrument drift. Literature sources were also evaluated as part of the assessment of chemical decay of the dye. No quenching of the dye was anticipated at the low chlorine residuals expected during the study as suggested by similar measurements by Deaner (1973), a copy of which was furnished to DEQ with the SAP. Therefore, there was no significant quenching of the dye by residual chlorine in the effluent.

Photochemical Decay. Photochemical decay of the tracer was assumed to be negligible over the duration of the study. No direct measurements were made for this study. However, Cosmopolitan Engineering conducted dye studies in the Willapa Estuary during September 2001 that established a photochemical decay rate of 0.04 day^{-1}, which is insignificant for the short duration of this study (Cosmopolitan, in process).

Other Dye Loss. The effect of turbidity, algal interception and/or suspended solids adsorption was determined by decanting several samples on each side of the tide gate and measuring the impact on dye concentration. The concentration of decanted versus non-decanted samples were within 10 percent.

DILUTION RESULTS

Data Analysis. Data have been converted from tracer concentration to dilution factor, which is the ratio of the effluent concentration to the concentration measured in the receiving waters. The resulting dilution factor for each sample transect time and location seaward of the tide gate are provided in Table 7. Dilution factors as a function of time, tide and distance from the tide gate are also shown in Figure 7.

Table 7 Dilution Factors Seaward of the Tide Gate, July 17, 2002

Transect Time	Distance from Tide Gate							Tide, MLLW
	10 ft	20 ft	30 ft	50 ft	100 ft	200 ft	300 ft	
8:00	10.86	12.52	12.00	11.87	11.17	16.04	21.50	6.3
10:15	1.28	1.26	1.24	1.22	1.28	1.29	1.30	4.1
12:00	1.15	1.15	1.15	1.19	1.29	1.19	1.21	1.9
14:00	1.19	1.19	1.21	1.19	1.30	1.24	1.22	1.1
16:45	1.23	1.26	1.31	1.69	3.63	11.78	17.11	4.6
18:30	2.21	2.28	2.36	2.95	5.48	13.59	19.06	7.3
20:08*	10.86	12.52	12.00	11.87	11.17	16.04	21.50	8.3
Average	**2.99**	**3.28**	**3.21**	**3.35**	**4.02**	**7.52**	**10.23**	

*Projected

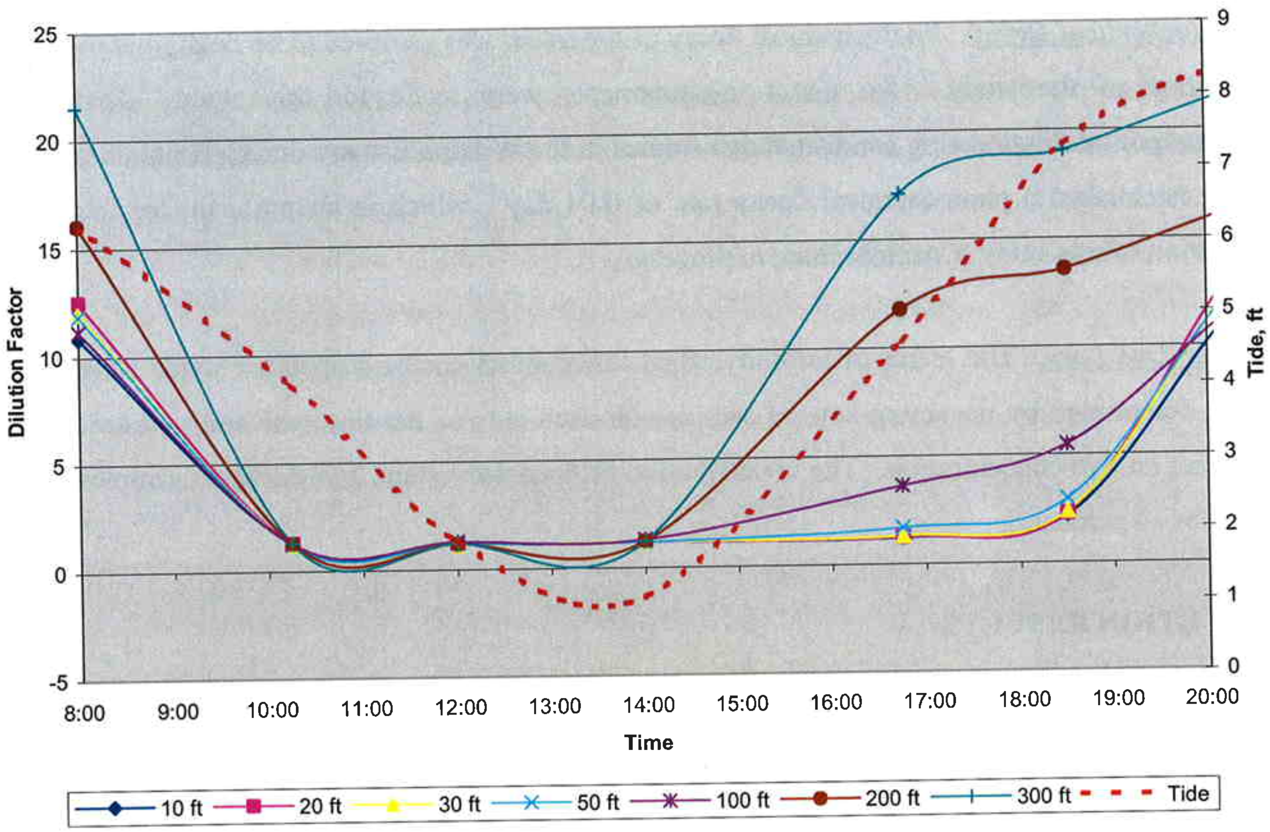


Figure 7 Dilution Time Series During the Dye Study 7/17/02

The results show dilution to be dependent on the tide stage. The only period that significant dilution occurs is from mid-flood through shortly after high tide, when dilution water is available from the incoming tide. From field observations, it was noted that the tide gate is not watertight, so some nominal dilution occurs landward of the tide gate.

Beginning at ebb tide through low tide to the following mid-flood tide, there is minimal dilution water available. This condition represents the critical case. The dilution factors at the proposed extended mixing zone boundaries during the critical case are very small.

Acute Dilution Factor. Acute water quality criteria are based on short-term exposure. Therefore, critical acute dilution factor during the study is interpreted as the lowest measured dilution of any tidal condition at the 10-foot distances from the tide gate. From Table 7, the lowest acute dilution factor during the study was 1.15, which was observed during low tide.

Chronic Dilution Factor. Chronic water quality criteria are based on long-term exposure of 24 to 96 hours. Therefore, critical chronic dilution factor during the study is interpreted as the tidally averaged dilution factor at the 100-foot distance from the tide gate. From Table 7, the chronic dilution factor was 4.02.

Dilution Factors Extrapolated to Design Flows. Design flows are specified in Table 2, and are significantly higher than flows occurring during the field study. Therefore, dilution factors at design conditions will be lower than measured during the field study. Field measured dilution factors are converted to design flow conditions by the equation shown below:

$$S_d = 1 + (S_f - 1)/R$$

Where:

S_d = Dilution factor at the design flow condition
S_f = Dilution factor measured during the field studies
R = Ratio of the design effluent flow rate to the flow rate during the field study

The ratios (R) for the study were 4.9 and 3.3 for acute and chronic conditions, respectively. The resulting dilution factors are presented in Table 8.

Table 8 Dilution Factors for the Extended Mixing Zone

Condition	Acute Dilution	Chronic Dilution
July 17, 2002 Observed (Q=0.47 mgd)	1.15	4.0
2022 Design Flows	1.03	1.9

MIXING ZONE STUDY FOR NEW OUTFALL TO COLUMBIA RIVER

An alternative to the existing ditch outfall with an extended mixing zone would be to extend the outfall into the Columbia River Estuary. Field studies and modeling have been conducted to assess the effluent mixing that would occur for a new outfall to the deep portion of the Columbia River.

ALTERNATIVES

The proposed deep outfall site was indicated in Figure 2. The two principal objectives for siting the new outfall are (1) to gain sufficient depth to provide significant effluent mixing, while (2) not encroaching on the commercial navigation channel. For this analysis, a discharge depth of approximately –30 feet NGVD has been established to meet these objectives. The selected site is just offshore of the Alder Cove tideflat and shoreward of the navigation channel.

Two diffuser alternatives are considered in this mixing zone analysis. The first alternative would consist of a single 12-inch diameter nozzle. The second alternative is a 35-foot long diffuser with eight 4-inch diameter ports at 5-foot spacing.

MODEL SELECTION

Three dilution models were considered for this application: PLUMES, UDKHDEN, and CORMIX2. Each model was developed with the support of EPA and is well documented. Following is a discussion of the strengths and weaknesses of each model.

CORMIX2 is suited best to river situations without buoyant effects and where the diffuser is much longer than the water depth. The Columbia Estuary near Warrenton has intermittent strong density stratification, and the diffuser length will be about the same or less than the water depth. CORMIX2 would oversimplify plume geometry and over-predict nearfield dilution in this application. Therefore, CORMIX2 is not recommended for this application.

PLUMES and UDKHDEN are similar, and either model would be acceptable. Both models were designed for buoyant discharges (*e.g.* fresh water effluent into salt water), and evaluate diffusers with cross-flows and arbitrary ambient density stratification. Boundaries such as the bottom, surface and lateral shoreline may not be well represented in some cases with these models. However, these boundary limitations are not significant at the proposed outfall site.

The PLUMES model was selected for this study. The PLUMES model is documented in Baumgartner (1993). It has the advantages over UDKHDEN of (1) better documentation and support from EPA, and (2) it is coupled with a farfield component capable of predicting dilution beyond the buoyant mixing zone.

OCEANOGRAPHIC DATA

Density Profiles. The dilution model PLUMES requires ambient data for density stratification. Density stratification is determined from profiles of conductivity, temperature and depth (CTD). Field sampling for these parameters was conducted over one tide cycle (12.4 hours) on July 16, 2002 near the proposed diffuser location. CTD profiles were obtained from a 17-foot research vessel at approximately bi-hourly intervals from high water to the following high water. CTD profiles were obtained with a Sea-Bird Model SBE19 profiler. Cast times relative to the tide curve, and the CTD data, are provided in Attachment D.

The ambient profiles varied significantly with the tide. Salinity profiles are shown in Figure 8. High salinities with significant stratification were observed near high tide due to ocean intrusion. Low salinities were observed at low tide as portions of the salt wedge were forced out of the estuary. The highest stratification near the proposed diffuser depth occurred during ebb tide. The high stratification at that depth inhibits buoyant mixing and produces the lowest modeled dilution factors.

The field studies were limited to summer conditions. Therefore, no similar data were collected during other seasons. However, the density profiles are judged to be so dependent on tide, that tide is believed to be more important than seasonally-varying parameters such as ocean salinity and river flow.

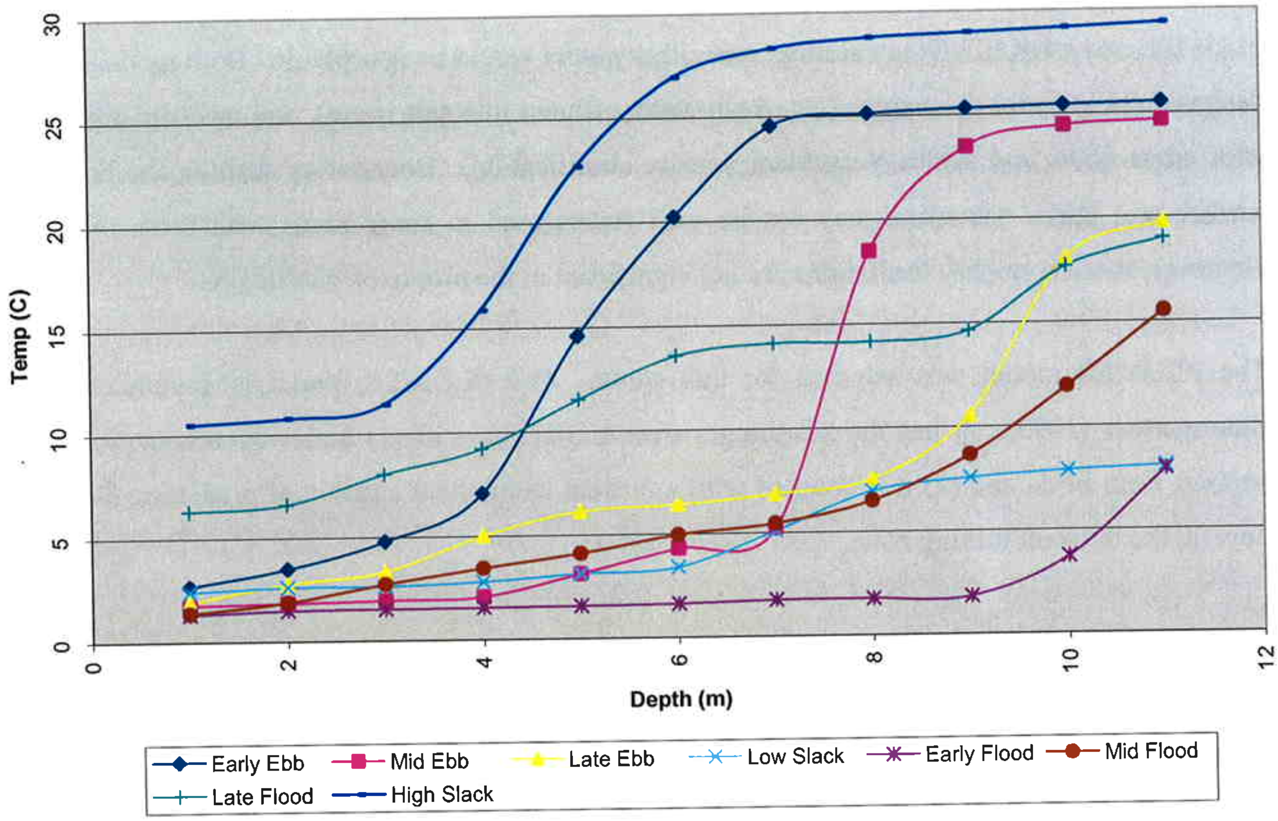


Figure 8 Salinity Profiles at the Deep Water Outfall Site 7/16/02

There are density profiles from all seasons from other data sources, which were described in the SAP. These data show stratification consistent with that observed in the July 2002 study.

Current Speed. Current speed is the other ambient parameter that influences initial dilution of an effluent plume. Currents were measured with windowshade drogues set at mid-depth and tracked with differential GPS. Currents were measured approximately hourly over the same full tide cycle (ebb and flood) as the CTD casts. Results of the current measurements are shown in Figure 9, along with the tide. Current data and measurement times are also included in Attachment D.

According to protocol established by Washington Department of Ecology for estuaries, and accepted by DEQ in the SAP, acute dilution modeling will be conducted at the 10th percentile current speed, and chronic modeling at the median current speed. These values from the current study are 0.26 m/sec and 0.45 m/sec, respectively.

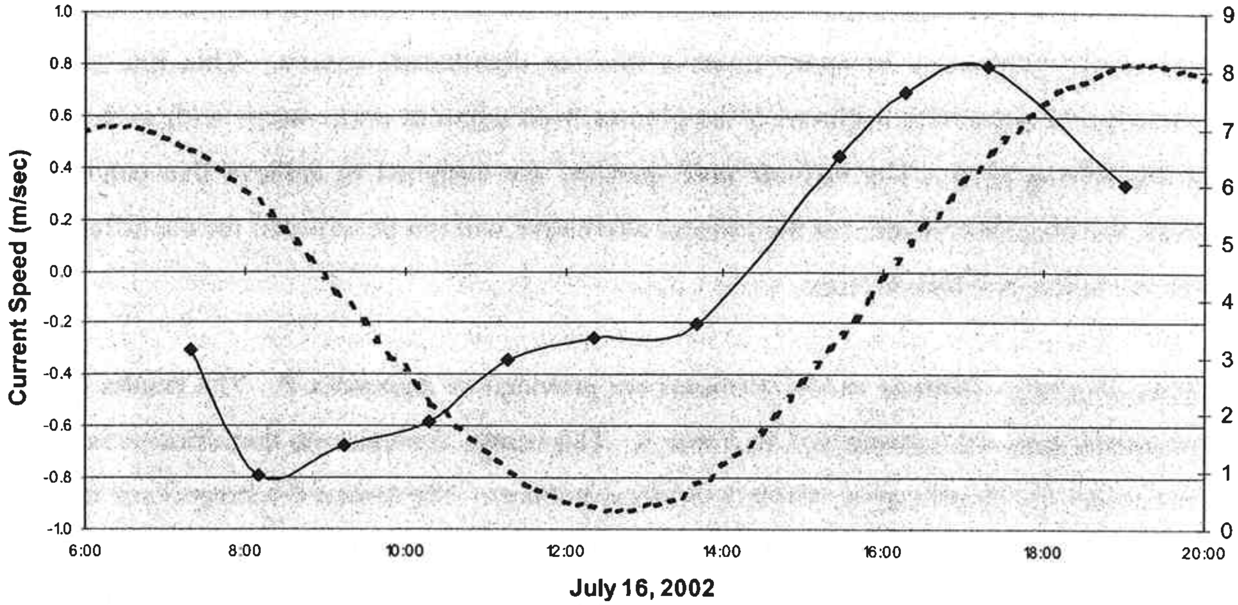


Figure 9 Current Speed and Tide at the Deep Water Outfall Site 7/16/02

DILUTION MODEL RESULTS

Centerline vs. Flux-Average Dilution. Temporally-averaged plume concentrations from a point-source discharge follow a characteristic Gaussian (i.e., bell shaped) distribution. The mean concentrations at the centerline are greater than the average concentration over the width of the plume, which is termed "flux-average." DEQ guidelines specify that mixing zone dilution factors be based on centerline rather than flux-average.

Research has shown that the ratio between centerline and flux-average concentrations in fully-developed 3-D plumes is approximately 1.7. The ratio for 2-D plumes, such as wastewater plumes after trapping depth is reached, is approximately 1.4 (Fischer, 1979).

The version of PLUMES used for this report expresses results only as flux-averaged. For the single-port discharge results in this report, the flux-averaged dilution factors will be adjusted downward. A factor of 1.7 will be used for the acute dilution, since the plume is largely 3-D at this point. A factor of 1.4 will be used for the chronic mixing zone because the plume is 2-D at this distance.

Centerline and flux-average plume concentrations are essentially equivalent for a well-designed diffuser, whose purpose is to approximate a line (or distributed) source. This line source approximation is essentially achieved if the plumes from adjacent ports merge with each other within the mixing zone. The diffuser port spacings are designed to achieve this condition. Therefore, the PLUMES results for the diffuser alternative will not be adjusted for the difference between centerline and flux-average.

Sensitivity Analysis. Dilution model printouts are provided in Appendix E. The results of all dilution model runs are summarized in Table 9. The results demonstrate that dilution is very sensitive to density stratification, which is tidally dependent. The lowest dilutions occur during maximum stratification. The critical CTD profile was the mid-ebb (Cast 1), which represents maximum stratification above the proposed outfall depth as shown in Figure 8. The highest dilutions occur in the absence of significant salinity or salinity stratification, as shown by the low slack and early flood CTD profiles.

Table 9 Dilution Model Results for All Runs

CTD Cast	Acute Mixing Zone		Chronic Mixing Zone	
	Single Nozzle(1)	8-Port Diffuser(2)	Single Nozzle(3)	8-Port Diffuser(4)
00 – Early Ebb	8.3	38.7	40.4	161.4
01 – Mid Ebb	**5.9**	**23.4**	15.2	40.5
02 – Late Ebb	6.7	30.0	29.4	44.3
03 – Low Ebb	6.6	30.0	22.6	62.6
04 – Early Ebb	6.3	29.3	63.3	140.5
05 – Mid Ebb	6.6	29.6	25.1	48.9
06 – Late Ebb	7.4	34.7	59.0	214.9
07 – High Ebb	8.5	40.1	55.0	176.0
Average	NA	NA	**38.8**	**111.1**
01 – Mid Ebb 90th % Current Sensitivity Run	7.1	26.0	NA	NA

(1) Model printout in Attachment E1.1
(2) Model printout in Attachment E2.1
(3) Model printout in Attachment E1.2
(4) Model printout in Attachment E2.2

Sensitivity to current speed was also assessed for the acute mixing zone condition. The results are shown in Table 9, and the model run is included in Appendix E. The dilution model was run at the 90th percentile current speed of 0.79 m/sec, critical CTD profile (Cast 1-mid ebb). The predicted dilution at the acute mixing zone boundary is higher at 90th percentile currents than at the 10th percentile currents. Therefore, the 10th percentile current condition governs the acute dilution factor.

Critical Dilution Factors. The acute dilution factors used in the water quality section of this report are the lowest dilutions predicted from modeling all CTD profiles in combination with the 2022 maximum daily effluent flow and 10th percentile current speed. In this case, the critical CTD profile is Cast 1 (Case 2 of 16) for each diffuser alternative. The chronic dilution factors used in the water quality section are the tidally-averaged dilution for all CTD casts at the 2022 maximum monthly effluent flow.

The critical acute and chronic dilution factors for the two outfall alternatives are summarized in Table 10. Dilution model printouts are provided in Attachment E.

Table 10 Critical Dilution Factors for the Deep Outfall Alternatives

Alternative	Acute Dilution	Chronic Dilution
Single 12-inch nozzle	5.9	39
8-port diffuser	23.4	111

EFFLUENT FATE OUTSIDE THE MIXING ZONE

No field studies were conducted specifically to address the fate of the effluent plume beyond the mixing zone boundary. However, the drogue study and general observations about the receiving water setting provide some useful insight into this issue.

Velocity Vectors. Current velocity was measured by the drogues. Figure 9 and the dilution model results are based on only the speed component of the velocity. This section addresses the directional component of current measurements relative to adjacent shoreline features.

Velocity vectors are illustrated in two ways. Figure 10 presents a velocity rose of the vectors measured during the drogue study. Each vector is plotted with a common origin at the proposed diffuser site. The length of each vector is proportional to speed according to the scale shown on the figure. The beginning of the Alder Cove tideflat is shown by the 0 MLLW depth contour. The results show that current velocity is principally unidirectional. That is, both ebb and flood currents run along shore, with little cross-shore component. All drogues remained at least 200-250 feet from the Alder Cove MLLW shoreline at all tidal conditions.

The second vector representation is known as a whisker plot, and is shown in Figure 11. Unlike the velocity rose, the adjacent shoreline is not represented. However, the whisker plot reveals the velocity relationship to tide. Each "whisker" is the measured velocity vector with its origin plotted along the tide curve at the time of measurement. Current speed is indicated by the length of the vector according to the scale provided. The bearing of each vector is indicated in reference to the north arrow. The results confirm the typical estuary current orientation, with downstream velocities during the entire ebb through early flood, and upstream velocities over the final two-thirds of the flood tide.

Re-Entrainment Potential. Reversing tidal currents have the potential to re-entrain a portion of the effluent into the plume within the mixing zone. This potential is minimized in this case by two factors: (1) The Columbia Estuary is very wide compared to the plume width, minimizing the probability that the plume will return to its origin, and (2) dilution water is entrained from below as effluent rises during the buoyant mixing phase, thus separating it vertically from the plume returning at the trapping depth (i.e., the returning plume would not reside at the depth where water is being entrained into the buoyant plume).

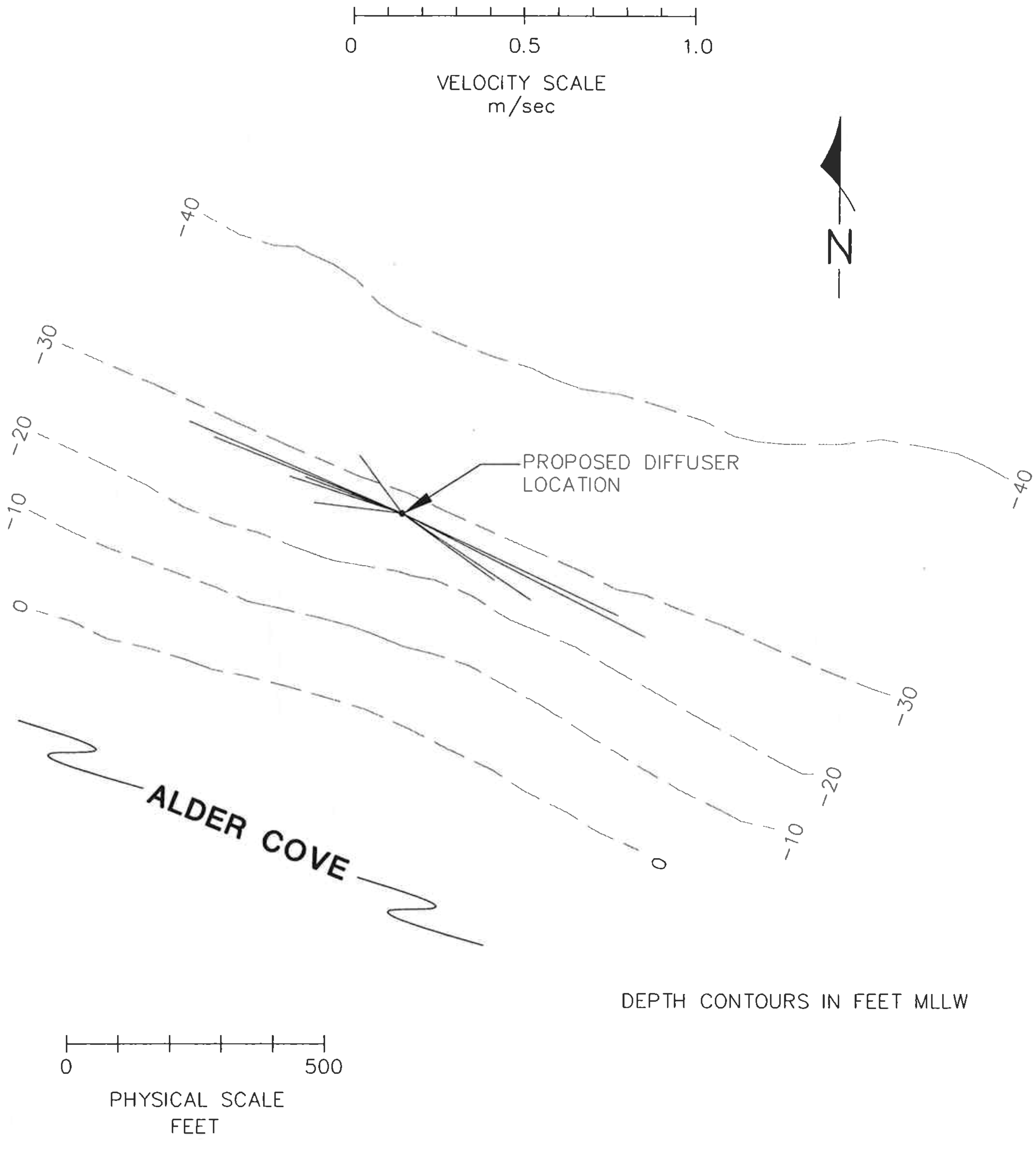


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Figure 10 Current Velocity Rose

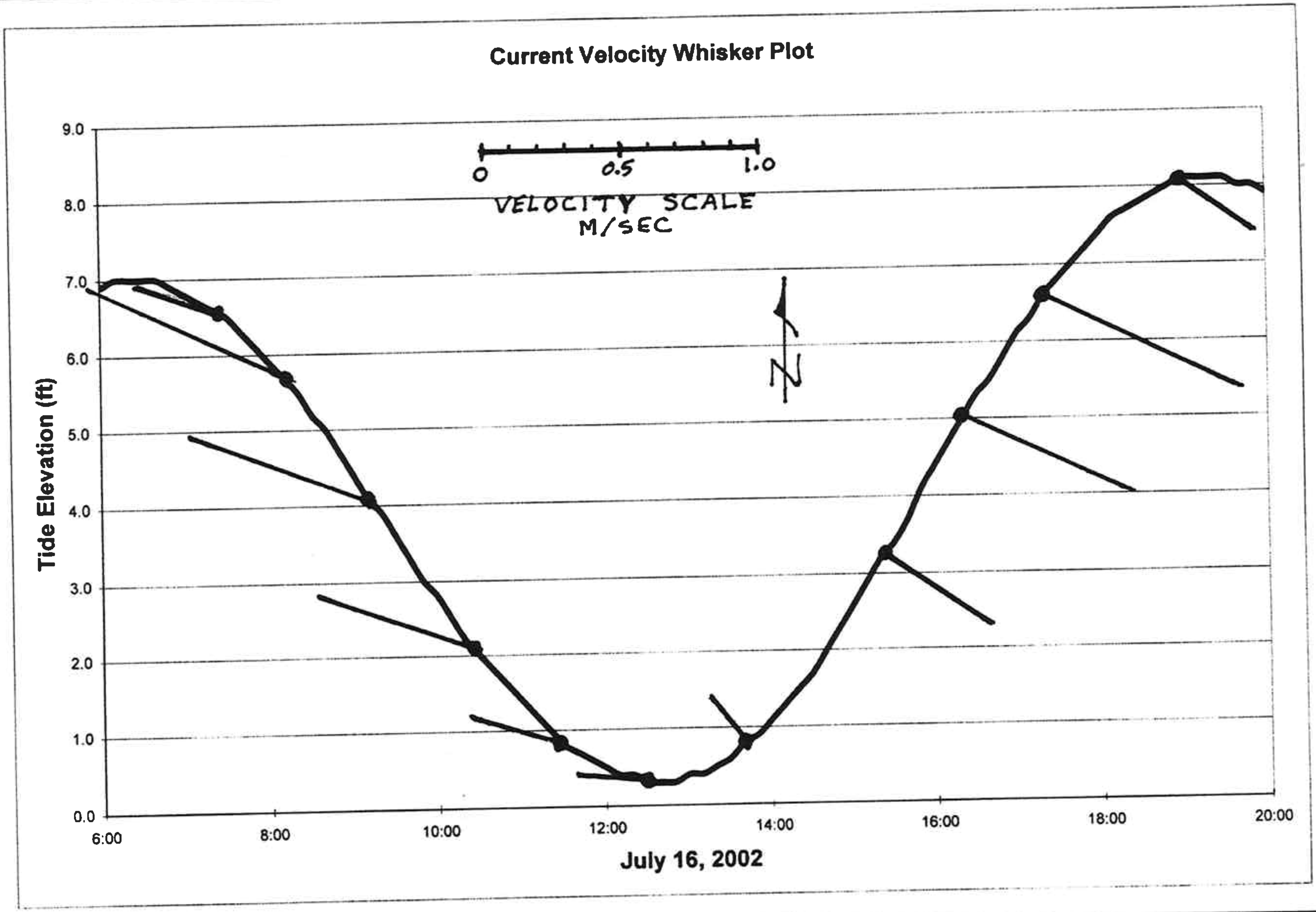

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Figure 11: Current Velocity Whisker Plot

Fisheries Issues. The Columbia River Estuary Taskforce (CREST) conducted an evaluation of fisheries resources in the estuary relative to the proposed deep-water outfall, which follows:

> The Columbia River Estuary serves as a critical transitional habitat for migratory salmonids in the Columbia Basin. The estuary is particularly significant for juvenile salmonids as rearing and foraging areas as the fish migrate to and transition to the ocean.
>
> The following species are listed as endangered or threatened and occur, or may occur in the proposed project area:

- Chinook Salmon:
  - Snake River Fall Run ESU (threatened)
  - Snake River Spring/Summer Run ESU (threatened)
  - Lower Columbia River ESU (threatened)
  - Upper Willamette River ESU (threatened)
  - Upper Columbia River Spring Run ESU (endangered)
- Sockeye Salmon:
  - Snake River ESU (endangered)
- Steelhead Trout:
  - Upper Willamette River ESU (threatened)
  - Middle Columbia River ESU (threatened)
  - Upper Columbia River ESU (endangered)
  - Lower Columbia River ESU (threatened)
  - Snake River Basin ESU (threatened)
- Chum Salmon:
  - Columbia River ESU (threatened)
- Coho Salmon:
  - Lower Columbia River/Southwest Washington ESU (candidate)

- Cutthroat Trout
- Southwestern Washington/Columbia River ESU (proposed threatened)

It is important to note that these fish are migratory and while they may pass through the proposed outfall area, it is unlikely that fish would reside in the area. The latest estuarine science as it relates to juvenile salmonid use in the Columbia River Estuary also indicates that juvenile salmon are likely to migrate in depths of -6 to -25 feet. The estuarine environment at -30 feet depths is extremely dynamic and strong uni-directional currents (depending on tide conditions) dominate. Due to depths at the outfall location it is likely that effluent dispersal will be in the deeper water associated with the navigation channel and onshore movement to shallower depths is unlikely. Therefore, potential impacts to ESA fishes or their associated habitat will be minimal.

WATER QUALITY ANALYSIS

METHODS

EPA's *Technical Support Document for Water Quality-based Toxics Control* (1991) established a statistical procedure for assessing the "reasonable potential" for WWTP discharges to meet water quality standards for toxicants. For discharges with reasonable potential to exceed standards, the EPA technical support document includes a procedure for establishing NPDES limits to meet water quality standards. DEQ has adopted the EPA procedures, and they are used in this study.

REASONABLE POTENTIAL ANALYSIS

The "reasonable potential to exceed water quality standards" has been determined for the outfall alternatives according to the EPA protocol. Water quality parameters included in this analysis include chlorine, ammonia and selected metals from Table 20 of OAR 340-41. Maximum expected effluent concentrations were estimated using EPA recommended multipliers and the maximum measured effluent concentrations from Table 3. Effluent ammonia concentration in Table 10 was conservatively estimated by Rick Esvelt for the projected new wastewater treatment facilities. EPA's recommended default coefficient of variation equal to 0.6 is used in these calculations.

The results of the reasonable potential analysis are provided in Table 11. For the existing outfall with an extended mixing zone, chlorine, ammonia and copper would have a reasonable potential to exceed standards. The City would be issued an NPDES permit limit for each of these parameters to ensure compliance. For the new 12-inch nozzle outfall alternative, chlorine and copper would also have a reasonable potential to exceed standards and need a permit limit. For the deep diffuser alternative, only chlorine would need a permit limit.

Table 11 Reasonable Potential to Exceed Water Quality Standards

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)

				State Water Quality Standard		Max concentration at edge of...								
	Metal Criteria Translator as decimal	Metal Criteria Translator as decimal	Ambient Concentration (metals as dissolved)	Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone	LIMIT REQ'D?	Max effluent conc. measured (metals as total recoverable)	Coeff Variation	# of samples	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor
Parameter	Acute	Chronic	ug/L	ug/L	ug/L	ug/L	ug/L		ug/L	CV	n			
Existing Outfall w/ Extended Mixing Zone														
Ammonia-N			67.0000	3600.00	490.00	4856.32	2663.32	YES	5000.00	0.60		1.0	1.03	1.9
Chlorine				13.00	7.50	679.61	368.42	YES	700.00	0.60	90	1.0	1.03	1.9
Arsenic	1.00		1.4500	69.00	36.0000	7.81	4.90	NO	0.80	0.60	3	10.0	1.03	1.9
Cadmium	0.994	0.994	0.0500	43.00	9.3000	0.77	0.44	NO	0.08	0.60	3	10.0	1.03	1.9
Copper	0.830	0.830	1.6200	2.90	2.9000	52.43	29.16	YES	6.50	0.60	3	10.0	1.03	1.9
Lead	0.951	0.951	0.0700	140.00	5.6000	1.20	0.68	NO	0.13	0.60	3	10.0	1.03	1.9
Mercury	0.85			2.10	0.0250	0.04951	0.03158	YES	0.006	0.60	3	10.0	1.03	1.9
Nickel	0.99	0.99	0.9400	75.00	8.3000	14.44	8.26	NO	1.50	0.60	3	10.0	1.03	1.9
Silver	0.85			2.30	2.3000	0.41	0.26	NO	0.05	0.60	3	10.0	1.03	1.9
Zinc	0.946	0.946	2.7800	95.00	86.0000	91.93	51.11	NO	10.00	0.60	3	10.0	1.03	1.9
Deepwater Discharge - 12-Inch Nozzle														
Ammonia-N			67.0000	3600.00	490.00	903.10	194.14	NO	5000.00	0.60		1.0	5.9	38.8
Chlorine				13.00	7.50	118.64	18.04	YES	700.00	0.60	90	1.0	5.9	38.8
Arsenic	1.00		1.4500	69.00	36.0000	2.56	1.62	NO	0.80	0.60	3	10.0	5.9	38.8
Cadmium	0.994	0.994	0.0500	43.00	9.3000	0.18	0.07	NO	0.08	0.60	3	10.0	5.9	38.8
Copper	0.830	0.830	1.6200	2.90	2.9000	10.49	2.97	YES	6.50	0.60	3	10.0	5.9	38.8
Lead	0.951	0.951	0.0700	140.00	5.6000	0.27	0.10	NO	0.13	0.60	3	10.0	5.9	38.8
Mercury	0.85			2.10	0.0250	0.00864	0.00155	NO	0.006	0.60	3	10.0	5.9	38.8
Nickel	0.99	0.99	0.9400	75.00	8.3000	3.30	1.30	NO	1.50	0.60	3	10.0	5.9	38.8
Silver	0.85			2.30	2.3000	0.07	0.01	NO	0.05	0.60	3	10.0	5.9	38.8
Zinc	0.946	0.946	2.7800	95.00	86.0000	18.34	5.15	NO	10.00	0.60	3	10.0	5.9	38.8
Deepwater Discharge - 8 Port Diffuser														
Ammonia-N			67.0000	3600.00	490.00	277.81	111.44	NO	5000.00	0.60		1.0	23.4	111.0
Chlorine				13.00	7.50	29.91	6.31	YES	700.00	0.60	90	1.0	23.4	111.0
Arsenic	1.00		1.4500	69.00	36.0000	1.73	1.51	NO	0.80	0.60	3	10.0	23.4	111.0
Cadmium	0.994	0.994	0.0500	43.00	9.3000	0.08	0.06	NO	0.08	0.60	3	10.0	23.4	111.0
Copper	0.830	0.830	1.6200	2.90	2.9000	3.86	2.09	YES	6.50	0.60	3	10.0	23.4	111.0
Lead	0.951	0.951	0.0700	140.00	5.6000	0.12	0.08	NO	0.13	0.60	3	10.0	23.4	111.0
Mercury	0.85			2.10	0.0250	0.00218	0.00054	NO	0.006	0.60	3	10.0	23.4	111.0
Nickel	0.99	0.99	0.9400	75.00	8.3000	1.53	1.07	NO	1.50	0.60	3	10.0	23.4	111.0
Silver	0.85			2.30	2.3000	0.02	0.00	NO	0.05	0.60	3	10.0	23.4	111.0
Zinc	0.946	0.946	2.7800	95.00	86.0000	6.70	3.61	NO	10.00	0.60	3	10.0	23.4	111.0

WATER QUALITY-BASED EFFLUENT LIMITS

Water quality-based effluent limits would be required for each parameter and outfall alternative combination with a reasonable potential to exceed water quality standards. Projected limits are determined for 2022 flows and loadings per the methods on page 98 of the TSD (EPA, 1991). This is the method DEQ will use to establish NPDES permit limits for the selected alternative.

The projected effluent limits are presented in Table 12. The new treatment facilities are expected to use UV for disinfection, thus chlorine limits will not be relevant. The existing outfall with extended mixing zone would have difficult limits for ammonia and copper. Other metals may be detected in future effluent tests that would be difficult to meet with the very low dilution.

Table 12 Potential Water Quality-Based NPDES Permit Limits

Outfall Alternative	Parameter	Maximum Daily Limit	Average Monthly Limit
Existing with Extended Outfall	Chlorine Ammonia Copper	13 µg/L 1.5 mg/L 3.5 µg/L	5 µg/L 0.7 mg/L 2.4 µg/L
Deep Discharge with Single 12-Inch Nozzle	Chlorine Copper	77 µg/L 11 µg/L	29 µg/L 8 µg/L
Deep Discharge with 8-Port Diffuser	Chlorine	300 µg/L	110 µg/L

Both deep-water discharge alternatives should be capable of meeting water quality standards for all toxicants. The diffuser option would provide a greater margin of safety than the single 12-inch-diameter discharge nozzle.

DISSOLVED OXYGEN MODEL

A simplified farfield dissolved oxygen model presented in EPA's *Section 301(h) Technical Support Document* (1982) is used to assess the potential effect of deep water alternatives on dissolved oxygen (DO). The dissolved oxygen concentration in the receiving waters can be expressed as a function of travel time as follows:

$$DO(t) = DO_a + \frac{DO_f - DO_a}{D_s} - \left[\frac{L_{fc}}{D_s}[1 - \exp(-k_c t]\right] - \left[\frac{L_{fn}}{D_s}[1 - \exp(k_n t)]\right]$$

Where:

DO(t) = dissolved oxygen concentration in a submerged wastefield as a function of travel time, t, mg/L

DO_a = ambient dissolved oxygen concentration, mg/L

DO_f = dissolved oxygen concentration at the completion of initial dilution, mg/L

k_c = CBOD decay rate constant

k_n = NBOD decay rate constant

L_{fc} = ultimate CBOD concentration above ambient at completion of initial dilution, mg/L

L_{fn} = NBOD concentration above ambient at completion of initial dilution, mg/L

D_S = dilution attained subsequent to initial dilution as a function of travel time.

The above equation expresses the dissolved oxygen deficit which arises due to an initial deficit at the completion of initial dilution (DO_a - DO_f) plus that caused by exertion of BOD in the water column. The last term in the above equation estimates the exertion due to NBOD. The dissolved oxygen deficit tends to decrease at longer travel times as a result of subsequent dilution and to increase as a result of BOD exertion. Depending on the particular case being analyzed, one influence can dominate the other over a range of travel times so that a minimum dissolved oxygen level can occur either immediately following initial dilution or at a subsequent travel time.

The model uses 2022 effluent BOD_5 and ammonia concentrations, and initial dilution predictions from the PLUMES model. Effluent dissolved oxygen concentration is conservatively set at 2 mg/L. BOD_5 and ammonia concentrations are conservatively set at 30 mg/L and 5 mg/L, respectively. Farfield dilution factors, ultimate BOD conversions and kinetic rate constants are taken from the TSD (EPA, 1991). The model parameters and tabulated results are shown in Table 13.

Table 13 Simplified DO Model Parameters and Calculations

DOa	7.2	mg/L
Doe	2	mg/L
CBOD5	30	mg/L
UCBOD	43.8	mg/L
NH3	5	mg/L
NBOD	22.85	mg/L
Kc	0.23	day-1
Kn	0.1	day-1

Deep Water Outfall with 8-port Diffuser

Time (day)	Sa	Sb	Ds	term1	term2	term3	term4	DO(t)
0	111	1	111	7.2	-0.046847	0	0	7.153153
0.25	111	4.5	500	7.2	-0.01041	0.0049	0.001129	7.18356
0.5	111	6.3	699	7.2	-0.007436	0.006804	0.001594	7.184166
1	111	7.1	788	7.2	-0.006598	0.011419	0.002759	7.179224
2	111	13	1443	7.2	-0.003604	0.011192	0.00287	7.182334
4	111	18	1998	7.2	-0.002603	0.013186	0.00377	7.180441

Deep Water Outfall with Single Nozzle

Time (day)	Sa	Sb	Ds	term1	term2	term3	term4	DO(t)
0	39	1	39	7.2	-0.133333	0	0	7.066667
0.25	39	4.5	176	7.2	-0.02963	0.013946	0.003215	7.15321
0.5	39	6.3	246	7.2	-0.021164	0.019366	0.004536	7.154935
1	39	7.1	277	7.2	-0.018779	0.032501	0.007853	7.140867
2	39	13	507	7.2	-0.010256	0.031854	0.00817	7.14972
4	39	18	702	7.2	-0.007407	0.037528	0.010731	7.144333

Existing Outfall with Extended Mixing Zone

Time (day)	Sa	Sb	Ds	term1	term2	term3	term4	DO(t)
0	2	1	2	7.2	-2.6	0	0	4.6
0.25	2	4.5	9	7.2	-0.577778	0.27194	0.062685	6.287597
0.5	2	6.3	13	7.2	-0.412698	0.377632	0.088445	6.321225
1	2	7.1	14	7.2	-0.366197	0.633763	0.153131	6.046909
2	2	13	26	7.2	-0.2	0.621145	0.159308	6.219547
4	2	18	36	7.2	-0.144444	0.731802	0.209255	6.114499

term1 = ambient concentration
term2 = initial deficit
term3 = carbonaceous deficit
term4 = nitrogenous deficit
DO(t) = Final DO as a function of time after discharge from outfall

The results of the farfield DO model are shown in Figure 12. The critical (*i.e.* lowest observed) ambient DO was 7.2 mg/L, and the water quality standard is 6.5 mg/L. The deep diffuser alternative would cause a farfield DO depletion of less than 0.02 mg/L, which is well within water quality standards. The open-ended deep outfall would cause a farfield DO depletion of less than 0.05 mg/L, which is also well within water quality standards. These alternatives would have no measurable impact, as defined by the antidegradation criteria of 0.1 mg/L (OAR 340-41-0026). However, the model indicates that the existing discharge would cause a measurable DO depletion below the water quality standard both near the outfall and in the farfield.

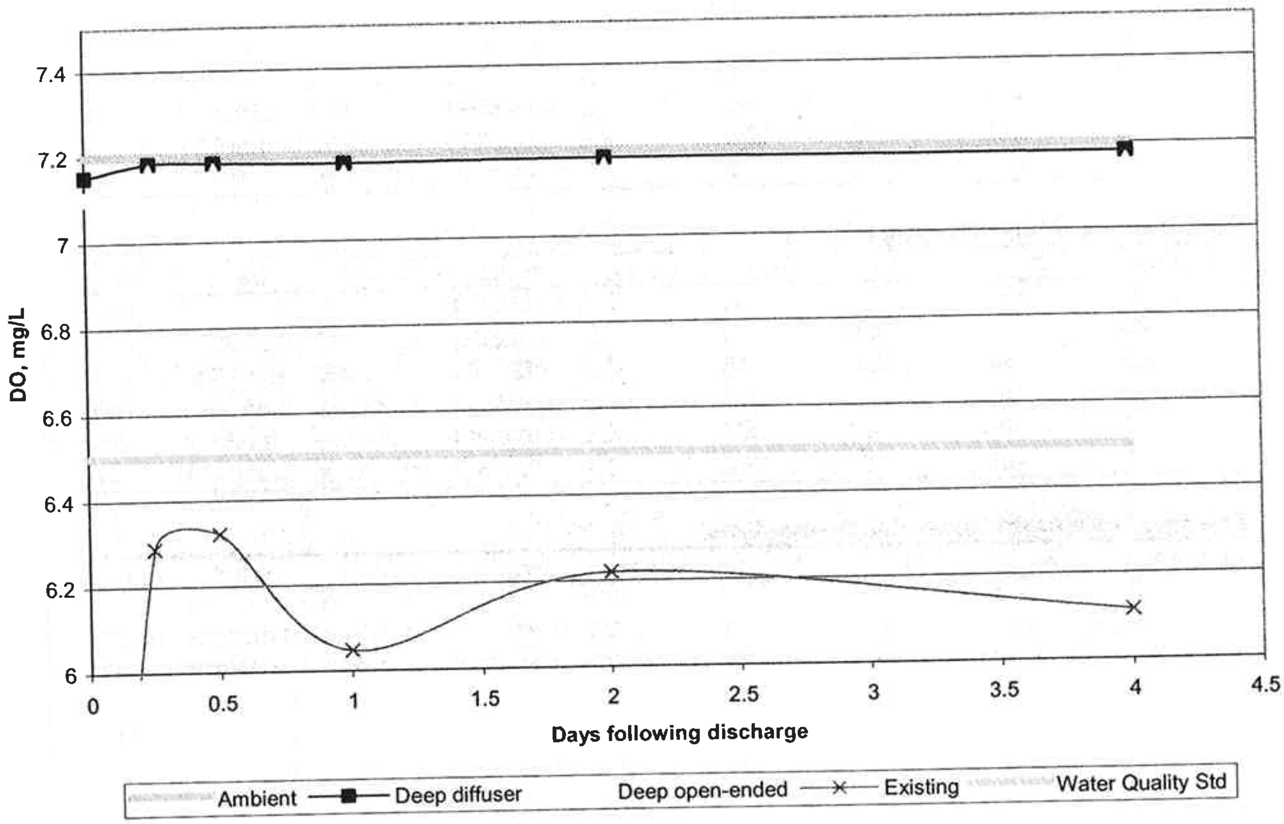


Figure 12 Farfield Dissolved Oxygen Model

FECAL COLIFORM BACTERIA

The current NPDES permit allows a maximum weekly fecal coliform concentration of 400 MPN per 100 mL, and monthly average of 200 MPN per 100 mL. Based on a dilution factor of 2.0 for the existing discharge with an assumed 100-foot extended mixing zone, the monthly average effluent limit would need to be less than 28 MPN per 100 mL in order to meet the fecal coliform water quality standard of 14 MPN per 100 mL at the mixing zone boundary. Since the receiving water is on the 303(d) list for fecal coliform, the treatment plant may be required to meet bacterial water quality standards in the effluent.

The deep outfall alternatives provide sufficient dilution to meet the water quality standards at the mixing zone boundary with technology-based effluent limits in the current NPDES permit.

TEMPERATURE MANAGEMENT PLAN

The effect of wastewater effluent on temperature at the boundary of the mixing zone is assessed for each discharge alternative. This section of the report, along with the Facility Plan, constitutes a temperature management plan (TMP) according to guidance in the *Temperature Implementation Internal Management Directive for Existing Point Source Discharges* (DEQ, 2001). Compliance with the temperature criteria is determined as a function of critical dilution factor and effluent and ambient temperature data. The need for a temperature limit is evaluated for both the existing discharge with an extended mixing zone and a standard mixing zone for the deep outfall alternatives.

EFFLUENT TEMPERATURE

The maximum temperature of the existing effluent in 2002 was measured to be 25°C (77°F) on August 13. However, there is significant heat gain in the treatment ponds that will not occur after the treatment plant is converted to an SBR, as recommended in the Facility Plan. According to Rick Esvelt, Project Engineer for the WWTP modifications, the maximum effluent temperature he has observed from an SBR was 21°C. This occurred during July-August 2001 in Eastern Washington, which has higher ambient air temperatures than Warrenton. For future conditions at Warrenton, a very conservative maximum effluent temperature of approximately 22°C (71.6°F) is projected.

AMBIENT TEMPERATURE

The lower Columbia River is included on the 303(d) list of impaired waters. According to the TMP guidance, the effect of the discharge at the mixing zone boundary must be determined assuming an ambient temperature equal to the water quality standard. For the lower Columbia River the standard is 20°C (68°F).

TEMPERATURE AT MIXING ZONE BOUNDARY

The final mixing zone temperatures and temperature increases for each outfall alternative are shown in Table 14 for both the existing WWTP and the proposed SBR.

Table 14 Temperature Impacts at the Mixing Zone Boundary

Outfall Alternative	Critical Ambient Temp	Dilution Factor	Existing WWTP			Future WWTP		
			Effluent Temp	Temp @ Mixing Zone	Temp Increase	Effluent Temp	Temp @ Mixing Zone	Temp Increase
Existing	68°F	2.0	77°F	72.5°F	4.5°F	71.6°F	69.8°F	1.8°F
Deep Single 12" Nozzle	68°F	39	77°F	68.23°F	0.23°F	71.6°F	68.09°F	0.09°F
Deep 8-Port Diffuser	68°F	111	77°F	68.08°F	0.08°F	71.6°F	68.03°F	0.03°F

Mixing Zone Temp = Ambient+(Effluent-Ambient)/Dilution

Existing Outfall. Discharges to 303(d) limited waterbodies such as the lower Columbia River are not allowed to measurably increase temperature at the mixing zone boundary. The water quality standards and TMP guidance document define a *no measurable increase* threshold as 0.25°F. The existing outfall with an extended mixing zone would not meet this criterion because the temperature increase would be 4.5°F for the existing WWTP, or 1.8°F for the SBR treatment plant.

Therefore, the City of Warrenton would need to implement direct effluent treatment for temperature control if the existing ditch outfall remains. These alternatives could include cooling towers, spray ponds, cooling ponds or chillers.

Deep Outfall. As shown in Table 12, the open-ended outfall and diffuser alternative would meet the *no measurable increase* criterion of 0.25°F, regardless of the WWTP alternative. Therefore, no temperature BMPs would be required for the collection system or treatment plant if the outfall is extended to the Columbia River.

EPA is developing a TMDL for temperature in the Columbia Estuary. The TMDL may include a thermal load allocation for the Warrenton WWTP. Any temperature permit limits set for the Warrenton WWTP prior to the TMDL are subject to revision when the TMDL is completed.

MONITORING

Effluent temperature will need to be monitored after the WWTP improvements are implemented. Monitoring may include both effluent and receiving water. These monitoring requirements will be established by DEQ in the future NPDES permit.

RECOMMENDED OUTFALL ALTERNATIVE

The existing ditch outfall would not meet water quality standards even if an extended mixing zone is granted by DEQ per OAR 340-41-205(4)(g)(B). If the extended mixing zone were granted, the following improvements would be necessary for the existing outfall:

- The WWTP would be designed to meet the current effluent mass limits for BOD_5 and TSS. This requirement was stipulated in the December 13, 2001 letter from DEQ. BOD_5 and DO in the final effluent may require even more stringent limits to meet farfield DO criteria.
- Either dechlorination or UV disinfection would be required (UV is already planned).
- Nitrification would be required (the proposed SBR would accomplish this).
- Advanced pre-treatment or treatment for metals removal may be required, particularly for copper.
- Advanced disinfection would be required. Fecal coliform limits would be equal to or more stringent than 28 MPN per 100 mL for monthly average.
- Effluent would need to be cooled during summer to meet the temperature water quality standard.

It is the collective opinion of Cosmopolitan Engineering Group, HLB & Associates, and H. Rick Esvelt that all of the above requirements would be prohibitively expensive for the City of Warrenton to achieve. The advanced disinfection and the cooling processes are very expensive requirements. For these reasons, no further analysis of the extended mixing zone at the existing ditch outfall is warranted.

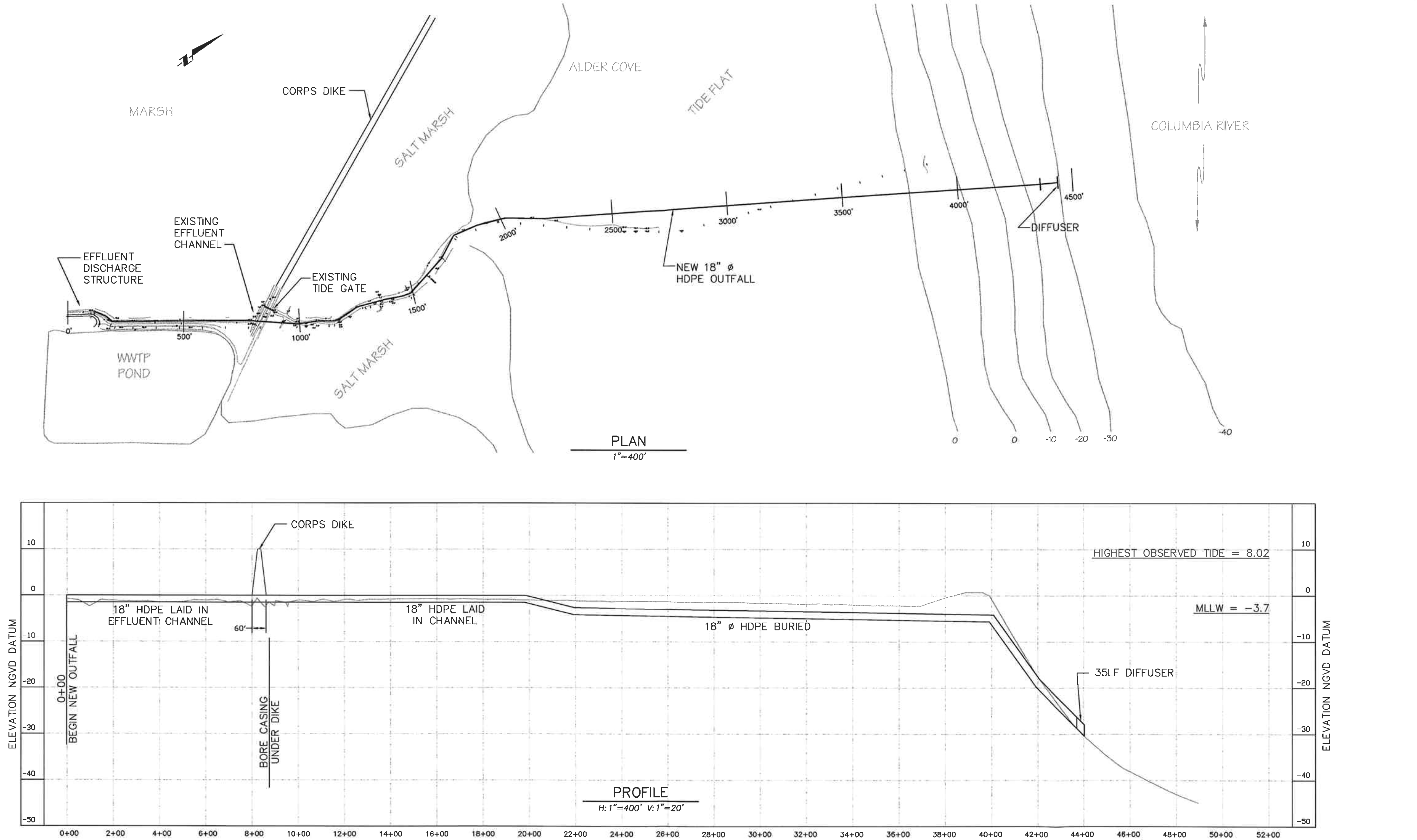
Therefore, due to the high projected costs of the advanced treatment required for the extended mixing zone at the existing ditch outfall, the recommended alternative is to construct a new outfall with an 8-port diffuser to the Columbia River channel. All water quality standards would be met within the proposed 100-foot mixing zone radius. The diffuser is recommended over the open-ended configuration due to the greater dilution achieved.

The outfall could be constructed exclusively for the Warrenton wastewater treatment plant, or as a joint project with Pacific Surimi Seafoods. If Pacific Surimi opts into the project, the dilution and water quality evaluations would need to be revised. However, the dilution factor for the diffuser option provides a significant margin of safety, such that compliance with water quality standards for a joint discharge is highly likely.

ALIGNMENT AND PROFILE

There are a number of potential routes for a new outfall to the Columbia River. If the deep outfall alternative is selected by the City, a more comprehensive study of alternatives may be required in consultation with permitting agencies. For the purposes of this mixing zone study, the most direct route has been selected. The alignment and profile are shown in Figure 11 and described below:

- The outfall would begin at the UV chamber outlet near the existing effluent weir.
- The ground profile is very flat for 4,000 feet. The pipe invert would be approximately elevation –1 NGVD through this section.
- Pipe material would be HDPE with external concrete anchors to provide negative buoyancy when filled with air.
- The outfall would be laid within the existing outfall ditch for approximately 800 lineal feet to the Corps of Engineers dike. Some excavation of the ditch may be required. The need for and quantity of backfill would be dependent on the future drainage needs of the marsh west of the treatment plant.
- A casing would be bored through the Corps dike and sealed after the outfall is pulled into place. The casing length would be approximately 60 feet.
    - The outfall would be installed within the existing channel and backfilled or armored for approximately 1,200 lineal feet seaward of the tide gate (Station 20+00±).



JOB: HLB001 FILE: HLB001F11

COSMOPOLITAN ENGINEERING GROUP
Civil, Environmental and Recreational Consulting

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Figure 11 New 18" Outfall Plan and Profile

- The outfall would traverse approximately 2,000 lineal feet of tideflat to the Columbia River channel. The outfall would be trenched, weighted and buried in this section. Low-impact construction techniques would be used, and the ground profile restored following construction. Low impact construction techniques include miniature excavators, rubber-tracked excavators, use of construction mats, and manual construction labor.

- The outfall would proceed down the channel slope to a depth of approximately –30 feet NGVD. The outfall would be buried out to the final depth, where the outfall would end in a 35-foot-long, 8-port diffuser.

HYDRAULICS

The outfall has preliminarily been sized as an 18-inch HDPE pipe with SDR rating of 17. The inside diameter is 16.88 inches. This outfall would provide capacity for the 2022 peak flow and beyond.

The hydraulic grade line at the UV chamber outlet is shown in Table 15 for several effluent flow and tide combinations. The datum is NGVD, which is the basis for existing City of Warrenton utility drawings.

Table 15 Hydraulic Grade Line at UV Chamber Outlet for Proposed Deep Outfall

Effluent Flow	Tide Condition	HGL (NGVD Datum)
2022 Annual Average (1.1 mgd)	Highest Observed MHHW MLLW	10.2 6.7 -1.7
2022 Peak Flow (4.7 mgd)	Highest Observed MHHW MLLW	33.2 29.7 21.3

Highest Observed Tide = 11.9' MLLW = 8.25 NGVD per NOS tidal benchmark at Ft. Stevens.
NGVD = National Geodetic Vertical Datum
MLLW = Mean Lower Low Water = 3.7' NGVD
MHHW = Mean Higher High Water = 8.4' MLLW = 4.7' NGVD

The projected UV chamber outlet elevation is approximately –1 foot NGVD. Effluent may flow by gravity during low tide and effluent flow conditions. However, effluent pumping will be necessary during high effluent flow or tide conditions. Effluent pumping will be required at least daily during all high tides.

Effluent pumping is highly recommended regardless of the HGL due to the flat grade of the outfall pipe. The most common mode of outfall failure is floatation due to air entrapment. Therefore, the outfall design is recommended to include full negative buoyancy in the event of air entrapment, along with effluent pumps to overcome air blockages.

COST ESTIMATE

A construction and project cost estimate is provided in Table 16. This estimate is a preliminary-level cost estimate, which should only be used for budget development purposes. There has been no significant design development to support this cost estimate, and no agencies have been consulted regarding potential design changes and environmental mitigation costs.

Table 16 Deep Outfall Cost Estimate

Item No.	Description	QTY	Unit	Unit Cost	Cost	Note
1	Mobilization	1	LS	$80,000	$80,000	
2	HDPE pipe 18" SDR 17	4,400	LF	$20	$89,760	24 lb/ft * $0.85/lb FOB Warrenton
3	HDPE fusion welder & operator	5	Day	$4,000	$20,000	
4	Concrete anchors	170	CY	$550	$93,500	Precast gravity anchors
5	Bedding	210	CY	$20	$4,200	
6	Backfill	730	CY	$25	$18,250	
7	24" casing under dike	1	LS	$41,000	$41,000	
8	Installation to dike	810	LF	$30	$24,300	
9	Installation in channel	1,200	LF	$40	$48,000	
10	Installation on tideflat	2,000	LF	$80	$160,000	
11	Channel slope and diffuser	5	Day	$13,000	$65,000	400 LF
				SUBTOTAL	**$644,010**	
			Contingency	30%	$193,203	
				CONSTRUCTION SUBTOTAL	**$837,213**	$10.15/LF/in. dia.
			Engineering, survey, geotech, CM, inspection	25%	$209,303	
			Permitting	10%	$83,721	
				PROJECT TOTAL	**$1,130,238**	

If the City decides to proceed with this alternative, the recommended next step is a predesign analysis of alternatives with input from permitting/regulatory agencies to aid in determining feasible routes and refining costs.

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Attachment A

Effluent Metals Data 2002

A1

June 19, 2002

HLB001

Columbia Analytical Services INC.
An Employee-Owned Company

July 17, 2002

Service Request No: K2204071

Merita Trohimovich
Cosmopolitan Engineering Group
117 S. 8th Street
Tacoma, WA 98402

RE: Warrenton/HLB001

Dear Merita:

Enclosed are the results of the sample(s) submitted to our laboratory on June 19, 2002. For your reference, these analyses have been assigned our service request number K2204071.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAC standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3280.

Respectfully submitted,

Columbia Analytical Services, Inc.

Les Kennedy
Project Chemist

LK/dj

1317 South 13th Avenue • P.O. Box 479 • Kelso, Washington 98626 • Telephone 360/ 577-7222 • Fax 360/636-1068

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
i	The MRL/MDL has been elevated due to a matrix interference.
X	See case narrative.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
B	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL has been elevated due to a matrix interference.
X	See case narrative.
*	The duplicate analysis not within control limits. See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results (25% for CLP Pesticides).
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
i	The MRL/MDL has been elevated due to a chromatographic interference.
X	See case narrative.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Cosmopolitan Engineering Group	**Service Request:**	K2204071
Project:	Warrenton/HLB001	**Date Collected:**	6/19/02
Sample Matrix:	Water	**Date Received:**	6/19/02
		Date Extracted:	NA
		Date Analyzed:	6/21/02

Ammonia as Nitrogen
EPA Method 350.1
Units: mg/L (ppm)

Sample Name	**Lab Code**	**MRL**	**Result**
Warrenton Effluent Weir	K2204071-001	0.05	0.08
Method Blank	K2204071-MB	0.05	ND

Approved By: Mil Dith Date: 7/2/02

04071WET EL1 - 1AMRL 7/2/02

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Cosmopolitan Engineering Group
Project: Warrenton/HLB001
Sample Matrix: Water

Service Request: K2204071
Date Collected: 6/19/02
Date Received: 6/19/02
Date Extracted: 6/27/02
Date Analyzed: 7/2/02

Hardness, as $CaCO_3$
EPA Method 6010B/ SM Method 2340B
Units: mg/L (ppm)

Sample Name	Lab Code	MRL	Result
Warrenton Effluent Weir	K2204071-001	0.4	52.7
Method Blank	K2204071-MB	0.4	ND

Approved By: Cf Brown Date: 7/16/02

1AMRL/102594

04071ICP.BR1 - Sample 7/15/02

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Cosmopolitan Engineering Group
Project: Warrenton/HLB001
Sample Matrix: Water

Service Request: K2204071
Date Collected: 6/19/02
Date Received: 6/19/02
Date Extracted: 6/26/02
Date Analyzed: 6/27/02

Total Mercury
EPA Method 1631
Units: ng/L (ppt)

Sample Name	Lab Code	MRL	Result
Warrenton Effluent Weir	K2204071-001	1.0	3.9
Method Blank	K2204071-MB	1.0	ND

Approved By: Cf Bravo Date: 7/16/02

1AMRL/102594

COLUMBIA ANALYTICAL SERVICES, INC.

- Cover Page -
INORGANIC ANALYSIS DATA PACKAGE

Client : Cosmopolitan Engineering Group
Project Name : Warrenton
Project No. : HLB001

Service Request : K2204071

Sample Name :	**Lab Code :**
Warrenton Effluent Weir	K2204071-001
Method Blank	K2204071-MB

Comments:

Approved By: [signature] Date: 7/16/02

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client :	Cosmopolitan Engineering Group	**Service Request :**	K2204071
Project Name :	Warrenton	**Date Collected :**	06/19/02
Project No. :	HLB001	**Date Received :**	06/19/02
Matrix :	Water	**Date Extracted :**	6/27, 7/11/02

Total Metals

Sample Name :	Warrenton Effluent Weir	**Units :**	ug/L (ppb)
Lab Code :	K2204071-001	**Basis :**	NA

Analyte	Analysis Method	MRL	Date Analyzed	Result	Result Notes
Aluminum	6010B	50	07/02/02	102	
Arsenic	200.8	0.5	07/10/02	0.6	
Cadmium	200.8	0.05	07/10/02	ND	
Chromium	6010B	5.0	07/02/02	ND	
Copper	200.8	0.1	07/10/02	4.7	
Iron	6010B	20	07/02/02	2060	
Lead	200.8	0.02	07/10/02	0.10	
Nickel	200.8	0.2	07/10/02	1.3	
Selenium	200.8	1.0	07/10/02	ND	
Silver	200.8	0.02	07/15/02	0.05	
Zinc	6010B	10	07/02/02	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client :	Cosmopolitan Engineering Group	**Service Request :**	K2204071
Project Name :	Warrenton	**Date Collected :**	NA
Project No. :	HLB001	**Date Received :**	NA
Matrix :	Water	**Date Extracted :**	6/27, 7/11/02

Total Metals

Sample Name :	Method Blank	**Units :**	ug/L (ppb)
Lab Code :	K2204071-MB	**Basis :**	NA

Analyte	Analysis Method	MRL	Date Analyzed	Result	Result Notes
Aluminum	6010B	50	07/02/02	ND	
Arsenic	200.8	0.5	07/10/02	ND	
Cadmium	200.8	0.05	07/10/02	ND	
Chromium	6010B	5.0	07/02/02	ND	
Copper	200.8	0.1	07/10/02	ND	
Iron	6010B	20	07/02/02	ND	
Lead	200.8	0.02	07/10/02	ND	
Nickel	200.8	0.2	07/10/02	ND	
Selenium	200.8	1.0	07/10/02	ND	
Silver	200.8	0.02	07/15/02	ND	
Zinc	6010B	10	07/02/02	ND	

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CHAIN OF CUSTODY

SR#: K2204071
PAGE 1 OF 1 COC #

PROJECT NAME Warrenton
PROJECT NUMBER HLB001
PROJECT MANAGER Merita Trohimovich
COMPANY/ADDRESS Cosmopolitan Engineering Group
117 South 8th Street
Tacoma, WA 98402
PHONE # 253 272-7220
FAX # 253 272-7250
SAMPLER'S SIGNATURE Merita Tr[illegible]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐	Volatile Organics 624☐ 8260☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐ 8021☐ BTEX☐	☐ Fuel Fingerprint (FIQ) ☐ NW-HCID Screen	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCB's Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081A☐ 8141A☐ 8151A☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	PAH'S 8310☐ SIM☐	Metals, Total or Dissolved (See list below) Trace Analysis	Cyanide☐ Hex-Chrom☐	pH, Cond., Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS (circle) NH3-N COD, Total-P, TKN, TOC, DOC (circle) NO2+NO3	TOX 9020☐ AOX 1650☐ 506☐	Hardness					REMARKS
Warrenton Effluent Weir	6/19														X		X		X					

REPORT REQUIREMENTS

✓ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # HLB001
Bill To: above

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
X Provide FAX Results
___ Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORHTWEST OTHER:____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

See Les Kennedy

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: Merita Tr[illegible] Date/Time: 6/19/02 13:30	Signature: [illegible] Date/Time: 6/19/02	Signature Date/Time	Signature Date/Time
Printed Name: Merita Trohimovich Firm: CEG	Printed Name: [illegible] Firm: CAS	Printed Name Firm	Printed Name Firm

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Project/Client Gonzales Work Order K22 04071

Cooler received on 4/20/02 and opened on 4/20/02 by KA

1.	Were custody seals on outside of cooler? If yes, how many and where?	Y	N
2.	Were seals intact and signature & date correct?	Y	N
3.	COC #		
	Temperature of cooler(s) upon receipt: 4.0		
	Temperature Blank: 2.4		
4.	Were custody papers properly filled out (ink, signed, etc.)?	Y	N
5.	Type of packing material present		
6.	Did all bottles arrive in good condition (unbroken)?	Y	N
7.	Were all bottle labels complete (*i.e.* analysis, preservation, etc.)?	Y	N
8.	Did all bottle labels and tags agree with custody papers?	Y	N
9.	Were the correct types of bottles used for the tests indicated?	Y	N
10.	Were all of the preserved bottles received at the lab with the appropriate pH?	Y	N
11.	Were VOA vials checked for absence of air bubbles, and if present, noted below?	~~Y~~	~~N~~
12.	Did the bottles originate from CAS/K or a branch laboratory?	Y	N
13.	Are CWA Microbiology samples received with > ½ the 24 hr. hold time remaining from collection?	~~Y~~	~~N~~
14.	Was CL2/Residual negative?	~~Y~~	~~N~~

Explain any discrepancies:

RESOLUTION:

Samples that required preservation or received out of temperature:

Sample ID	Reagent	Volume	Lot Number	Bottle Type	Rec'd out of Temperature	Initials

A2

July 15, 2002

HLB001

Columbia Analytical Services INC.
An Employee-Owned Company

August 5, 2002

Service Request No: K2204724

Merita Trohimovich
Cosmopolitan Engineering Group
117 S 8th Street
Tacoma, WA 98402

Re: Warrenton / HLB.001

Dear Merita:

Enclosed are the results of the sample(s) submitted to our laboratory on July 15, 2002. For your reference, these analyses have been assigned our service request number K2204724.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAC standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3280.

Respectfully submitted,

Columbia Analytical Services, Inc.

Les Kennedy
Project Chemist

LK/jeb

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Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- , The analyte was found in the associated method blank at a level that is significant relative to the sample result.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
- U The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
- i The MRL/MDL has been elevated due to a matrix interference.
- X See case narrative.

Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- B The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL has been elevated due to a matrix interference.
- X See case narrative.
- * The duplicate analysis not within control limits. See case narrative.
- \+ The correlation coefficient for the MSA is less than 0.995.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results (25% for CLP Pesticides).
- U The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
- i The MRL/MDL has been elevated due to a chromatographic interference.
- X See case narrative.

Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- J The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Cosmopolitan Engineering Group
Project: Warrenton/HLB.001
Sample Matrix: Water

Service Request: K2204724
Date Collected: 7/15/02
Date Received: 7/15/02
Date Extracted: NA
Date Analyzed: 7/18/02

Ammonia as Nitrogen
EPA Method 350.1
Units: mg/L (ppm)

Sample Name	Lab Code	MRL	Result
Warrenton Effluent weir	K2204724-001	0.05	0.13
Method Blank	K2204724-MB	0.05	ND

Approved By: ______________ Date: 7/25/02

04724WET.EL1 - 1AMRL 7/25/02

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Cosmopolitan Engineering Group
Project: Warrenton/HLB.001
Sample Matrix: Water

Service Request: K2204724
Date Collected: 7/15/02
Date Received: 7/15/02

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631
Test Notes:

Units: ng/L
Basis: NA

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Warrenton Effluent weir	K2204724-001	4.0	4	7/16/02	7/17/02	6.4	
Method Blank	K2204724-MB	1.0	1	7/16/02	7/17/02	ND	

Approved By: JL Date: 8/2/02

1A/052595

COLUMBIA ANALYTICAL SERVICES, INC.

- Cover Page -
INORGANIC ANALYSIS DATA PACKAGE

Client : Cosmopolitan Engineering Group
Project Name : Warrenton
Project No. : HLB.001

Service Request : K2204724

Sample Name :	**Lab Code :**
Warrenton Effluent weir	K2204724-001
Method Blank	K2204724-MB

Comments:

Approved By: Jeff Co

Date: 8/2/02

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client :	Cosmopolitan Engineering Group	**Service Request :**	K2204724
roject Name :	Warrenton	**Date Collected :**	07/15/02
Project No. :	HLB.001	**Date Received :**	07/15/02
Matrix :	Water	**Date Extracted :**	07/23/02

Total Metals

Sample Name :	Warrenton Effluent weir	**Units :**	ug/L (ppb)
Lab Code :	K2204724-001	**Basis :**	NA

Analyte	Analysis Method	MRL	Date Analyzed	Result	Result Notes
Aluminum	6010B	50	08/01/02	83	
Arsenic	200.8	0.5	08/01/02	0.8	
Cadmium	200.8	0.05	08/01/02	0.08	
Chromium	6010B	5.0	08/01/02	ND	
Copper	200.8	0.1	08/01/02	6.5	
Iron	6010B	20	08/01/02	1000	
Lead	200.8	0.02	08/01/02	0.13	
Nickel	200.8	0.2	08/01/02	1.5	
Selenium	200.8	1.0	08/01/02	1.4	
Silver	200.8	0.02	08/01/02	0.04	
Zinc	200.8	10	08/01/02	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client :	Cosmopolitan Engineering Group	**Service Request :**	K2204724
Project Name :	Warrenton	**Date Collected :**	NA
Project No. :	HLB.001	**Date Received :**	NA
Matrix :	Water	**Date Extracted :**	07/23/02

Total Metals

Sample Name :	Method Blank	**Units :**	ug/L (ppb)
Lab Code :	K2204724-MB	**Basis :**	NA

Analyte	Analysis Method	MRL	Date Analyzed	Result	Result Notes
Aluminum	6010B	50	08/01/02	ND	
Arsenic	200.8	0.5	08/01/02	ND	
Cadmium	200.8	0.05	08/01/02	ND	
Chromium	6010B	5.0	08/01/02	ND	
Copper	200.8	0.1	08/01/02	ND	
Iron	6010B	20	08/01/02	ND	
Lead	200.8	0.02	08/01/02	ND	
Nickel	200.8	0.2	08/01/02	ND	
Selenium	200.8	1.0	08/01/02	ND	
Silver	200.8	0.02	08/01/02	ND	
Zinc	200.8	10	08/01/02	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Cosmopolitan Engineering Group	**Service Request:**	K2204724
Project:	Warrenton/HLB.001	**Date Collected:**	7/15/02
Sample Matrix:	Water	**Date Received:**	7/15/02
		Date Extracted:	7/23/02
		Date Analyzed:	8/1/02

Hardness, as CaCO3
EPA Method 6010B/ SM Method 2340B
Units: mg/L (ppm)

Sample Name	**Lab Code**	**MRL**	**Result**
Warrenton Effluent weir	K2204724-001	0.2	55.4
Method Blank	K2204724-MB	0.2	ND

Approved By: ___ill___ Date: 8/5/02

1AMRL/102594

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Hand Del

Project/Client Cosmop　　Work Order K22 4724

Cooler received on 7/14/02 and opened on 7/14/02 by FA

1.	Were custody seals on outside of cooler? If yes, how many and where?					Y (N)
2.	Were seals intact and signature & date correct?					Y (N)
3.	COC #					
	Temperature of cooler(s) upon receipt:	8.6				
	Temperature Blank:	7.4				
4.	Were custody papers properly filled out (ink, signed, etc.)?					(Y) N
5.	Type of packing material present					
6.	Did all bottles arrive in good condition (unbroken)?					(Y) N
7.	Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? no					~~Y N~~ KN
8.	Did all bottle labels and tags agree with custody papers?					(Y) N
9.	Were the correct types of bottles used for the tests indicated?					(Y) N
10.	Were all of the preserved bottles received at the lab with the appropriate pH?					(Y) N
11.	Were VOA vials checked for absence of air bubbles, and if present, noted below?					~~Y N~~
12.	Did the bottles originate from CAS/K or a branch laboratory?					(Y) N
13.	Are CWA Microbiology samples received with > ½ the 24 hr. hold time remaining from collection?					~~Y N~~
14.	Was CL2/Residual negative?					~~Y N~~

Explain any discrepancies: 1631-HG on bottle order w/ a blue bottle rec'd. 7/15 on 1L Red + 500 yellow. No sample ID, or date on 500 Blue.

RESOLUTION:

Samples that required preservation or received out of temperature:

Sample ID	Reagent	Volume	Lot Number	Bottle Type	Rec'd out of Temperature	Initials

CRFREV.DOC12/24/01

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CHAIN OF CUSTODY

SR#: K2205824.

PAGE 1 OF 1 COC #

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000010

PROJECT NAME Warrenton
PROJECT NUMBER HLB·001
PROJECT MANAGER Merita Trohimovich
COMPANY/ADDRESS Cosmopolitan Engineering Group
117 South 8th St / Tacoma, WA 98402
PHONE # 253 272 7220 FAX # 253 272-7250
SAMPLER'S SIGNATURE Merita Trohimovich

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐	Volatile Organics 624 ☐ 8260 ☐ 8021 ☐ BTEX ☐	Hydrocarbons (*see below) Gas ☐ Diesel ☐ Oil ☐	☐ Fuel Fingerprint (FIQ) ☐ NW-HCID Screen	Oil & Grease/TRPH 1664 HEM ☐ 1664 SGT ☐	PCB's Aroclors ☐ Congeners ☐	Pesticides/Herbicides 608 ☐ 8081A ☐ 8141A ☐ 8151A ☐	Chlorophenolics - 8151M Tri ☐ Tetra ☐ PCP ☐	PAHS 8310 ☐ SIM ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐	pH, Cond, Cl, SO4, PO4, F, NO2, Hex-Chrom ☐	NO3, BOD, TSS, TDS (circle) NH3-N COD, Total-P, TKN, TOC, DOC (circle) NO2+NO3	TOX 9020 ☐ AOX 1650 ☐ 506 ☐	Hardness					REMARKS
Warrenton					3										X			X		X					
Effluent weir																									

REPORT REQUIREMENTS

✓ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # HLB·001
Bill To: above

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
X Provide FAX Results

___ Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORHTWEST OTHER:_____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

See Les Kennedy

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: Merita Trohimovich Date/Time: 7/15/02 14:00	Signature: T. Griffis Date/Time: 7/15 2:40pm	Signature: T. Griffis Date/Time: 4:35 7/15	Signature: [illegible] Date/Time: 7/15/02 1635
Printed Name: Merita Trohimovich Firm: CEG	Printed Name: T. Griffis Firm: HLB	Printed Name: T. Griffis Firm: HLB	Printed Name: A Paynter Firm: CAS

A3

August 5, 2002

Columbia Analytical Services INC.
An Employee-Owned Company

August 15, 2002

Service Request No: K2205254

Merita Trohimivich
Cosmopolitan Engineering Group
117 S 8th Street
Tacoma, WA 98402

Re: Warrenton / HLB .001

Dear Merita:

Enclosed are the results of the sample(s) submitted to our laboratory on August 5, 2002. For your reference, these analyses have been assigned our service request number K2205254.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAC standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3280.

Respectfully submitted,

Columbia Analytical Services, Inc.

Les Kennedy
Project Chemist

LK/jeb

NELAC Accredited
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ACIL Seal of Excellence Laboratory

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- \# The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
- U The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
- i The MRL/MDL has been elevated due to a matrix interference.
- X See case narrative.

Metals Data Qualifiers

- \# The control limit criteria is not applicable. See case narrative.
- B The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL has been elevated due to a matrix interference.
- X See case narrative.
- * The duplicate analysis not within control limits. See case narrative.
- \+ The correlation coefficient for the MSA is less than 0.995.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
- \# The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results (25% for CLP Pesticides).
- U The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
- i The MRL/MDL has been elevated due to a chromatographic interference.
- X See case narrative.

Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Cosmopolitan Engineering Group	**Service Request:**	K2205254
Project:	Warrenton/HLB .001	**Date Collected:**	8/5/02
Sample Matrix:	Water	**Date Received:**	8/5/02
		Date Extracted:	NA
		Date Analyzed:	8/8/02

Ammonia as Nitrogen
EPA Method 350.1
Units: mg/L (ppm)

Sample Name	**Lab Code**	**MRL**	**Result**
Warrenton Effluent	K2205254-001	0.05	0.26
Method Blank	K2205254-MB	0.05	ND

Approved By: Mil Dith Date: 8/14/02

05254WET.EL1 - 1AMRL 8/12/02

COLUMBIA ANALYTICAL SERVICES, INC.

- Cover Page -
INORGANIC ANALYSIS DATA PACKAGE

Client : Cosmopolitan Engineering Group
Project Name : Warrenton
Project No. : HLB .001

Service Request : K2205254

Sample Name :	**Lab Code :**
Warrenton Effluent	K2205254-001
Method Blank	K2205254-MB

Comments:

Approved By: Jeff Coe

Date: 8/14/02

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client :	Cosmopolitan Engineering Group	**Service Request :**	K2205254
Project Name :	Warrenton	**Date Collected :**	08/05/02
Project No. :	HLB .001	**Date Received :**	08/05/02
Matrix :	Water	**Date Extracted :**	08/08/02

Total Metals

Sample Name :	Warrenton Effluent	**Units :**	ug/L (ppb)
Lab Code :	K2205254-001	**Basis :**	NA

Analyte	Analysis Method	MRL	Date Analyzed	Result	Result Notes
Aluminum	6010B	50	08/14/02	64	
Arsenic	200.8	0.5	08/13/02	0.5	
Cadmium	200.8	0.05	08/13/02	ND	
Chromium	6010B	5.0	08/14/02	ND	
Copper	200.8	0.1	08/13/02	3.2	
Iron	6010B	20	08/14/02	747	
Lead	200.8	0.04	08/13/02	ND	
Nickel	200.8	0.2	08/13/02	0.8	
Selenium	200.8	1.0	08/13/02	ND	
Silver	200.8	0.02	08/13/02	ND	
Zinc	6010B	10	08/14/02	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client :	Cosmopolitan Engineering Group	**Service Request :**	K2205254
Project Name :	Warrenton	**Date Collected :**	NA
Project No. :	HLB .001	**Date Received :**	NA
Matrix :	Water	**Date Extracted :**	08/08/02

Total Metals

Sample Name :	Method Blank	**Units :**	ug/L (ppb)
Lab Code :	K2205254-MB	**Basis :**	NA

Analyte	Analysis Method	MRL	Date Analyzed	Result	Result Notes
Aluminum	6010B	50	08/14/02	ND	
Arsenic	200.8	0.5	08/13/02	ND	
Cadmium	200.8	0.05	08/13/02	ND	
Chromium	6010B	5.0	08/14/02	ND	
Copper	200.8	0.1	08/13/02	ND	
Iron	6010B	20	08/14/02	ND	
Lead	200.8	0.04	08/13/02	ND	
Nickel	200.8	0.2	08/13/02	ND	
Selenium	200.8	1.0	08/13/02	ND	
Silver	200.8	0.02	08/13/02	ND	
Zinc	6010B	10	08/14/02	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Cosmopolitan Engineering Group
Project: Warrenton/HLB .001
Sample Matrix: Water

Service Request: K2205254
Date Collected: 8/5/02
Date Received: 8/5/02

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631
Test Notes:

Units: ng/L
Basis: NA

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Warrenton Effluent	K2205254-001	1.0	1	8/6/02	8/7/02	4.8	
Method Blank	K2205254-MB	1.0	1	8/6/02	8/7/02	ND	

Approved By: _______________ Date: 8/14/02

1A/052595
05254ICP.JB1 - Sample 8/8/02

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Cosmopolitan Engineering Group	**Service Request:**	K2205254
Project:	Warrenton/HLB .001	**Date Collected:**	8/5/02
Sample Matrix:	Water	**Date Received:**	8/5/02
		Date Extracted:	8/8/02
		Date Analyzed:	8/14/02

Hardness, as CaCO3
EPA Method 6010B/ SM Method 2340B
Units: mg/L (ppm)

Sample Name	Lab Code	MRL	Result
Warrenton Effluent	K2205254-001	0.4	59.3
Method Blank	K2205254-MB	0.4	ND

Approved By: ____JC____ Date: 8/14/02

1AMRL/102594

Analytical Services INC.
An Employee-Owned Company
1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222x07 • FAX (360) 636-1068

CHAIN OF CUSTODY

SR#: K2205254

PAGE ____ OF ____ COC # ____

00010

PROJECT NAME Warrenton
PROJECT NUMBER HLB . 001
PROJECT MANAGER Merita Trohimivich
COMPANY/ADDRESS ~~Cosmopolitan Engineering Group~~
117 South 8th St., Tacoma, WA 98402
PHONE # 253 272 7924 FAX # 253 272 7250
SAMPLER'S SIGNATURE Jeff Harrington Jeff Harrington

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐	Volatile Organics 624☐ 8260☐ 8021☐ BTEX☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐	Fuel Fingerprint (FIQ) ☐ NW-HCID Screen ☐	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCB's Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081A☐ 8141A☐ 8151A☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	PAHS 8310☐ SIM☐	Metals, Total or Dissolved (See list below)	Cyanide☐ Hex-Chrom☐	pH, Cond., Cl, SO4, PO4, F, NO_2, NO_3, BOD, TSS, TDS (circle)	NH_3-N, COD, Total-P, TKN, TOC, DOC (circle) NO_2+NO_3	TOX 9020☐ AOX 1650☐ 506☐					REMARKS

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # ~~HLB 001~~
Bill To: ~~Above~~

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
___ Standard (10-15 working days)
___ Provide FAX Results
___ Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORHTWEST OTHER:____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date/Time: 8/4/02 10:30	Signature: [signature] Date/Time: 8/5/02 10:30	Signature Date/Time	Signature: [signature] Date/Time: 8/5/02 MHS
Printed Name: Jeff Harrington Firm: HLB	Printed Name: Charles Carey Firm: Central Courier	Printed Name Firm	Printed Name: A. Paynton Firm: CAS

COC #1 04/02

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Project/Client Cosmopolitan Eng Work Order K22 05254

Cooler received on 8/5/12 and opened on 8/5/12 by T Black

1. Were custody seals on outside of cooler? Coastal Couri Y **N**
   If yes, how many and where?

2. Were seals intact and signature & date correct? Y **N**

3. COC #

Temperature of cooler(s) upon receipt:	2.0				
Temperature Blank:	n/a				

4. Were custody papers properly filled out (ink, signed, etc.)? Y **N**
5. Type of packing material present 1 wrap
6. Did all bottles arrive in good condition (unbroken)? **Y** N
7. Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? **Y** N
8. Did all bottle labels and tags agree with custody papers? ~~Y N~~
9. Were the correct types of bottles used for the tests indicated? **Y** N
10. Were all of the preserved bottles received at the lab with the appropriate pH? **Y** N
11. Were VOA vials checked for absence of air bubbles, and if present, noted below? ~~Y N~~
12. Did the bottles originate from CAS/K or a branch laboratory? **Y** N
13. Are CWA Microbiology samples received with > ½ the 24 hr. hold time remaining from collection? ~~Y N~~
14. Was CL2/Residual negative? ~~Y N~~

Explain any discrepancies: NO SAMPLES LISTED, NO TESTS MARKED used previous to find tests

RESOLUTION:

Samples that required preservation or received out of temperature:

Sample ID	Reagent	Volume	Lot Number	Bottle Type	Rec'd out of Temperature	Initials

Attachment B

SCUFA Specifications

Cosmopolitan Engineering

SCUFA®

SELF-CONTAINED UNDERWATER FLUORESCENCE APPARATUS

User's Manual

Dated: 6/19/01
Revision: 2.0
P/N: 998-2002

TURNER DESIGNS
845 W. Maude Avenue • Sunnyvale, CA 94085
(408) 749-0994 • FAX (408) 749-0998
www.turnerdesigns.com

Appendix A.
Specifications

A1. Model Specifications

	SCUFA®I (2000-001)	SCUFA®II (2000-002)	SCUFA®III (2000-003)
Application	Chlorophyll *a*	Chlorophyll *a*	Rhodamine WT
Turbidity Channel	No	Yes	Yes
Interface Software	Yes	Yes	Yes
Depth Rating	600m	600m	600m
Temperature Compensation	Yes	Yes	Yes
PC Interface Cable	Yes	Yes	Yes

A2. SCUFA® Specifications

	Chlorophyll	Rhodamine WT
Minimum Detection Limit (Fluorescence)	0.02μg/L *	0.04ppb
Minimum Detection Limit (Turbidity)	0.05NTU	0.05NTU
Dynamic Range (Fluorescence)	4 orders of magnitude	4 orders of magnitude
Dynamic Range (Turbidity)	3 orders of magnitude	3 orders of magnitude
Resolution	12 bit	12 bit
Power Draw (Max Sampling Rate)	50mA	50mA
Power Draw (IDL Sleep)	50μA	50μA
Input Voltage	7–15V DC	7–15V DC
Signal Output	0–5V/RS-232	0–5V/RS-232
Connector	Impulse (MCBH-8-MS SS)	Impulse (MCBH-8-MS SS)
Temperature Range	-2 to 40°C	-2 to 40°C
Light Source	Ultra-Bright Blue LED(2)	Ultra-Bright Green LED(2)
Detector	Photodiode	Photodiode
Optics	460FS30 / 685FS30	530FS20 / 600FS20
Weight in Air	1.98lb (0.9kg)	1.98lb (0.9kg)
Diameter	2.5" (6.35cm)	2.5" (6.35cm)
Length	10" (25.4cm)	10" (25.4cm)

* Minimum detection limit determined using *Isochrysis sp.* laboratory cultures.

Instrument Features

The following features are specific to the Turner Designs SCUFA Submersible Fluorometer:

✱ Dual Channel

The SCUFA Series Fluorometer can be configured to have a primary fluorescence channel to detect chlorophyll *a* or Rhodamine WT. The secondary channel will allow for simultaneous turbidity measurement.

✱ Windows-based Interface Software

Easy-to-use software guides the user through calibration and analysis.

✱ Digital or Analog Data Output

The SCUFA is a versatile instrument, capable of operating under a variety of user-selectable settings. Data can be transmitted through an RS-232 serial line to any PC or printer. In addition, the SCUFA can output 0-5V to interface with external data loggers and CTDs.

✱ Automatic Temperature Compensation (optional)

Fluorescent molecules fluoresce at different intensities at different temperatures. In most cases, fluorescence decreases as temperature increases. If this change is not accounted for, substantial errors may result. The SCUFA can be configured with a temperature compensation package for fully automatic temperature correction.

✱ Internal Data Logging (optional)

As an option, a powerful data logger can be built into the submersible fluorometer. This feature is a distinct advantage if you choose to carry minimal accessories or if you would like to avoid external connections. Using it in conjunction with the windows interface software is an excellent way to ensure that important data will not be lost. It can store up to 11,500 data points.

✱ Solid Secondary Standard (optional)

An invaluable accessory for the SCUFA Fluorometer to enable the user to easily check the SCUFA's performance and calibration.

✱ Copper Anti-Fouling System (optional)

The Copper Anti-Fouling System slow down the growth of bio-fouling organisms on the optics of the SCUFA. When installed, the copper components slowly dissolve, releasing copper ions into the environment surrounding the optics. The copper ions act as an inhibitor to growth of organisms.

Instrument Features Continued

Summary of Features and Benefits for the SCUFA Submersible Fluorometer

Feature	Advantage	Customer Benefit
Flexibility	Chlorophyll, tracer dye and turbidity.	* Dual channels to detect fluorescence and turbidity. * Configurable for both profiling and moored applications. * Open optics and flow-through mode.
Analog Interface	0-5V Analog output.	* User selectable. * Interfaces with external data loggers and most CTDs on the market.
Auto-ranging	Range switching.	* Provides maximum flexibility for varying sample concentrations. * Saves time & labor by eliminating manual switching. * Helps eliminate dilution & retesting. * Increases confidence in results.
Automatic Temperature Compensation	Temperature compensation of sample reading.	* Simplifies operation. * Provides more accurate results. * Saves time. * No additional equipment required. * Calculations made automatically.
Data Logging, Internal	11,500 Data points.	* Eliminates extra equipment/connections in field testing. * Easy to program and use. * Interface software provided.
Digital Interface	RS-232; serial port to computer or printer.	* Commonly known & used. * User selectable. * Increases user's options for data collection.
Direct Concentration Readout	Internal calculations.	* Saves time & labor by eliminating hand calculations. * Eliminates transcription errors. * Eliminates math errors by automatically calculating results. * Increases confidence in results.
Interface Software	Displays up to 6 interface screens.	* Simplifies operation. * Calibrations, sampling parameters, data collection, and diagnostics programmable by user. * Provides user flexibility.

Definitions:

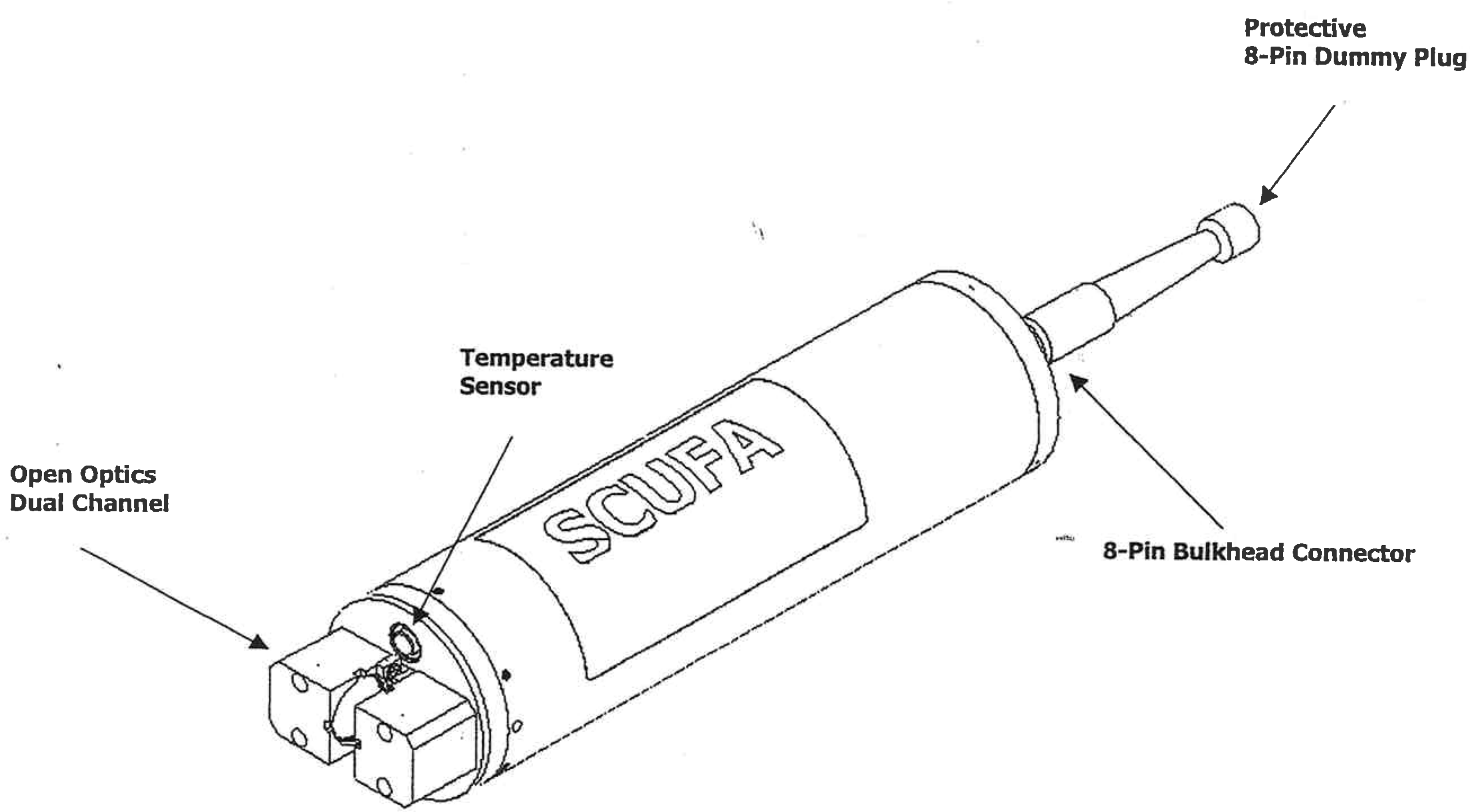
Feature: An item or thing associated with a system or product.

Advantage: Describes the particular feature. Generally in comparison to the competition or the previous system or product.

Benefit: Most important of all of the above. Relates the features of the system or product to the customer. Benefits are what the customer relates to and why the customer is buying.

Instrument Features

Continued



Attachment C

Dye Study Results 7/17/02

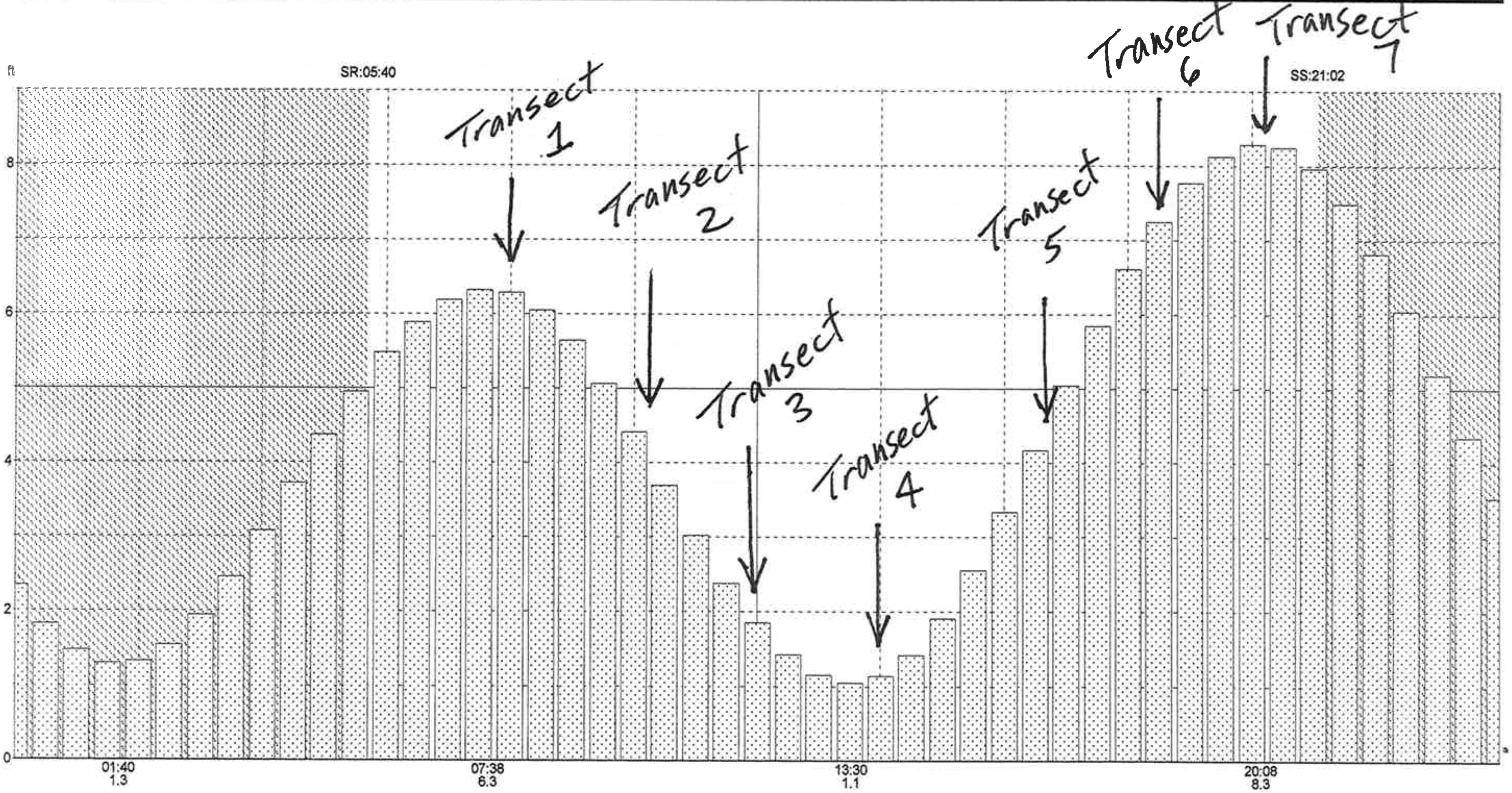
Tides-Warrenton, Skipanon River, Oreg.

based on Astoria, Tongue Point, Oregon (NOAA)
46° 10 N 123° 55 W

Wednesday, July 17, 2002

Average Tides	
Mean Range:	6.5 ft
MHHW:	8.3 ft
Mean Tide:	4.4 ft

Daily Highs & Lows		
01:40	1.3 ft	Low
07:38	6.3 ft	High
13:30	1.1 ft	Low
20:08	8.3 ft	High



(PDT)	Tide
00:00	2.3 ft
00:30	1.8 ft
01:00	1.5 ft
01:30	1.3 ft
02:00	1.3 ft
02:30	1.5 ft
03:00	1.9 ft
03:30	2.5 ft
04:00	3.1 ft
04:30	3.7 ft
05:00	4.4 ft
05:30	5.0 ft
06:00	5.5 ft
06:30	5.9 ft
07:00	6.2 ft
07:30	6.3 ft
08:00	6.3 ft
08:30	6.1 ft
09:00	5.6 ft
09:30	5.1 ft
10:00	4.4 ft
10:30	3.7 ft
11:00	3.0 ft
11:30	2.4 ft
12:00	1.9 ft
12:30	1.4 ft
13:00	1.2 ft
13:30	1.1 ft
14:00	1.1 ft
14:30	1.4 ft
15:00	1.9 ft
15:30	2.6 ft
16:00	3.3 ft
16:30	4.2 ft
17:00	5.0 ft
17:30	5.9 ft
18:00	6.6 ft
18:30	7.3 ft
19:00	7.8 ft
19:30	8.1 ft
20:00	8.3 ft
20:30	8.2 ft
21:00	8.0 ft
21:30	7.5 ft
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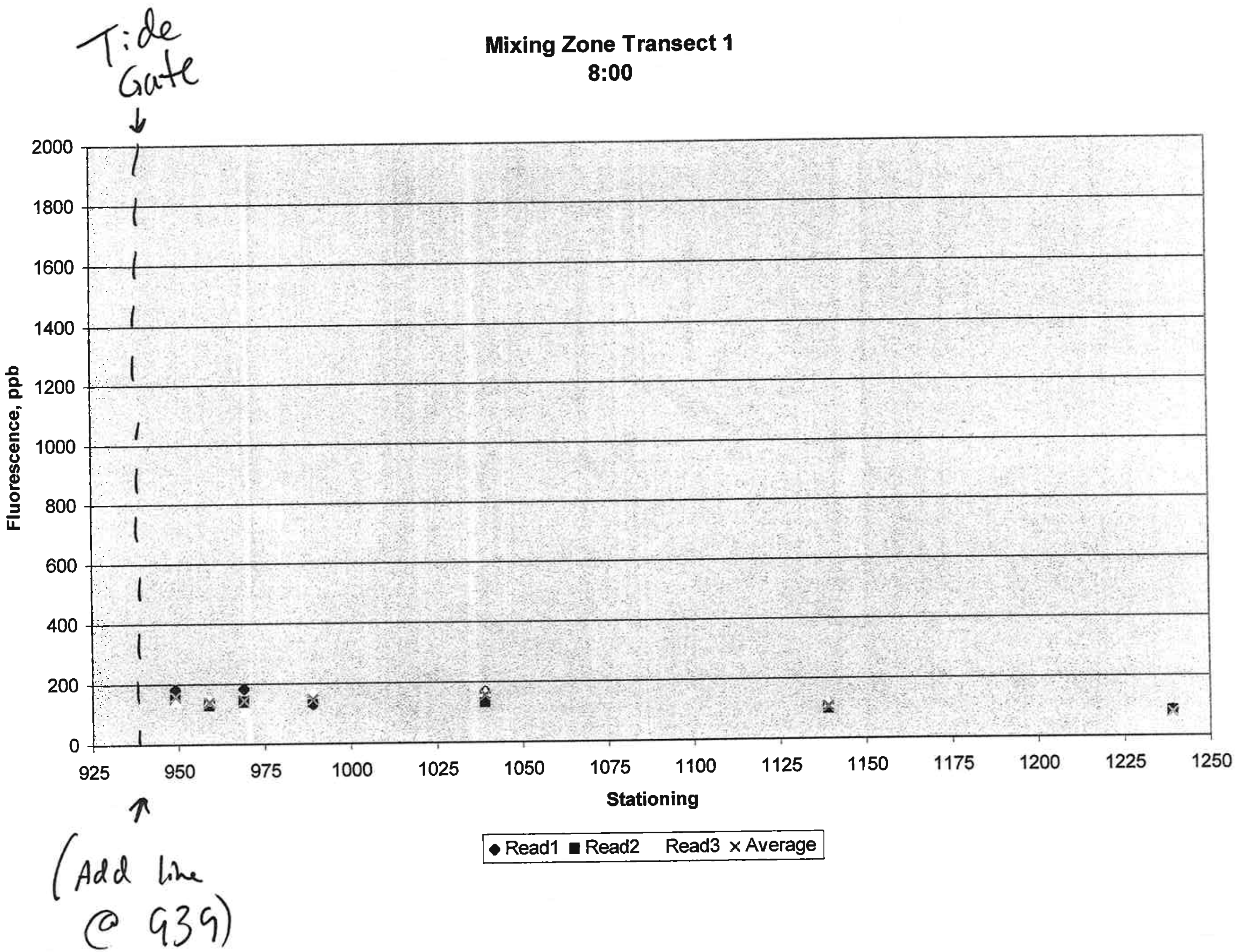
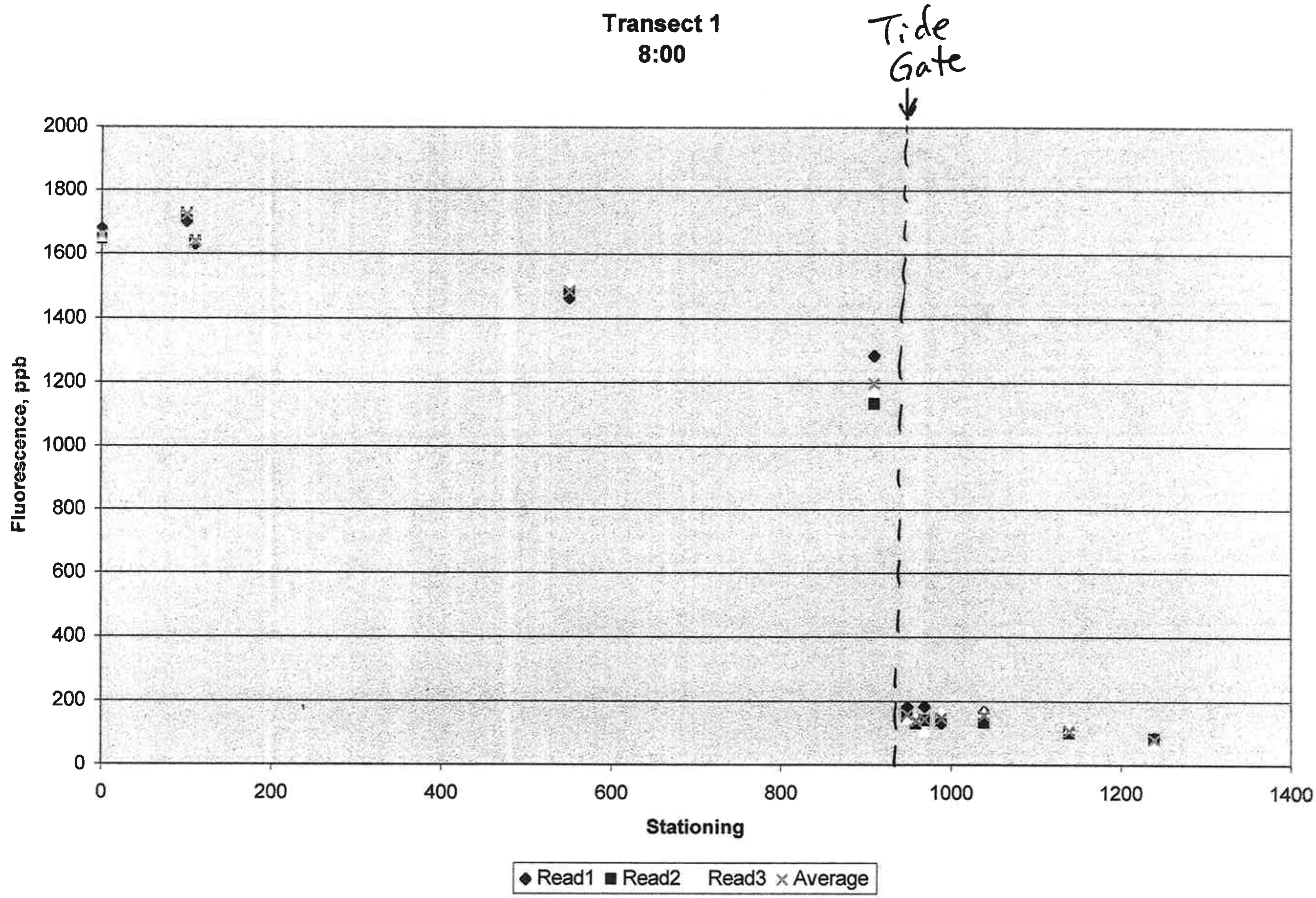
23:00	5.2 ft
23:30	4.4 ft
00:00	3.5 ft


Tide Gate
Mixing Zone Transect 1
8:00
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Fluorescence, ppb
925
950
975
1000
1025
1050
1075
1100
1125
1150
1175
1200
1225
1250
Stationing
Read1 Read2 Read3 x Average
(Add line @ 939)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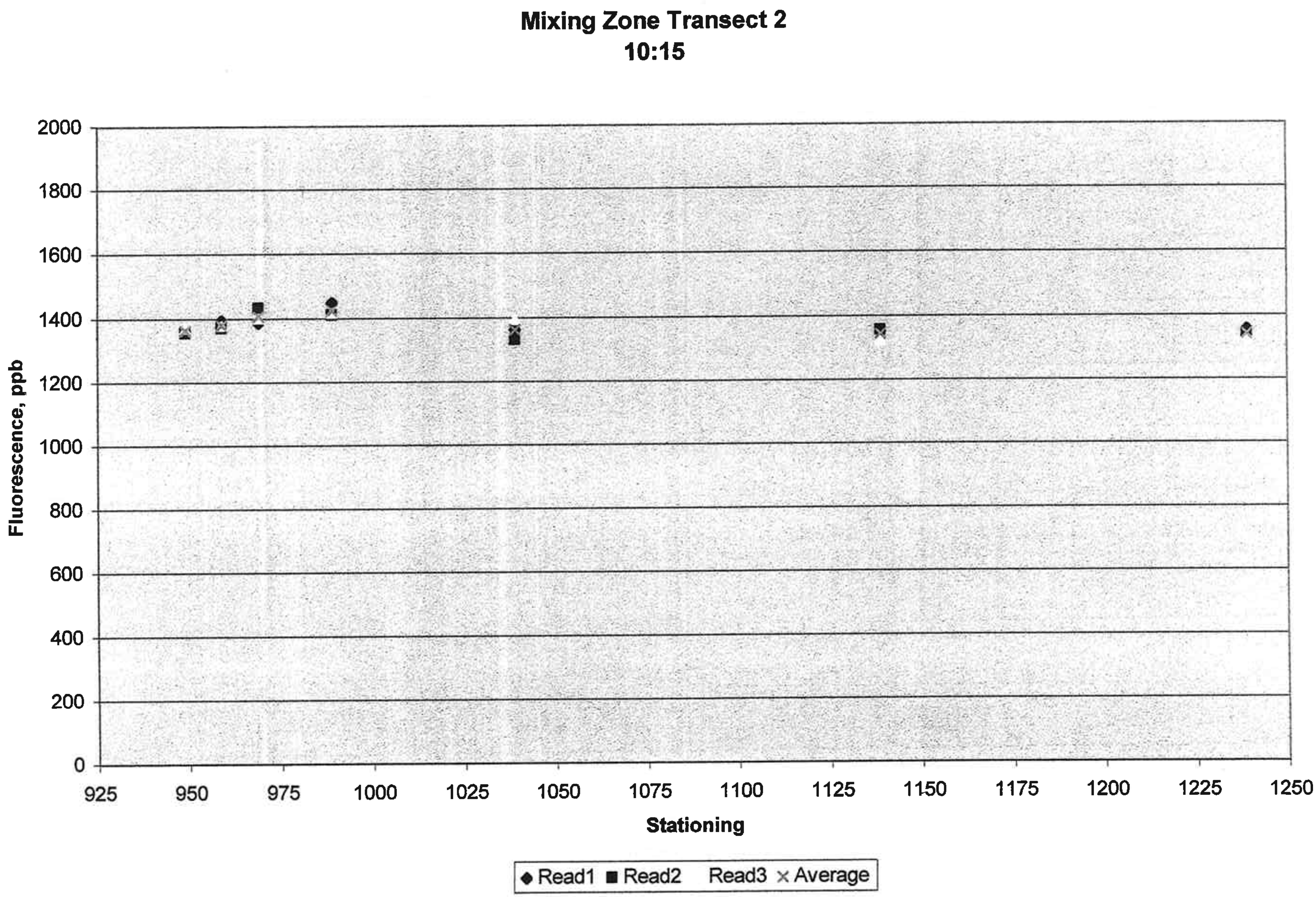
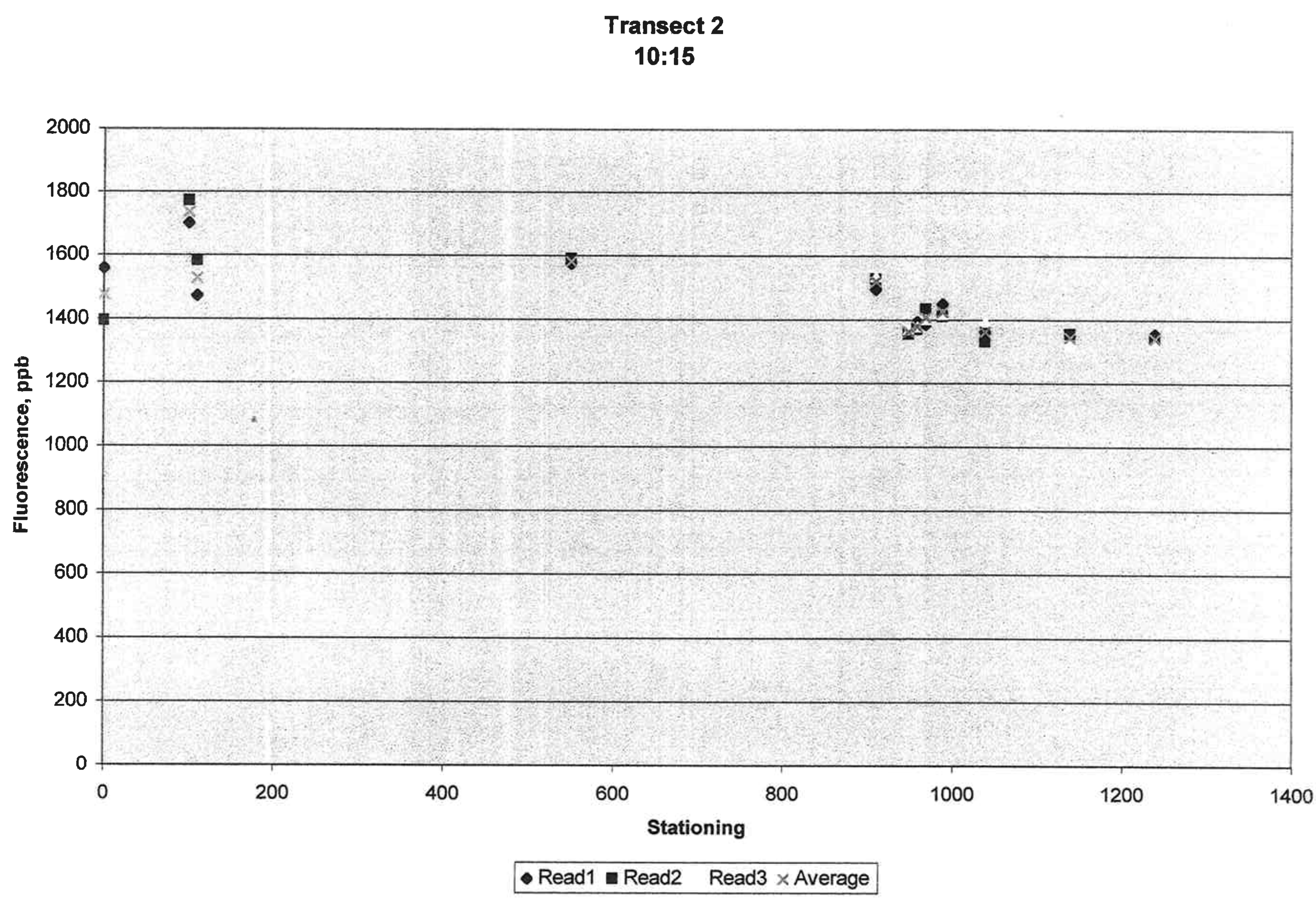
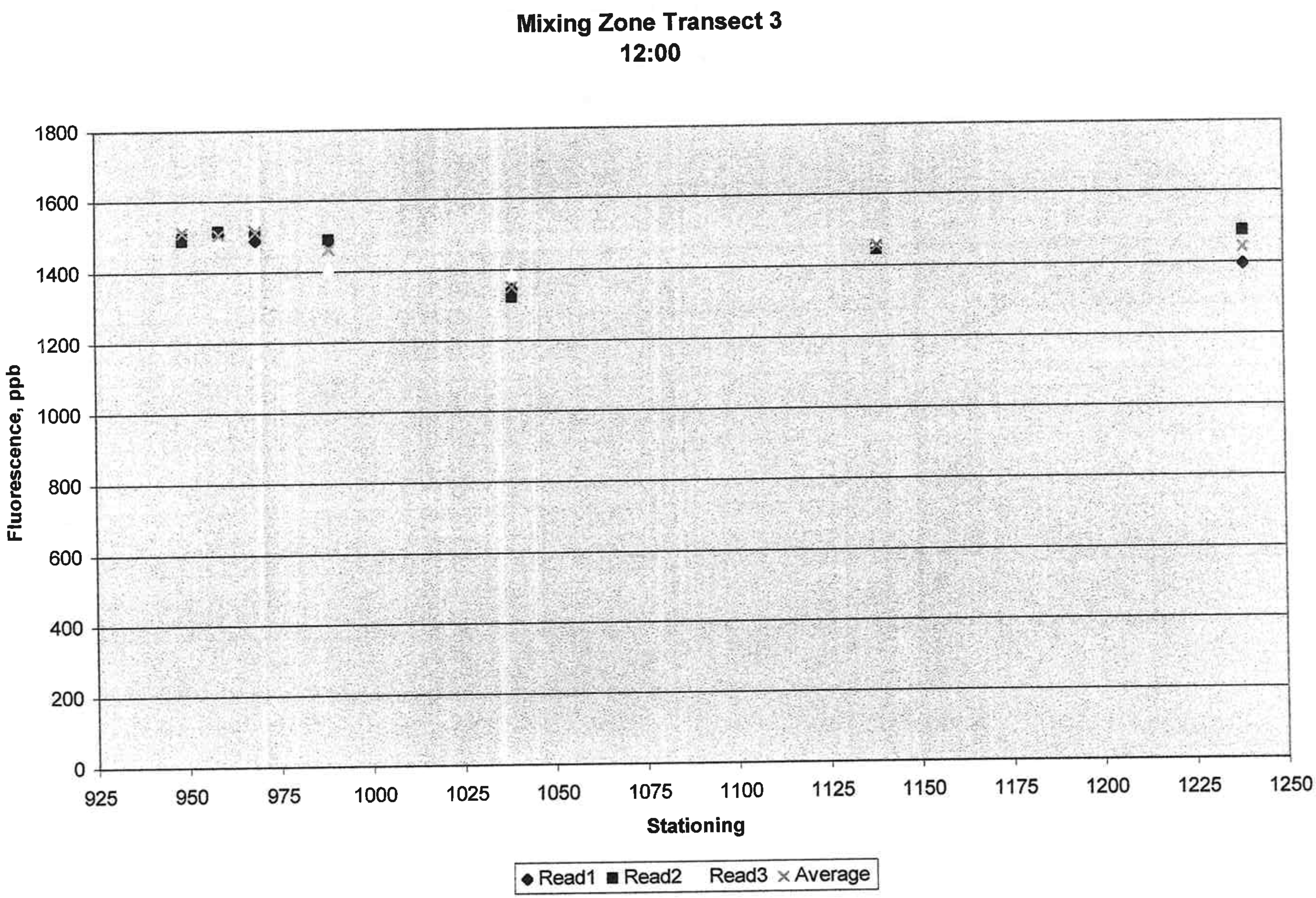
8:00
Tide Gate
Fluorescence, ppb
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Stationing
0
200
400
600
800
1000
1200
1400
Read1
Read2
Read3
Average

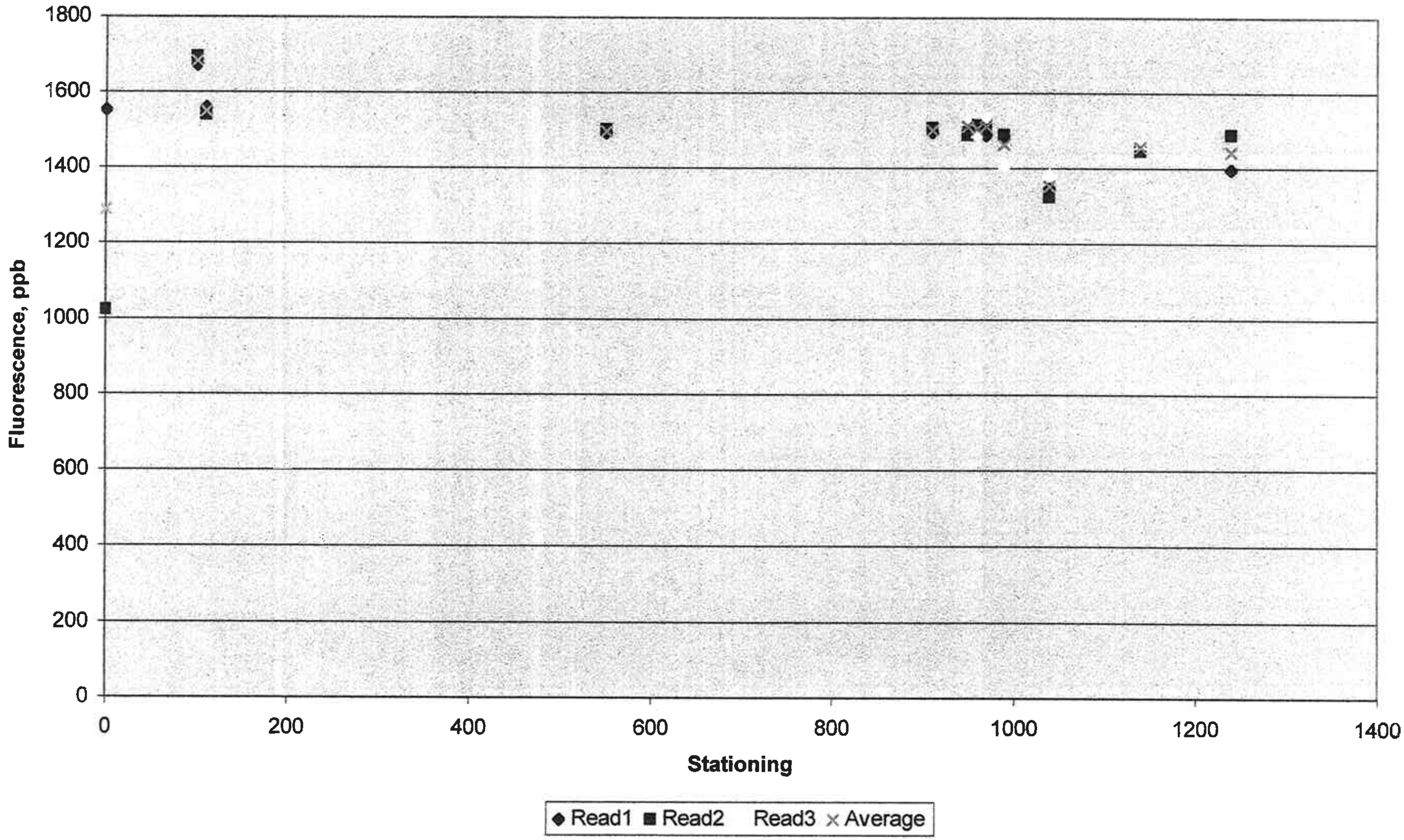


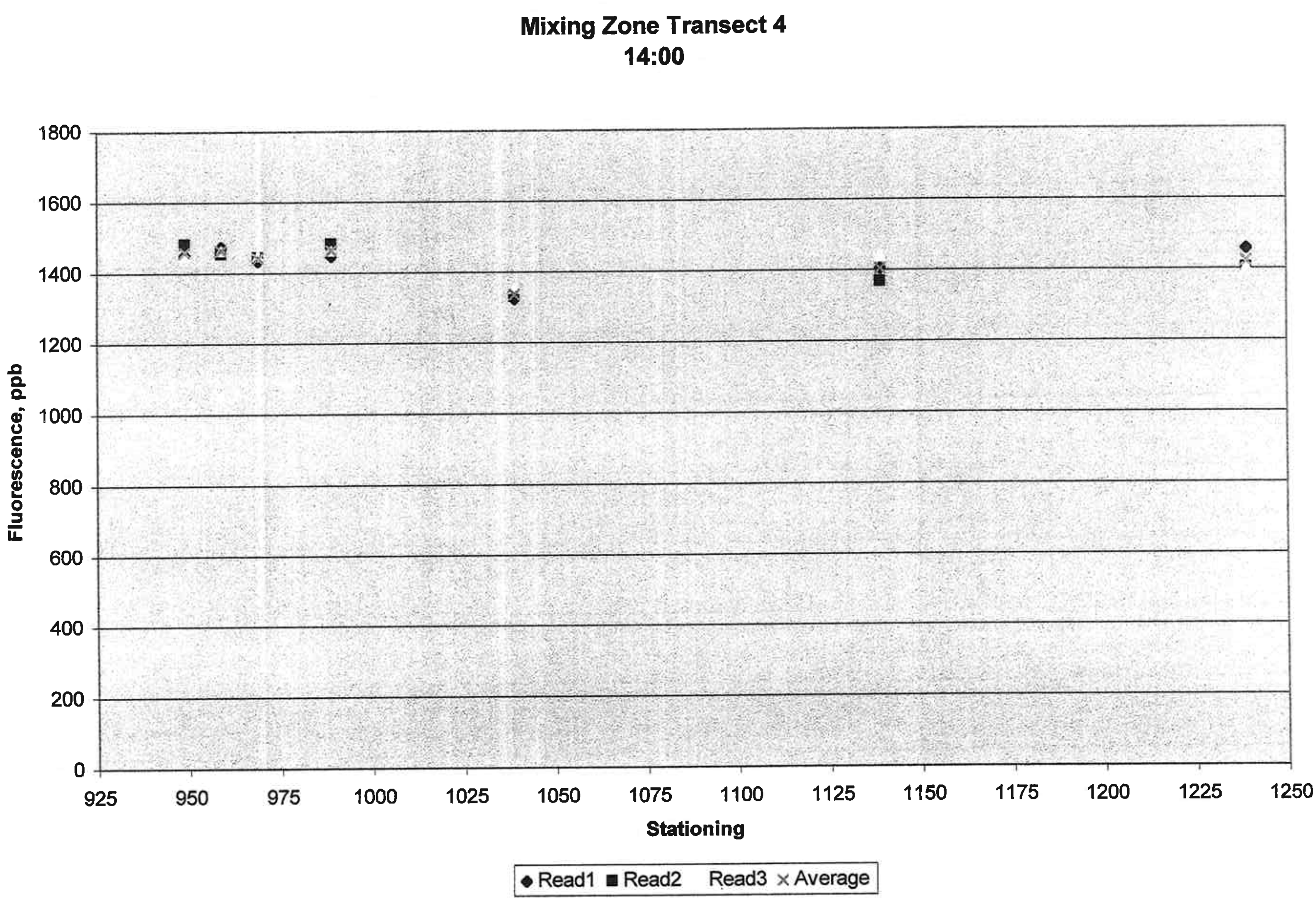
Mixing Zone Transect 2
10:15
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Fluorescence, ppb
925
950
975
1000
1025
1050
1075
1100
1125
1150
1175
1200
1225
1250
Stationing
Read1
Read2
Read3
Average


Transect 2
10:15
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Fluorescence, ppb
0
200
400
600
800
1000
1200
1400
Stationing
Read1
Read2
Read3
Average

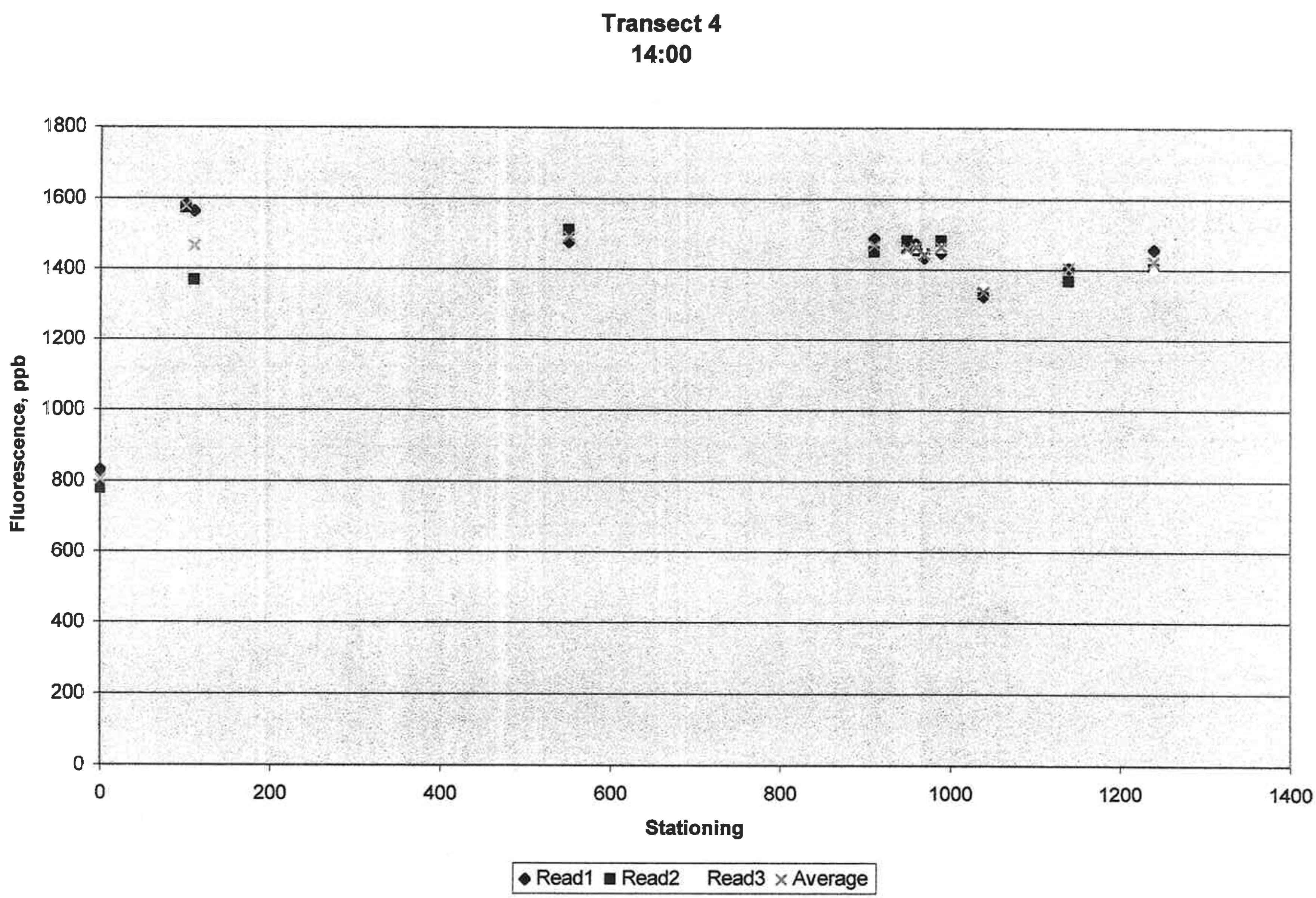

Mixing Zone Transect 3
12:00
Fluorescence, ppb
1800
1600
1400
1200
1000
800
600
400
200
0
925
950
975
1000
1025
1050
1075
1100
1125
1150
1175
1200
1225
1250
Stationing
Read1
Read2
Read3
Average

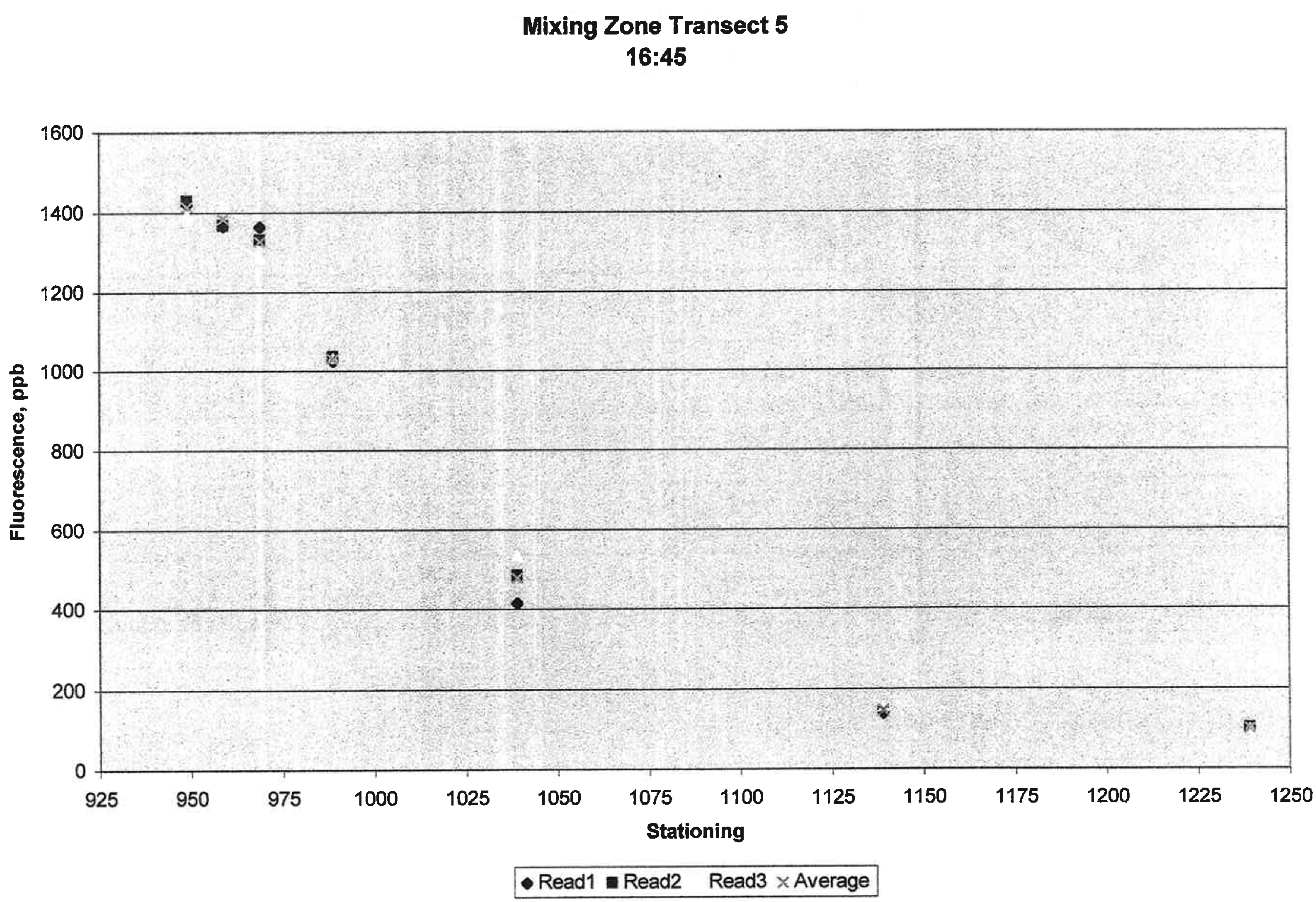
Transect 3
12:00





Mixing Zone Transect 4
14:00
1800
1600
1400
1200
1000
800
600
400
200
0
Fluorescence, ppb
925
950
975
1000
1025
1050
1075
1100
1125
1150
1175
1200
1225
1250
Stationing
Read1
Read2
Read3
Average


Transect 4
14:00
1800
1600
1400
1200
1000
800
600
400
200
0
Fluorescence, ppb
0
200
400
600
800
1000
1200
1400
Stationing
Read1
Read2
Read3
Average

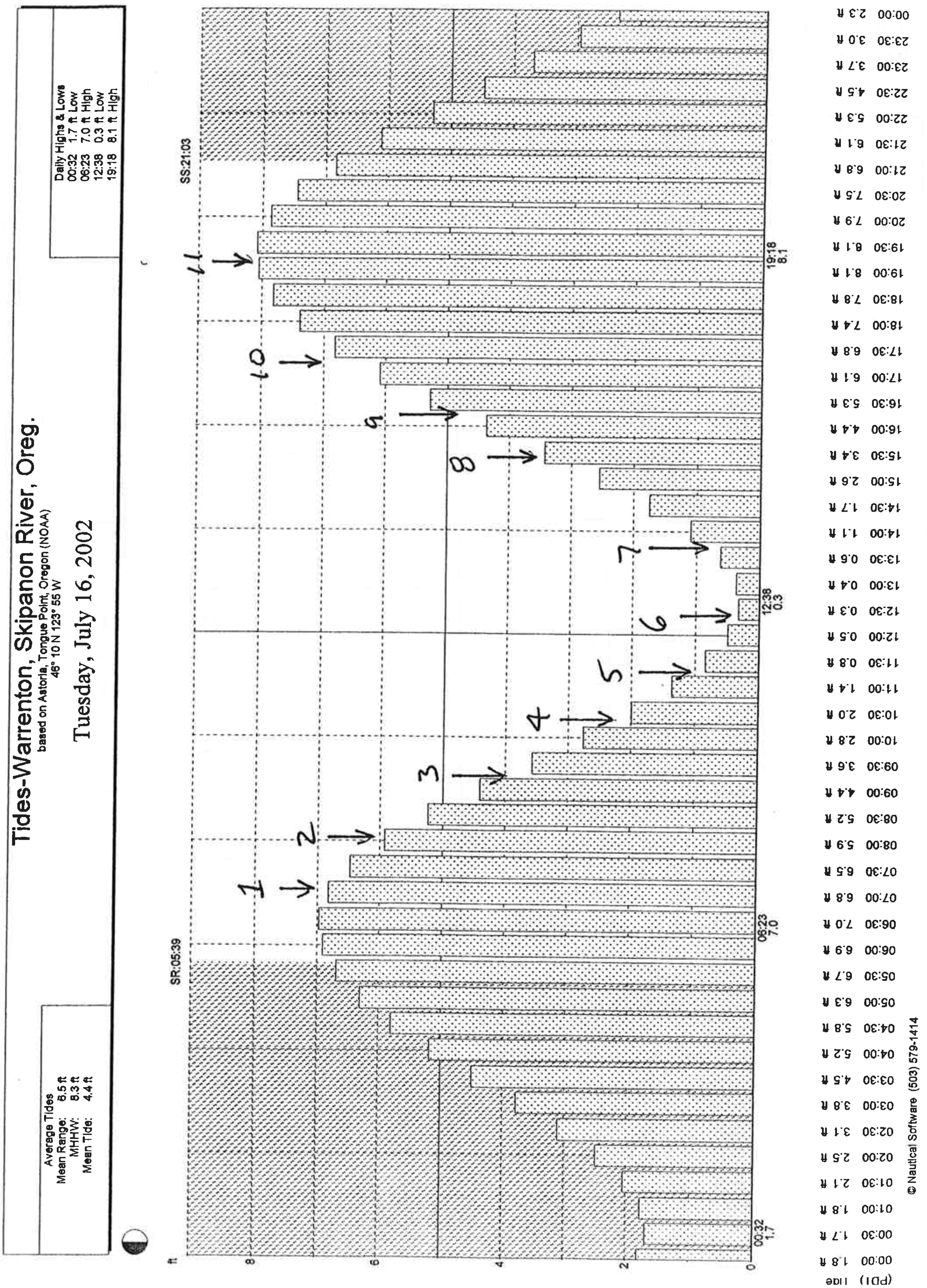


Mixing Zone Transect 5
16:45
Fluorescence, ppb
1600
1400
1200
1000
800
600
400
200
0
925
950
975
1000
1025
1050
1075
1100
1125
1150
1175
1200
1225
1250
Stationing
Read1
Read2
Read3
Average

Attachment D

Current Measurements and CTD Profiles 7/16/02

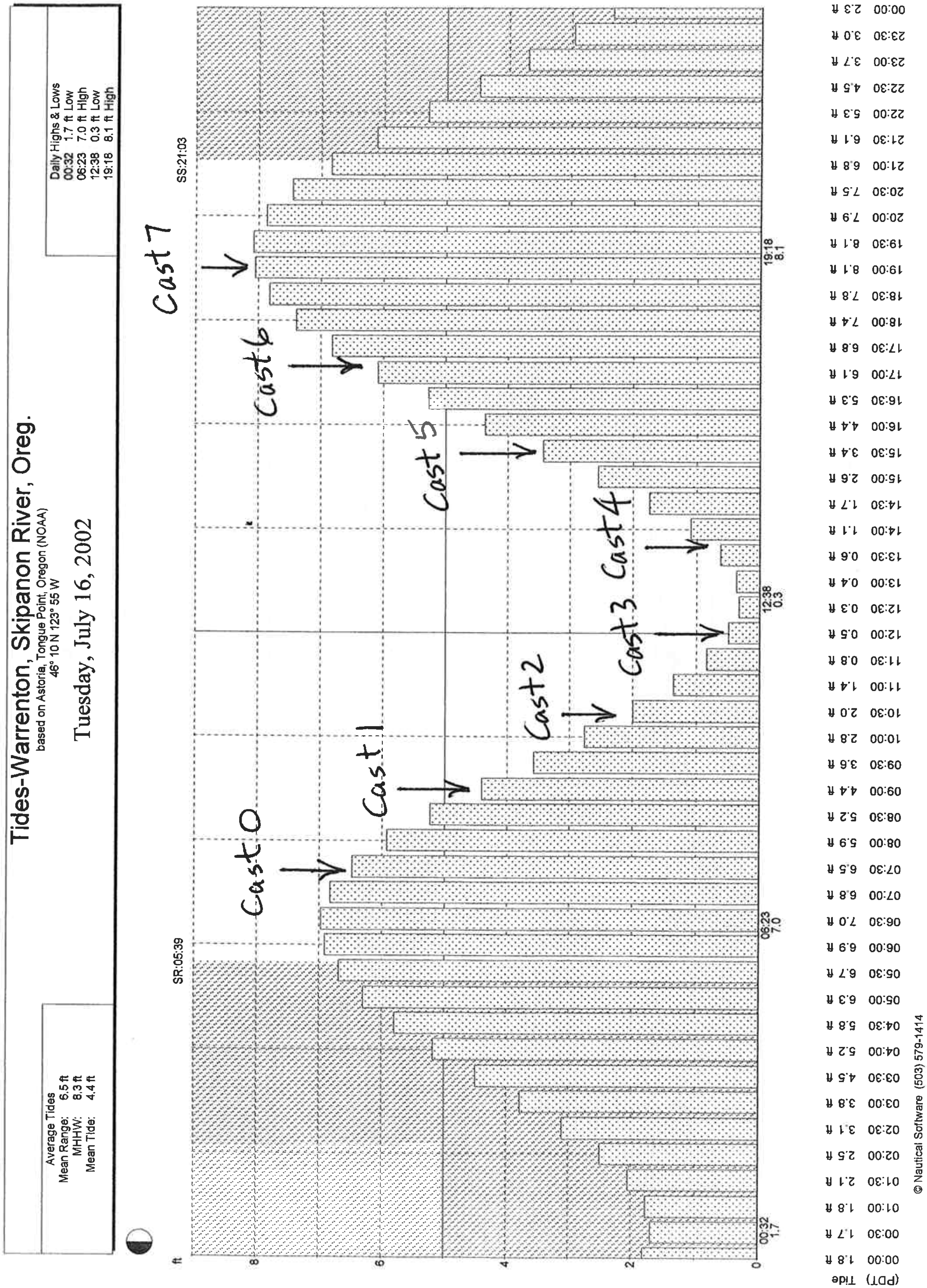
Current Measurement Times



July 16 2002 Drogue Study
Warrenton WWTP Outfall Study

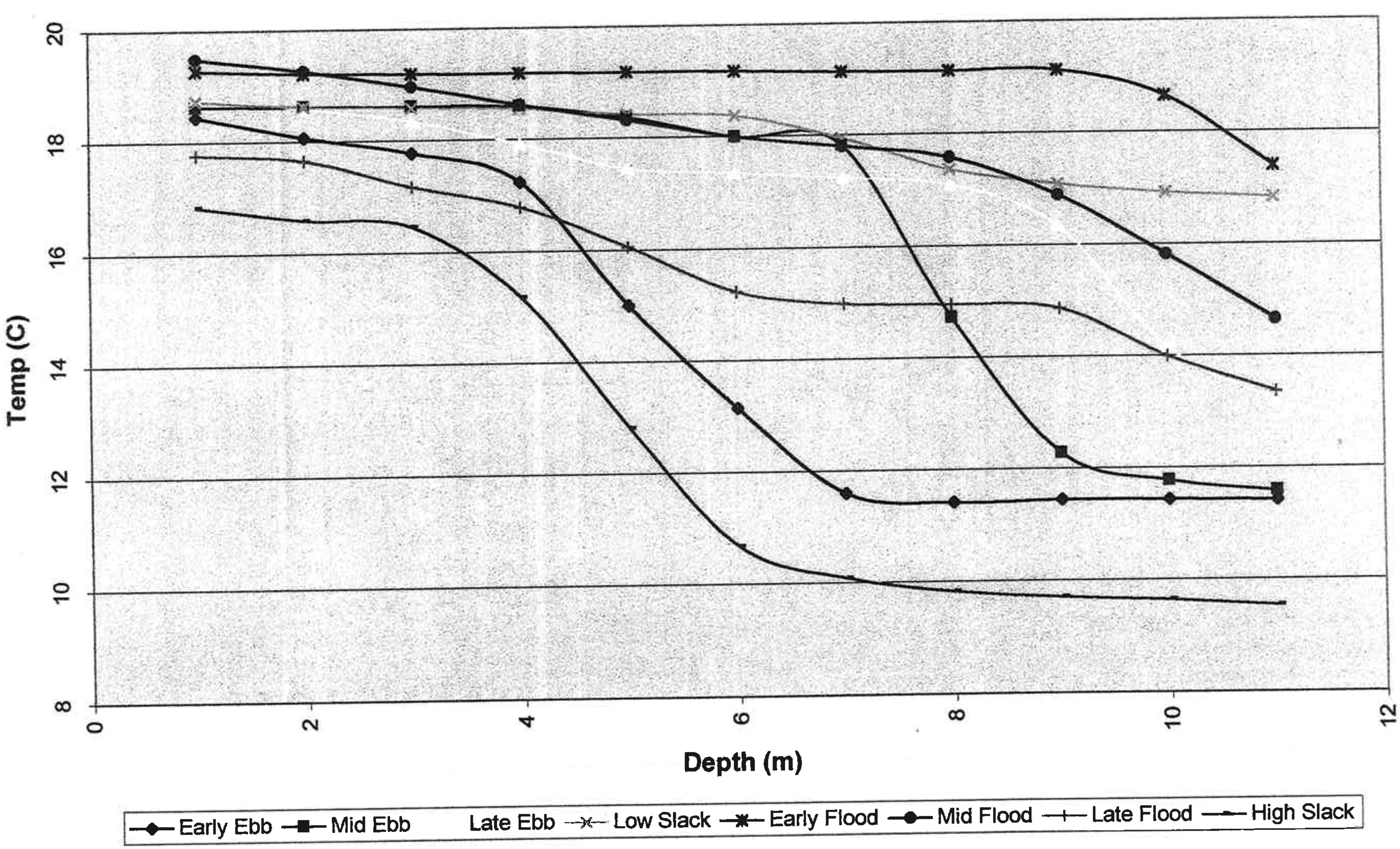
Drogue #	Depth (m)	Time	Lat 46 (min)	Long 123 (min)	dT (min)	dX (m)	dY (m)	Dist (m)	Speed (m/sec)
1	4	7:19 7:30	11.225 11.262	54.828 54.976	11	68	190	201	0.31
2	4	8:10 8:23	11.231 11.380	54.728 55.157	13	276	549	615	0.79
3	4	9:16 9:29	11.186 11.294	54.573 54.956	13	200	490	530	0.68
4	4	10:19 10:39	11.186 11.324	54.630 55.136	20	255	648	696	0.58
5	4	11:17 11:34	11.159 11.216	54.483 54.743	17	105	333	349	0.34
6	4	12:21 12:37	11.219 11.234	54.734 54.924	16	28	243	245	0.26
7	4	13:40 13:53	11.276 11.345	54.944 55.020	13	128	97	160	0.21
8	4	15:26 15:42	11.284 11.146	55.016 54.747	16	-255	-344	429	0.45
9	4	16:16 16:31	11.255 11.108	54.930 54.495	15	-272	-557	620	0.69
10	4	17:18 17:29	11.263 11.133	54.942 54.581	11	-240	-462	521	0.79
11	4	19:01 19:18	11.283 11.173	54.972 54.760	17	-203	-271	339	0.33
								10% 50% 90%	0.26 0.45 0.79

CTD Cast Times

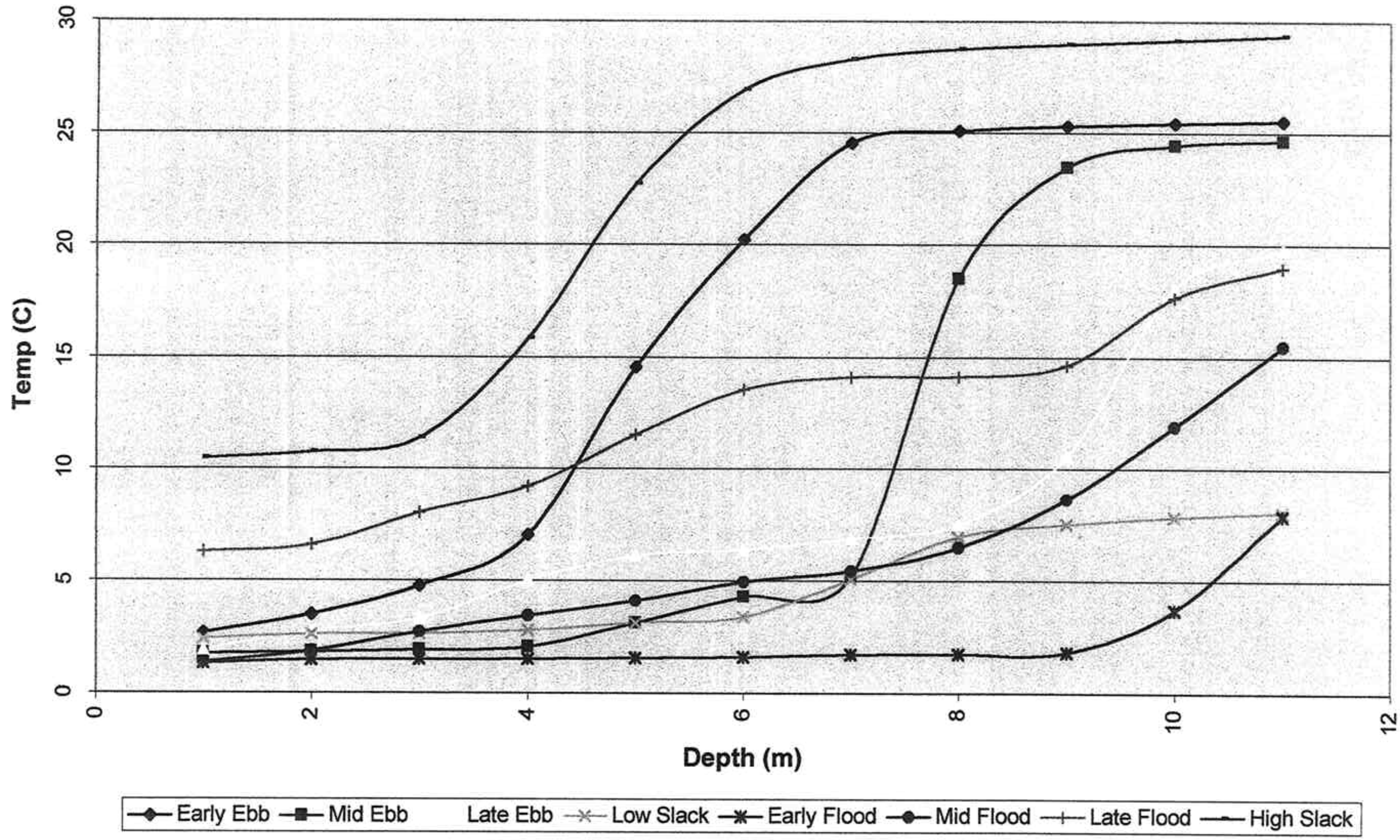


Temperature Profiles

July 16, 2002



Salinity Profiles
July 16, 2002



Cast 0
7:24
Early Ebb

```
* Sea-Bird SBE 19 Data File:
* FileName = \SBE19\Warr00.HEX
* Software Version 4.233
* Temperature SN = 2678
* Conductivity SN = 2678
* System UpLoad Time = Jul 24 2002 07:37:29
* ds
* SEACAT PROFILER V3.1b SN 2678   07/24/02  07:33:46.241
* strain gauge pressure sensor: S/N = 184559,  range = 100 psia,  tc = -183
* clk = 32768.664   iop = 177   vmain = 11.6   vlith = 5.8
* mode = PROFILE  ncasts = 8
* sample rate = 1 scan every 0.5 seconds
* minimum raw conductivity frequency for pump turn on = 1000 hertz
* pump delay = 45 seconds
* samples = 16521   free = 99564   lwait = 0 msec
* SW1 = C8   battery cutoff = 7.3 volts
* number of voltages sampled = 2
* logdata = NO
* S>
* cast 0  07/16  07:24:53   samples 0 to 569 sample rate = 1 scan every 0.5
seconds  stop = switch off
# nquan = 7
# nvalues = 21
# units = metric
# name 0 = scan: scan number
# name 1 = t068: temperature, IPTS-68 [deg C]
# name 2 = sal: salinity, PSS-78 [PSU]
# name 3 = pr: pressure [db]
# name 4 = oxMg/L: oxygen [mg/l]
# name 5 = flag:  0.000e+00
# name 6 = nbin: number of scans per bin
# datcnv_date = Jul 24 2002 07:47:09, 4.233
# datcnv_in = WARR00.HEX 2678.CON
# datcnv_skipover = 0
# binavg_date = Jul 24 2002 07:58:45, 4.233
# binavg_in = WARR00.CNV
# binavg_bintype = Pressure Bins
# binavg_binsize = 1.00
# binavg_excl_bad_scans = yes
# binavg_downcast_only = no
# binavg_skipover = 238
# binavg_surface_bin = no, min = 0.000, max = 0.000, value = 0.000
# file_type = ascii
*END*
```

	T(°C)	S(ppt)	D(m)			
257	18.4451	2.6917	1.000	2.63930	0.000e+00	21.0000
279	18.0698	3.5129	2.000	2.68546	0.000e+00	24.0000
306	17.7781	4.7987	3.000	2.75352	0.000e+00	29.0000
331	17.2530	7.0685	4.000	2.76907	0.000e+00	21.0000
353	15.0067	14.5876	5.000	2.58493	0.000e+00	21.0000
371	13.1533	20.2390	6.000	2.44873	0.000e+00	19.0000
393	11.6135	24.5690	7.000	2.28978	0.000e+00	23.0000
416	11.4272	25.1178	8.000	2.30336	0.000e+00	24.0000
439	11.4532	25.3262	9.000	2.36073	0.000e+00	22.0000
461	11.4457	25.4481	10.000	2.39569	0.000e+00	19.0000
480	11.4312	25.5488	11.000	2.41638	0.000e+00	10.0000

Cast 1
8:58
Mid Ebb

```
* Sea-Bird SBE 19 Data File:
* FileName = \SBE19\Warr01.HEX
* Software Version 4.233
* Temperature SN = 2678
* Conductivity SN = 2678
* System UpLoad Time = Jul 24 2002 07:37:43
* ds
* SEACAT PROFILER V3.1b SN 2678   07/24/02  07:33:46.241
* strain gauge pressure sensor: S/N = 184559,  range = 100 psia,  tc = -183
* clk = 32768.664   iop = 177   vmain = 11.6   vlith = 5.8
* mode = PROFILE  ncasts = 8
* sample rate = 1 scan every 0.5 seconds
* minimum raw conductivity frequency for pump turn on = 1000 hertz
* pump delay = 45 seconds
* samples = 16521   free = 99564   lwait = 0 msec
* SW1 = C8   battery cutoff = 7.3 volts
* number of voltages sampled = 2
* logdata = NO
* S>
* cast 1  07/16  08:58:17   samples 570 to 1208 sample rate = 1 scan every 0.5
seconds  stop = switch off
# nquan = 7
# nvalues = 21
# units = metric
# name 0 = scan: scan number
# name 1 = t068: temperature, IPTS-68 [deg C]
# name 2 = sal: salinity, PSS-78 [PSU]
# name 3 = pr: pressure [db]
# name 4 = oxMg/L: oxygen [mg/l]
# name 5 = flag:  0.000e+00
# name 6 = nbin: number of scans per bin
# datcnv_date = Jul 24 2002 07:47:20, 4.233
# datcnv_in = WARR01.HEX 2678.CON
# datcnv_skipover = 0
# binavg_date = Jul 24 2002 07:59:09, 4.233
# binavg_in = WARR01.CNV
# binavg_bintype = Pressure Bins
# binavg_binsize = 1.00
# binavg_excl_bad_scans = yes
# binavg_downcast_only = no
# binavg_skipover = 288
# binavg_surface_bin = no, min = 0.000, max = 0.000, value = 0.000
# file_type = ascii
*END*
```

	T (°C)	S (ppt)	D (m)			
311	18.6253	1.7752	1.000	2.97629	0.000e+00	23.0000
334	18.6157	1.8603	2.000	3.03649	0.000e+00	23.0000
359	18.6085	1.9432	3.000	3.10279	0.000e+00	27.0000
386	18.5901	2.0802	4.000	3.17199	0.000e+00	27.0000
414	18.3658	3.1437	5.000	3.20477	0.000e+00	29.0000
442	17.9972	4.3151	6.000	3.21607	0.000e+00	27.0000
469	17.8226	5.2194	7.000	3.23478	0.000e+00	24.0000
491	14.7230	18.4979	8.000	2.68634	0.000e+00	22.0000
510	12.2876	23.4626	9.000	2.55390	0.000e+00	16.0000
525	11.7866	24.4504	10.000	2.55594	0.000e+00	16.0000
547	11.5959	24.6607	11.000	2.57091	0.000e+00	20.0000

Cast 2
10:30
Late ~~Mid~~ Ebb

```
* Sea-Bird SBE 19 Data File:
* FileName = \SBE19\Warr02.HEX
* Software Version 4.233
* Temperature SN = 2678
* Conductivity SN = 2678
* System UpLoad Time = Jul 24 2002 07:37:59
* ds
* SEACAT PROFILER V3.1b SN 2678   07/24/02  07:33:46.241
* strain gauge pressure sensor: S/N = 184559,  range = 100 psia,  tc = -183
* clk = 32768.664   iop = 177   vmain = 11.6   vlith = 5.8
* mode = PROFILE  ncasts = 8
* sample rate = 1 scan every 0.5 seconds
* minimum raw conductivity frequency for pump turn on = 1000 hertz
* pump delay = 45 seconds
* samples = 16521   free = 99564   lwait = 0 msec
* SW1 = C8   battery cutoff = 7.3 volts
* number of voltages sampled = 2
* logdata = NO
* S>
* cast 2  07/16  10:30:12   samples 1209 to 1801 sample rate = 1 scan every 0.5
seconds  stop = switch off
# nquan = 7
# nvalues = 23
# units = metric
# name 0 = scan: scan number
# name 1 = t068: temperature, IPTS-68 [deg C]
# name 2 = sal: salinity, PSS-78 [PSU]
# name 3 = pr: pressure [db]
# name 4 = oxMg/L: oxygen [mg/l]
# name 5 = flag:  0.000e+00
# name 6 = nbin: number of scans per bin
# datcnv_date = Jul 24 2002 07:47:28, 4.233
# datcnv_in = WARR02.HEX 2678.CON
# datcnv_skipover = 0
# binavg_date = Jul 24 2002 07:59:25, 4.233
# binavg_in = WARR02.CNV
# binavg_bintype = Pressure Bins
# binavg_binsize = 1.00
# binavg_excl_bad_scans = yes
# binavg_downcast_only = no
# binavg_skipover = 250
# binavg_surface_bin = no, min = 0.000, max = 0.000, value = 0.000
# file_type = ascii
*END*
```

	T (°C)	S (ppt)	D (m)			
261	18.7890	1.9407	1.000	2.77221	0.000e+00	19.0000
276	18.5933	2.7824	2.000	2.76338	0.000e+00	14.0000
290	18.3425	3.3395	3.000	2.76828	0.000e+00	14.0000
307	17.9269	5.0374	4.000	2.75642	0.000e+00	17.0000
322	17.4701	6.1485	5.000	2.74142	0.000e+00	15.0000
336	17.3700	6.4304	6.000	2.77198	0.000e+00	15.0000
352	17.2500	6.8895	7.000	2.79404	0.000e+00	16.0000
369	17.1069	7.5469	8.000	2.81996	0.000e+00	17.0000
386	16.3442	10.5785	9.000	2.75266	0.000e+00	17.0000
404	14.1478	18.0673	10.000	2.53306	0.000e+00	18.0000
424	13.1935	19.7949	11.000	2.52140	0.000e+00	30.0000

Cast 3
11:59
Low Slack

```
* Sea-Bird SBE 19 Data File:
* FileName = \SBE19\Warr03.HEX
* Software Version 4.233
* Temperature SN = 2678
* Conductivity SN = 2678
* System UpLoad Time = Jul 24 2002 07:38:13
* ds
* SEACAT PROFILER V3.1b SN 2678   07/24/02  07:33:46.241
* strain gauge pressure sensor: S/N = 184559,  range = 100 psia,  tc = -183
* clk = 32768.664   iop = 177   vmain = 11.6   vlith = 5.8
* mode = PROFILE  ncasts = 8
* sample rate = 1 scan every 0.5 seconds
* minimum raw conductivity frequency for pump turn on = 1000 hertz
* pump delay = 45 seconds
* samples = 16521   free = 99564   lwait = 0 msec
* SW1 = C8   battery cutoff = 7.3 volts
* number of voltages sampled = 2
* logdata = NO
* S>
* cast 3  07/16  11:59:23   samples 1802 to 2472 sample rate = 1 scan every 0.5
seconds  stop = switch off
# nquan = 7
# nvalues = 23
# units = metric
# name 0 = scan: scan number
# name 1 = t068: temperature, IPTS-68 [deg C]
# name 2 = sal: salinity, PSS-78 [PSU]
# name 3 = pr: pressure [db]
# name 4 = oxMg/L: oxygen [mg/l]
# name 5 = flag:  0.000e+00
# name 6 = nbin: number of scans per bin
# datcnv_date = Jul 24 2002 07:47:36, 4.233
# datcnv_in = WARR03.HEX 2678.CON
# datcnv_skipover = 0
# binavg_date = Jul 24 2002 07:59:42, 4.233
# binavg_in = WARR03.CNV
# binavg_bintype = Pressure Bins
# binavg_binsize = 1.00
# binavg_excl_bad_scans = yes
# binavg_downcast_only = no
# binavg_skipover = 389
# binavg_surface_bin = no, min = 0.000, max = 0.000, value = 0.000
# file_type = ascii
*END*
```

	T (°C)	S(ppt)	D(m)			
405	18.7292	2.4305	1.000	3.33985	0.000e+00	14.0000
421	18.6183	2.6243	2.000	3.36169	0.000e+00	17.0000
437	18.5823	2.6457	3.000	3.39832	0.000e+00	17.0000
455	18.5501	2.8072	4.000	3.42492	0.000e+00	15.0000
469	18.4207	3.1429	5.000	3.41933	0.000e+00	15.0000
483	18.3683	3.4062	6.000	3.42440	0.000e+00	12.0000
496	17.9471	5.0925	7.000	3.36824	0.000e+00	15.0000
512	17.3705	6.9711	8.000	3.28858	0.000e+00	17.0000
528	17.0903	7.5447	9.000	3.29363	0.000e+00	15.0000
542	16.9307	7.8704	10.000	3.31772	0.000e+00	13.0000
555	16.8388	8.0763	11.000	3.34452	0.000e+00	13.0000

Cast 4
13:40
Early Flood

```
* Sea-Bird SBE 19 Data File:
* FileName = \SBE19\Warr04.HEX
* Software Version 4.233
* Temperature SN = 2678
* Conductivity SN = 2678
* System UpLoad Time = Jul 24 2002 07:38:29
* ds
* SEACAT PROFILER V3.1b SN 2678   07/24/02  07:33:46.241
* strain gauge pressure sensor: S/N = 184559,  range = 100 psia,  tc = -183
* clk = 32768.664   iop = 177   vmain = 11.6   vlith = 5.8
* mode = PROFILE  ncasts = 8
* sample rate = 1 scan every 0.5 seconds
* minimum raw conductivity frequency for pump turn on = 1000 hertz
* pump delay = 45 seconds
* samples = 16521   free = 99564   lwait = 0 msec
* SW1 = C8   battery cutoff = 7.3 volts
* number of voltages sampled = 2
* logdata = NO
* S>
* cast 4  07/16  12:05:07   samples 2473 to 14731 sample rate = 1 scan every 0.5
seconds  stop = switch off
# nquan = 7
# nvalues = 21
# units = metric
# name 0 = scan: scan number
# name 1 = t068: temperature, IPTS-68 [deg C]
# name 2 = sal: salinity, PSS-78 [PSU]
# name 3 = pr: pressure [db]
# name 4 = oxMg/L: oxygen [mg/l]
# name 5 = flag:  0.000e+00
# name 6 = nbin: number of scans per bin
# datcnv_date = Jul 24 2002 07:47:43, 4.233
# datcnv_in = WARR04.HEX 2678.CON
# datcnv_skipover = 0
# binavg_date = Jul 24 2002 08:00:02, 4.233
# binavg_in = WARR04.CNV
# binavg_bintype = Pressure Bins
# binavg_binsize = 1.00
# binavg_excl_bad_scans = yes
# binavg_downcast_only = no
# binavg_skipover = 12004
# binavg_surface_bin = no, min = 0.000, max = 0.000, value = 0.000
# file_type = ascii
*END*
```

Header Time

Cast Time 13:40

	T(oC)	S(ppt)	D(m)			
12018	19.2740	1.3375	1.000	5.59295	0.000e+00	19.0000
12036	19.2179	1.4994	2.000	5.61353	0.000e+00	17.0000
12055	19.1979	1.5331	3.000	5.77330	0.000e+00	21.0000
12074	19.1897	1.5599	4.000	5.88663	0.000e+00	16.0000
12090	19.1757	1.6035	5.000	5.94310	0.000e+00	15.0000
12107	19.1664	1.6393	6.000	5.99438	0.000e+00	17.0000
12123	19.1321	1.7573	7.000	6.00901	0.000e+00	16.0000
12139	19.1218	1.7815	8.000	6.03429	0.000e+00	15.0000
12156	19.1106	1.8442	9.000	6.05498	0.000e+00	20.0000
12173	18.6484	3.7288	10.000	5.94470	0.000e+00	12.0000
12189	17.4082	7.9196	11.000	5.48056	0.000e+00	8.0000

Cast 5
15:27
Mid Flood

```
* Sea-Bird SBE 19 Data File:
* FileName = \SBE19\Warr05.HEX
* Software Version 4.233
* Temperature SN = 2678
* Conductivity SN = 2678
* System UpLoad Time = Jul 24 2002 07:42:47
* ds
* SEACAT PROFILER V3.1b SN 2678   07/24/02  07:33:46.241
* strain gauge pressure sensor: S/N = 184559,  range = 100 psia,  tc = -183
* clk = 32768.664   iop = 177   vmain = 11.6   vlith = 5.8
* mode = PROFILE  ncasts = 8
* sample rate = 1 scan every 0.5 seconds
* minimum raw conductivity frequency for pump turn on = 1000 hertz
* pump delay = 45 seconds
* samples = 16521   free = 99564   lwait = 0 msec
* SW1 = C8   battery cutoff = 7.3 volts
* number of voltages sampled = 2
* logdata = NO
* S>
* cast 5  07/16  15:27:54   samples 14732 to 15314 sample rate = 1 scan every
0.5 seconds  stop = switch off
# nquan = 7
# nvalues = 25
# units = metric
# name 0 = scan: scan number
# name 1 = t068: temperature, IPTS-68 [deg C]
# name 2 = sal: salinity, PSS-78 [PSU]
# name 3 = pr: pressure [db]
# name 4 = oxMg/L: oxygen [mg/l]
# name 5 = flag:  0.000e+00
# name 6 = nbin: number of scans per bin
# datcnv_date = Jul 24 2002 07:47:55, 4.233
# datcnv_in = WARR05.HEX 2678.CON
# datcnv_skipover = 0
# binavg_date = Jul 24 2002 08:00:27, 4.233
# binavg_in = WARR05.CNV
# binavg_bintype = Pressure Bins
# binavg_binsize = 1.00
# binavg_excl_bad_scans = yes
# binavg_downcast_only = no
# binavg_skipover = 245
# binavg_surface_bin = no, min = 0.000, max = 0.000, value = 0.000
# file_type = ascii
*END*
```

	T (oc)	S (ppt)	D (m)			
263	19.4867	1.3979	1.000	3.63863	0.000e+00	21.0000
281	19.2618	1.9015	2.000	3.66496	0.000e+00	17.0000
301	18.9592	2.7432	3.000	3.67442	0.000e+00	20.0000
320	18.6194	3.4713	4.000	3.66866	0.000e+00	19.0000
338	18.3206	4.1282	5.000	3.68127	0.000e+00	18.0000
357	18.0028	4.9740	6.000	3.68951	0.000e+00	19.0000
374	17.8047	5.4693	7.000	3.70849	0.000e+00	16.0000
391	17.5829	6.5039	8.000	3.68235	0.000e+00	17.0000
407	16.9016	8.6691	9.000	3.59734	0.000e+00	16.0000
425	15.8210	11.9180	10.000	3.46059	0.000e+00	18.0000
442	14.6505	15.5092	11.000	3.29588	0.000e+00	17.0000
462	14.0055	16.9857	12.000	3.22444	0.000e+00	25.0000

Cast 6
17:11
Late Flood

```
* Sea-Bird SBE 19 Data File:
* FileName = \SBE19\Warr06.HEX
* Software Version 4.233
* Temperature SN = 2678
* Conductivity SN = 2678
* System UpLoad Time = Jul 24 2002 07:43:01
* ds
* SEACAT PROFILER V3.1b SN 2678   07/24/02  07:33:46.241
* strain gauge pressure sensor: S/N = 184559,  range = 100 psia,  tc = -183
* clk = 32768.664   iop = 177   vmain = 11.6   vlith = 5.8
* mode = PROFILE  ncasts = 8
* sample rate = 1 scan every 0.5 seconds
* minimum raw conductivity frequency for pump turn on = 1000 hertz
* pump delay = 45 seconds
* samples = 16521   free = 99564   lwait = 0 msec
* SW1 = C8   battery cutoff = 7.3 volts
* number of voltages sampled = 2
* logdata = NO
* S>
* cast 6  07/16  17:11:00   samples 15315 to 15920 sample rate = 1 scan every
0.5 seconds  stop = switch off
# nquan = 7
# nvalues = 25
# units = metric
# name 0 = scan: scan number
# name 1 = t068: temperature, IPTS-68 [deg C]
# name 2 = sal: salinity, PSS-78 [PSU]
# name 3 = pr: pressure [db]
# name 4 = oxMg/L: oxygen [mg/l]
# name 5 = flag:  0.000e+00
# name 6 = nbin: number of scans per bin
# datcnv_date = Jul 24 2002 07:48:07, 4.233
# datcnv_in = WARR06.HEX 2678.CON
# datcnv_skipover = 0
# binavg_date = Jul 24 2002 08:00:42, 4.233
# binavg_in = WARR06.CNV
# binavg_bintype = Pressure Bins
# binavg_binsize = 1.00
# binavg_excl_bad_scans = yes
# binavg_downcast_only = no
# binavg_skipover = 248
# binavg_surface_bin = no, min = 0.000, max = 0.000, value = 0.000
# file_type = ascii
*END*
```

	T (°C)	S(ppt)	D(m)			
267	17.7705	6.3028	1.000	3.04628	0.000e+00	22.0000
289	17.6599	6.6093	2.000	3.07561	0.000e+00	18.0000
309	17.1828	8.0390	3.000	3.06934	0.000e+00	23.0000
330	16.7975	9.2212	4.000	3.09406	0.000e+00	18.0000
351	16.0610	11.5456	5.000	3.06785	0.000e+00	24.0000
375	15.2299	13.5732	6.000	3.03440	0.000e+00	24.0000
395	14.9871	14.1153	7.000	3.03812	0.000e+00	16.0000
411	14.9519	14.1525	8.000	3.05241	0.000e+00	18.0000
429	14.8679	14.6447	9.000	3.05624	0.000e+00	18.0000
449	13.9965	17.6726	10.000	2.91941	0.000e+00	22.0000
471	13.3582	18.9982	11.000	2.86971	0.000e+00	23.0000
494	13.2444	19.2692	12.000	2.87170	0.000e+00	20.0000

Cast 7
19:03
High Slack

```
* Sea-Bird SBE 19 Data File:
* FileName = \SBE19\Warr07.HEX
* Software Version 4.233
* Temperature SN = 2678
* Conductivity SN = 2678
* System UpLoad Time = Jul 24 2002 07:43:16
* ds
* SEACAT PROFILER V3.1b SN 2678   07/24/02  07:33:46.241
* strain gauge pressure sensor: S/N = 184559,  range = 100 psia,  tc = -183
* clk = 32768.664   iop = 177   vmain = 11.6   vlith = 5.8
* mode = PROFILE  ncasts = 8
* sample rate = 1 scan every 0.5 seconds
* minimum raw conductivity frequency for pump turn on = 1000 hertz
* pump delay = 45 seconds
* samples = 16521   free = 99564   lwait = 0 msec
* SW1 = C8   battery cutoff = 7.3 volts
* number of voltages sampled = 2
* logdata = NO
* S>
* cast 7  07/16  19:03:10   samples 15921 to 16520 sample rate = 1 scan every
0.5 seconds  stop = switch off
# nquan = 7
# nvalues = 29
# units = metric
# name 0 = scan: scan number
# name 1 = t068: temperature, IPTS-68 [deg C]
# name 2 = sal: salinity, PSS-78 [PSU]
# name 3 = pr: pressure [db]
# name 4 = oxMg/L: oxygen [mg/l]
# name 5 = flag:  0.000e+00
# name 6 = nbin: number of scans per bin
# datcnv_date = Jul 24 2002 07:48:15, 4.233
# datcnv_in = WARR07.HEX 2678.CON
# datcnv_skipover = 0
# binavg_date = Jul 24 2002 08:00:56, 4.233
# binavg_in = WARR07.CNV
# binavg_bintype = Pressure Bins
# binavg_binsize = 1.00
# binavg_excl_bad_scans = yes
# binavg_downcast_only = no
# binavg_skipover = 237
# binavg_surface_bin = no, min = 0.000, max = 0.000, value = 0.000
# file_type = ascii
*END*
```

	T(°C)	S(ppt)	D(m)			
254	16.8531	10.4928	1.000	3.25020	0.000e+00	18.0000
276	16.6048	10.7663	2.000	3.30832	0.000e+00	22.0000
296	16.4758	11.4026	3.000	3.32027	0.000e+00	17.0000
314	15.1818	15.8609	4.000	3.15056	0.000e+00	21.0000
336	12.8295	22.7290	5.000	2.81586	0.000e+00	23.0000
359	10.6874	26.9671	6.000	2.56869	0.000e+00	23.0000
379	10.0946	28.3025	7.000	2.42610	0.000e+00	18.0000
395	9.8373	28.7664	8.000	2.35811	0.000e+00	15.0000
412	9.7210	28.9755	9.000	2.31144	0.000e+00	18.0000
433	9.6518	29.1590	10.000	2.27759	0.000e+00	22.0000
452	9.5466	29.3708	11.000	2.25163	0.000e+00	16.0000
464	9.5028	29.4407	12.000	2.23451	0.000e+00	11.0000

Attachment E

Dilution Model Runs for Deep Outfall Alternatives

E1.1

12-Inch Open-Ended Discharge
Acute Mixing Zone (10-foot radius)

Jul 24, 2002, 21:57:14 ERL-N PROGRAM PLUMES, Ed 3, 3/11/94 Case: 1 of 16

Title Cast 0 - Acute nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.1008	1	0.1008	1000	0.0	22	30.48	91.44
port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
8.534	0.3048	0.3048	1.381	0.9768	0.9768	0.10	50
port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.3048	45	1.0	-2.16673	100	0	5.466	832.2
hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	1000.0	19.1527	0.2600	0.003	0.26	5.313	0.03103

depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.26	0.628957	2.69	18.45		0.1445	0.2095
1	0.26	0.628957	2.69	18.45		buoy flux	puff-ther
2	0.26	1.32819	3.51	18.07		0.00002112	1.523
3	0.26	2.36815	4.80	17.78		jet-plume	jet-cross
4	0.26	4.20105	7.07	17.25		1.569	1.435
5	0.26	10.3592	14.59	15.01		plu-cross	jet-strat
6	0.26	15.0184	20.24	13.15		1.202	1.607
7	0.26	18.6133	24.57	11.61		plu-strat	
8	0.26	19.0678	25.12	11.43		1.626	
9	0.26	19.2268	25.33	11.45		hor dis>=	

CORMIX1 flow category algorithm is turned off.

0.1008 m3/s, 2.301 MGD, 3.560 cfs. >0.0 to 100 m3/s range

Help: F1. Quit: <esc>. Configuration:ATN00. FILE: WARREN1.VAR;

UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume dep m	plume dia m	poll conc	dilution	hor dis m	
8.534	0.3048	100.0	1.000	0.000	
8.347	0.4125	70.71	1.405	0.1923	
8.129	0.5531	50.00	1.979	0.4314	
7.880	0.7314	35.36	2.790	0.7221	
7.603	0.9534	25.00	3.937	1.070	
7.297	1.225	17.68	5.560	1.486	
6.960	1.555	12.50	7.855	1.984	
6.607	1.963	8.839	11.10	2.575	
6.466	2.155	7.695	12.75	2.845	-> trap level
6.260	2.475	6.250	15.70	3.307	
5.939	3.104	4.420	22.22	4.469	
5.880	3.298	4.011	24.48	5.357	

S= 14.0 flux avg @ 3.048 m

-> local maximum rise or fall

FARFIELD CALCULATION (based on Brooks, 1960, see guide)

Farfield dispersion based on wastefield width of 3.298m

S℄ = 8.3

--4/3 Power Law--		-Const Eddy Diff-			Time	
conc	dilution	conc	dilution	distance m	sec	hrs
1.907	52.0	2.710	36.5	30.48	96.63	0.0
0.9304	107.0	1.979	50.1	60.96	213.9	0.1
0.5733	174.0	1.632	60.8	91.44	331.1	0.1

```
Jul 24, 2002,  21:57:15  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   2 of  16
Title   Cast 1 - Acute                                                 nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.1008          1    0.1008      1000      0.0        22     30.48     91.44
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    8.534    0.3048    0.3048     1.381    0.9768    0.9768      0.10        50
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.3048        45       1.0  -2.16673       100         0     5.977     994.8
hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
       90    1000.0   15.6673    0.2600     0.003      0.26     5.313   0.03158
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
      0.0      0.26 -0.100467      1.78     18.63              0.1336    0.1753
        1      0.26 -0.100467      1.78     18.63           buoy flux puff-ther
        2      0.26-0.0374683      1.86     18.62          0.00001767     1.616
        3      0.26 0.0255279      1.94     18.61           jet-plume jet-cross
        4      0.26  0.194373      2.08     18.29               1.715     1.435
        5      0.26  0.989764      3.14     18.36           plu-cross jet-strat
        6      0.26   1.95966      4.32        18               1.005     1.671
        7      0.26   2.68083      5.22     17.82           plu-strat
        8      0.26   13.4033     18.50     14.72               1.650
        9      0.26   17.6431     23.46     12.29             hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.1008 m3/s, 2.301 MGD, 3.560 cfs.                      >0.0 to 100 m3/s range
Help: F1.  Quit: <esc>.  Configuration:ATN00.  FILE: WARREN1.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
        m         m                              m
    8.534    0.3048     100.0     1.000     0.000

    8.347    0.4135     70.71     1.407    0.1932
    8.130    0.5565     50.00     1.983    0.4344
    7.887    0.7402     35.36     2.799    0.7295
    7.627    0.9767     25.00     3.955     1.085
    7.590     1.015     23.82     4.152     1.140 -> trap level
    7.369     1.282     17.68     5.596     1.517
    7.137     1.668     12.50     7.921     2.095
    7.028     1.963     9.944     9.966     2.951
 -> local maximum rise or fall -> begin overlap
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      1.963m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution      conc  dilution  distance        Time
                                                 m     sec    hrs
     3.257      30.6     5.668      17.6     30.48   105.9    0.0
     1.493      66.9     4.115      24.2     60.96   223.1    0.1
    0.8959     111.5     3.388      29.4     91.44   340.3    0.1
```

Critical Acute

$S = \frac{9.97}{1.7}$

$= 5.9$

Jul 24, 2002, 21:57:15 ERL-N PROGRAM PLUMES, Ed 3, 3/11/94 Case: 3 of 16

Title Cast 2 - Acute nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.1008	1	0.1008	1000	0.0	22	30.48	91.44
port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
8.534	0.3048	0.3048	1.381	0.9768	0.9768	0.10	50
port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.3048	45	1.0	-2.16673	100	0	8.884	2198
hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	1000.0	5.90588	0.2600	0.003	0.26	5.313	0.02597

depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.26	0.0359617	2	18.79		0.08189	0.07934
1	0.26	0.0359617	2	18.79		buoy flux	puff-ther
2	0.26	0.670191	2.78	18.59		7.997E-06	2.105
3	0.26	1.14621	3.34	18.34		jet-plume	jet-cross
4	0.26	2.52231	5.04	17.93		2.549	1.435
5	0.26	3.45733	6.15	17.47		plu-cross	jet-strat
6	0.26	3.68999	6.43	17.37		0.4550	2.135
7	0.26	4.06373	6.89	17.25		plu-strat	
8	0.26	4.59381	7.55	17.11		1.954	
9	0.26	7.05087	10.58	16.34		hor dis>=	

CORMIX1 flow category algorithm is turned off.

0.1008 m3/s, 2.301 MGD, 3.560 cfs. >0.0 to 100 m3/s range

Help: F1. Quit: <esc>. Configuration:ATN00. FILE: WARREN1.VAR;

UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume dep m	plume dia m	poll conc	dilution	hor dis m	
8.534	0.3048	100.0	1.000	0.000	
8.347	0.4161	70.71	1.411	0.1953	
8.133	0.5635	50.00	1.992	0.4417	
7.897	0.7533	35.36	2.815	0.7471	
7.645	0.9916	25.00	3.979	1.124	
7.376	1.284	17.68	5.625	1.594	
7.089	1.634	12.50	7.953	2.197	
6.777	2.051	8.839	11.25	3.001	
6.428	2.540	6.250	15.90	4.132	
6.338	2.670	5.751	17.28	4.474	-> trap level
6.036	3.115	4.420	22.49	5.834	
5.598	3.792	3.125	31.81	8.944	
5.419	4.156	2.646	37.57	13.08	

$S_{F.A.} = 11.4$

$S_{℄} = 11.4/1.7$

$= 6.7$

-> local maximum rise or fall

FARFIELD CALCULATION (based on Brooks, 1960, see guide)

Farfield dispersion based on wastefield width of 4.156m

--4/3 Power Law-- conc	dilution	-Const Eddy Diff- conc	dilution	distance m	Time sec	hrs
1.756	56.7	2.107	47.2	30.48	66.94	0.0
0.8227	121.3	1.474	67.6	60.96	184.2	0.1
0.4963	201.3	1.195	83.5	91.44	301.4	0.1

```
Jul 24, 2002,  21:57:15  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   4 of  16
Title    Cast 3 - Acute                                                nonlinear
 tot flow   # ports port flow   spacing  effi sal effl temp   far inc   far dis
  0.1008          1   0.1008      1000       0.0        22     30.48     91.44
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    8.534    0.3048    0.3048     1.381    0.9768    0.9768      0.10        50
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.3048        45       1.0  -2.16673       100         0     9.878      2717
hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
       90    1000.0   4.36253    0.2600     0.003      0.26     5.313   0.02181
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
      0.0      0.26  0.375718      2.43     18.73             0.06754   0.06417
        1      0.26  0.375718      2.43     18.73           buoy flux puff-ther
        2      0.26  0.542280      2.62     18.62           6.468E-06     2.259
        3      0.26  0.573017      2.65     18.58           jet-plume jet-cross
        4      0.26  0.700926      2.81     18.55               2.834     1.435
        5      0.26  0.978056      3.14     18.42           plu-cross jet-strat
        6      0.26   1.19374      3.41     18.37              0.3680     2.351
        7      0.26   2.55655      5.09     17.95           plu-strat
        8      0.26   4.10189      6.97     17.37               2.141
        9      0.26   4.58998      7.54     17.09             hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.1008 m3/s, 2.301 MGD, 3.560 cfs.                      >0.0 to 100 m3/s range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: WARREN1.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.3048     100.0     1.000     0.000

     8.347    0.4164     70.71     1.412    0.1956
     8.133    0.5643     50.00     1.994    0.4427
     7.898    0.7542     35.36     2.817    0.7493
     7.646    0.9930     25.00     3.981     1.127
     7.381     1.287     17.68     5.629     1.599
     7.143     1.589     13.12     7.583     2.112 -> trap level
     7.103     1.643     12.50     7.960     2.208
     6.809     2.069     8.839     11.26     3.056
     6.502     2.573     6.250     15.92     4.469
     6.372     2.868     5.219     19.07     6.359
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      2.868m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution        conc  dilution  distance          Time
                                                   m        sec   hrs
     2.366      42.2       3.445      28.9     30.48      92.77   0.0
     1.107      90.3       2.475      40.3     60.96      210.0   0.1
    0.6697     149.2       2.030      49.2     91.44      327.2   0.1
```

$S_{FA} = 11.3$

$S_{\mathrm{CL}} = 6.6$

@ 3.048 m

```
Jul 24, 2002,  21:57:15  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   5 of  16
Title    Cast 4 - Acute                                                 nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.1008         1    0.1008      1000       0.0        22     30.48     91.44
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    8.534    0.3048    0.3048     1.381    0.9768    0.9768      0.10        50
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.3048        45       1.0  -2.16673       100         0     17.87      8894
hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
       90    1000.0 -0.171917    0.2600     0.003      0.26     5.313  0.007000
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
      0.0      0.26 -0.562906      1.34     19.27             0.02120   0.01961
        1      0.26 -0.562906      1.34     19.27           buoy flux puff-ther
        2      0.26 -0.430897       1.5     19.22           1.976E-06     3.354
        3      0.26 -0.404012      1.53      19.2           jet-plume jet-cross
        4      0.26 -0.379137      1.56     19.19               5.128     1.435
        5      0.26 -0.346641       1.6     19.18           plu-cross jet-strat
        6      0.26 -0.314145      1.64     19.17              0.1124     4.196
        7      0.26 -0.214656      1.76     19.13           plu-strat
        8      0.26 -0.197408      1.78     19.12               3.795
        9      0.26 -0.149671      1.84     19.11             hor dis>=
```

CORMIX1 flow category algorithm is turned off.
0.1008 m3/s, 2.301 MGD, 3.560 cfs. >0.0 to 100 m3/s range
Help: F1. Quit: <esc>. Configuration:ATN00. FILE: WARREN1.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume dep	plume dia	poll conc	dilution	hor dis
m	m			m
8.534	0.3048	100.0	1.000	0.000
8.347	0.4176	70.71	1.413	0.1966
8.135	0.5677	50.00	1.998	0.4462
7.904	0.7610	35.36	2.825	0.7581
7.659	1.003	25.00	3.994	1.147
7.401	1.299	17.68	5.648	1.642
7.124	1.653	12.50	7.986	2.296
6.818	2.069	8.839	11.29	3.196
6.472	2.555	6.250	15.97	4.482
6.072	3.124	4.420	22.59	6.383
5.716	3.635	3.373	29.60	8.557 -> trap level
5.607	3.791	3.125	31.94	9.328
5.062	4.574	2.210	45.17	14.19
4.444	5.495	1.563	63.88	23.97
4.291	5.824	1.399	71.37	32.79

$S_{FA} = 10.7$

$S_{℄} = 10.7/1.7 = 6.3$

-> local maximum rise or fall

FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of 5.824m

--4/3 Power Law--		-Const Eddy Diff-			Time	
conc	dilution	conc	dilution	distance		
				m	sec	hrs
0.7944	125.8	1.029	97.1	60.96	108.4	0.0
0.4427	225.8	0.7846	127.3	91.44	225.6	0.1

Jul 24, 2002, 21:57:15 ERL-N PROGRAM PLUMES, Ed 3, 3/11/94 Case: 6 of 16

Title Cast 5 - Acute nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.1008	1	0.1008	1000	0.0	22	30.48	91.44
port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
8.534	0.3048	0.3048	1.381	0.9768	0.9768	0.10	50
port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.3048	45	1.0	-2.16673	100	0	9.663	2600
hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	1000.0	4.65628	0.2600	0.003	0.26	5.313	0.02731
depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.26	-0.561729	1.4	19.49		0.07726	0.06706
1	0.26	-0.561729	1.4	19.49		buoy flux	puff-ther
2	0.26	-0.134144	1.9	19.26		6.760E-06	2.226
3	0.26	0.566239	2.74	18.96		jet-plume	jet-cross
4	0.26	1.19028	3.47	18.62		2.773	1.435
5	0.26	1.75248	4.13	18.32		plu-cross	jet-strat
6	0.26	2.45535	4.97	18		0.3846	2.198
7	0.26	2.87534	5.47	17.8		plu-strat	
8	0.26	3.70316	6.5	17.58		1.957	
9	0.26	5.48803	8.67	16.9		hor dis>=	

CORMIX1 flow category algorithm is turned off.
0.1008 m3/s, 2.301 MGD, 3.560 cfs. >0.0 to 100 m3/s range
Help: F1. Quit: <esc>. Configuration:ATN00. FILE: WARREN1.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume dep	plume dia	poll conc	dilution	hor dis	
m	m			m	
8.534	0.3048	100.0	1.000	0.000	
8.347	0.4164	70.71	1.411	0.1956	
8.134	0.5643	50.00	1.994	0.4426	
7.899	0.7547	35.36	2.817	0.7493	
7.648	0.9940	25.00	3.982	1.128	
7.382	1.288	17.68	5.630	1.602	
7.100	1.641	12.50	7.961	2.215	
6.796	2.060	8.839	11.26	3.051	$S_{FA} = 11.3$
6.777	2.088	8.657	11.49	3.111	-> trap level $S_{\mathbb{C}} = 6.6$
6.458	2.553	6.250	15.92	4.282	
6.083	3.131	4.420	22.52	6.343	
5.842	3.608	3.444	28.90	10.27	

-> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of 3.608m

--4/3 Power Law--		-Const Eddy Diff-			Time	
conc	dilution	conc	dilution	distance		
				m	sec	hrs
1.975	50.5	2.546	39.1	30.48	77.73	0.0
0.9239	108.1	1.801	55.4	60.96	195.0	0.1
0.5582	179.0	1.467	68.0	91.44	312.2	0.1

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Title Cast 6 - Acute nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.1008	1	0.1008	1000	0.0	22	30.48	91.44
port dep	**port dia**	**plume dia**	**total vel**	**horiz vel**	**vertl vel**	**asp coeff**	**print frq**
8.534	0.3048	0.3048	1.381	0.9768	0.9768	0.10	50
port elev	**ver angle**	**cont coef**	**effl den**	**poll conc**	**decay**	**Froude #**	**Roberts F**
0.3048	45	1.0	-2.16673	100	0	7.165	1430
hor angle	**red space**	**p amb den**	**p current**	**far dif**	**far vel**	**K:vel/cur**	**Stratif #**
90	1000.0	10.2413	0.2600	0.003	0.26	5.313	0.01936
depth	**current**	**density**	**salinity**	**temp**	**amb conc**	**N (freq)**	**red grav.**
0.0	0.26	3.51393	6.3	17.77		0.08748	0.1219
1	0.26	3.51393	6.3	17.77		buoy flux	puff-ther
2	0.26	3.77157	6.61	17.66		0.00001229	1.824
3	0.26	4.95422	8.04	17.18		jet-plume	jet-cross
4	0.26	5.92653	9.22	16.8		2.056	1.435
5	0.26	7.84359	11.55	16.06		plu-cross	jet-strat
6	0.26	9.53934	13.57	15.23		0.6994	2.065
7	0.26	10.0033	14.12	14.99		plu-strat	
8	0.26	10.0334	14.15	14.95		2.070	
9	0.26	10.4227	14.64	14.87		hor dis>=	

CORMIX1 flow category algorithm is turned off.

0.1008 m3/s, 2.301 MGD, 3.560 cfs. >0.0 to 100 m3/s range

Help: F1. Quit: <esc>. Configuration:ATNO0. FILE: WARREN1.VAR;

UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume dep	plume dia	poll conc	dilution	hor dis	
m	m			m	
8.534	0.3048	100.0	1.000	0.000	
8.347	0.4148	70.71	1.409	0.1943	
8.132	0.5598	50.00	1.988	0.4381	
7.890	0.7449	35.36	2.806	0.7382	
7.627	0.9761	25.00	3.963	1.103	
7.341	1.259	17.68	5.600	1.549	
7.028	1.598	12.50	7.915	2.098	
6.683	2.003	8.839	11.19	2.786	$S_{FA} = 12.6$
6.301	2.483	6.250	15.82	3.662	
5.877	3.055	4.420	22.37	4.817	$S_{¢} = 12.6/1.7$
5.842	3.105	4.299	23.00	4.924	-> trap level $= 7.4$
5.447	3.758	3.125	31.64	6.473	
5.282	4.145	2.646	37.37	8.463	

-> local maximum rise or fall

FARFIELD CALCULATION (based on Brooks, 1960, see guide)

Farfield dispersion based on wastefield width of 4.145m

--4/3 Power Law--		-Const Eddy Diff-			Time	
conc	dilution	conc	dilution	distance		
				m	sec	hrs
1.529	65.0	1.964	50.5	30.48	84.68	0.0
0.7547	132.1	1.422	69.9	60.96	201.9	0.1
0.4668	213.8	1.167	85.2	91.44	319.1	0.1

```
Jul 24, 2002,  21:57:16  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   8 of  16
Title    Cast 7 - Acute                                                nonlinear
 tot flow  # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.1008        1    0.1008      1000       0.0        22     30.48     91.44
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    8.534    0.3048    0.3048     1.381    0.9768    0.9768      0.10        50
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.3048        45       1.0  -2.16673       100         0     5.108     726.6
hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
       90    1000.0   22.2482    0.2600     0.003      0.26     5.313   0.02247
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
      0.0      0.26   6.88544     10.49     16.85              0.1314    0.2400
        1      0.26   6.88544     10.49     16.85           buoy flux puff-ther
        2      0.26   7.14677     10.77      16.6          0.00002419     1.455
        3      0.26   7.65011      11.4     16.48           jet-plume jet-cross
        4      0.26   11.2992     15.86     15.18               1.466     1.435
        5      0.26   16.9880     22.73     12.83           plu-cross jet-strat
        6      0.26   20.6196     26.97     10.69               1.376     1.685
        7      0.26   21.7468      28.3     10.09           plu-strat
        8      0.26   22.1511     28.77      9.84               1.807
        9      0.26   22.3330     28.98      9.72             hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.1008 m3/s, 2.301 MGD, 3.560 cfs.                        >0.0 to 100 m3/s range
Help: F1.  Quit: <esc>.  Configuration:ATN00.  FILE: WARREN1.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.3048     100.0     1.000     0.000

     8.347    0.4117     70.71     1.404    0.1917
     8.128    0.5509     50.00     1.976    0.4291
     7.877    0.7270     35.36     2.784    0.7167
     7.595    0.9458     25.00     3.928     1.060
     7.282     1.214     17.68     5.546     1.466
     6.937     1.539     12.50     7.834     1.951
     6.561     1.934     8.839     11.07     2.532
     6.157     2.413     6.250     15.65     3.242
     5.863     2.810     4.904     19.95     3.846 -> trap level
     5.742     3.003     4.420     22.13     4.131
     5.379     3.750     3.125     31.31     5.472
     5.334     3.929     2.896     33.79     6.349
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      3.929m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution       conc  dilution  distance        Time
                                                  m         sec    hrs
     1.544      64.0      2.068      47.6     30.48       92.81    0.0
    0.7728     128.7      1.515      65.3     60.96       210.0    0.1
    0.4813     207.0      1.251      79.2     91.44       327.3    0.1
```

$S_{FA} = 14.4$

$S_{℄} = 14.4/1.7 = 8.5$

```
Nov 20, 2002,  18:11:44  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   2 of  16
Title    Cast 1 - Acute at 90th percentile current speeds               nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.1008         1   0.1008      1000       0.0        22     30.48     91.44
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    8.534    0.3048    0.3048     1.381    0.9768    0.9768      0.10        50
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.3048        45       1.0  -2.16673       100         0     5.977     27910
hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
       90    1000.0   15.6673    0.7900     0.003      0.26     1.749   0.03158
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
      0.0      0.79 -0.100467      1.78     18.63              0.1336    0.1753
        1      0.79 -0.100467      1.78     18.63           buoy flux puff-ther
        2      0.79-0.0374683      1.86     18.62          0.00001767     1.116
        3      0.79 0.0255279      1.94     18.61           jet-plume jet-cross
        4      0.79  0.194373      2.08     18.29               1.715    0.4724
        5      0.79  0.989764      3.14     18.36           plu-cross jet-strat
        6      0.79   1.95966      4.32        18             0.03583     1.671
        7      0.79   2.68083      5.22     17.82            plu-strat
        8      0.79   13.4033     18.50     14.72               1.650
        9      0.79   17.6431     23.46     12.29              hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.79 m/s, 2.592 ft/s                                     >=0.0 to 2.0 m/s range
Help: F1.  Quit: <esc>.  Configuration:ATN00.  FILE: WARREN1.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
    8.534    0.3048     100.0     1.000     0.000

    8.462    0.3942     70.71     1.407   0.08272
    8.389    0.4994     50.00     1.983    0.1938
    8.308    0.6201     35.36     2.797    0.3580
    8.214    0.7587     25.00     3.949    0.6129
    8.101    0.9188     17.68     5.580     1.014
    7.966     1.106     12.50     7.886     1.644
    7.890     1.211     10.51     9.378     2.084 -> trap level
    7.807     1.326     8.839     11.15     2.650
    7.625     1.588     6.250     15.78     4.726
    7.599     1.646     5.832     16.92     6.101
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      1.646m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution      conc  dilution  distance        Time
                                                 m     sec   hrs
     1.923      51.8     3.336      29.7     30.48   93.77   0.0
    0.8181     122.0     2.353      42.3     60.96   211.0   0.1
    0.4761     209.8     1.919      51.9     91.44   328.2   0.1
```

Z S= 12.0 @ 3.048 m

℄ S = 12.0/1.7

= 7.1

E1.2

12-Inch Open-Ended Discharge
Chronic Mixing Zone (100-food radius)

```
Jul 24, 2002,  21:57:16  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   9 of  16
Title   Cast 0 - Chronic                                              nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
 0.06791          1   0.06791      1000     : 0.0        22     30.48     91.44
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    8.534    0.3048    0.3048    0.9307    0.6581    0.6581      0.10        50
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.3048        45       1.0  -2.16673       100         0     3.683      6404
hor angle red space p amb den p current   far dif  far vel K:vel/cur Stratif #
       90    1000.0   19.1527    0.4500     0.003      0.46     2.068   0.03103
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
      0.0      0.45  0.628957      2.69     18.45              0.1445    0.2095
        1      0.45  0.628957      2.69     18.45           buoy flux puff-ther
        2      0.45   1.32819      3.51     18.07          0.00001423    0.8545
        3      0.45   2.36815      4.80     17.78           jet-plume jet-cross
        4      0.45   4.20105      7.07     17.25               1.057    0.5587
        5      0.45   10.3592     14.59     15.01           plu-cross jet-strat
        6      0.45   15.0184     20.24     13.15              0.1562     1.319
        7      0.45   18.6133     24.57     11.61           plu-strat
        8      0.45   19.0678     25.12     11.43               1.473
        9      0.45   19.2268     25.33     11.45             hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.06791 m3/s, 1.550 MGD, 2.398 cfs.                       >0.0 to 100 m3/s range
Help: F1.  Quit: <esc>.  Configuration:ATN00.  FILE: WARREN1.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.3048     100.0     1.000     0.000

     8.443    0.3961     70.71     1.405    0.1009
     8.349    0.5063     50.00     1.979    0.2287
     8.247    0.6358     35.36     2.790    0.3989
     8.133    0.7863     25.00     3.937    0.6329
     8.000    0.9612     17.68     5.559    0.9589
     7.845     1.165     12.50     7.853     1.411
     7.661     1.405     8.839     11.10     2.029
     7.444     1.687     6.250     15.69     2.867
     7.188     2.021     4.420     22.18     3.997
     6.886     2.418     3.125     31.36     5.532
     6.861     2.453     3.040     32.24     5.677 -> trap level
     6.560     2.901     2.210     44.36     8.158
     6.529     2.998     2.076     47.22     9.841
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      2.998m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution       conc  dilution  distance         Time
                                                  m       sec    hrs
     1.517      65.0      1.740      56.5     30.48     44.87    0.0
    0.8408     118.0      1.302      75.8     60.96     111.1    0.0
    0.5471     181.8      1.080      91.6     91.44     177.4    0.0
```

S= 56.5/1.4 = 40.4 @ ℄

```
 Jul 24, 2002,  21:57:16  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:  10 of  16
 Title   Cast 1 - Chronic                                              nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.06791         1   0.06791      1000       0.0        22     30.48     91.44
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     8.534    0.3048    0.3048    0.9307    0.6581    0.6581      0.10        50
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048        45       1.0  -2.16673       100         0     4.027      7656
 hor angle red space p amb den p current  far dif   far vel K:vel/cur Stratif #
        90    1000.0   15.6673    0.4500     0.003      0.45     2.068   0.03158
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.45 -0.100467      1.78     18.63               0.1336    0.1753
         1      0.45 -0.100467      1.78     18.63            buoy flux puff-ther
         2      0.45-0.0374683      1.86     18.62           0.00001190    0.9069
         3      0.45 0.0255279      1.94     18.61            jet-plume jet-cross
         4      0.45  0.194373      2.08     18.29                1.155    0.5587
         5      0.45  0.989764      3.14     18.36            plu-cross jet-strat
         6      0.45   1.95966      4.32        18               0.1306     1.372
         7      0.45   2.68083      5.22     17.82            plu-strat
         8      0.45   13.4033     18.50     14.72                1.495
         9      0.45   17.6431     23.46     12.29              hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.06791 m3/s, 1.550 MGD, 2.398 cfs.                  >0.0 to 100 m3/s range
Help: F1.  Quit: <esc>.  Configuration:ATN00.  FILE: WARREN1.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.3048     100.0     1.000     0.000

     8.443    0.3970     70.71     1.407    0.1009
     8.350    0.5084     50.00     1.983    0.2290
     8.251    0.6393     35.36     2.797    0.4009
     8.139    0.7916     25.00     3.950    0.6412
     8.011    0.9688     17.68     5.581    0.9854
     7.863     1.177     12.50     7.889     1.485
     7.847     1.200     12.07     8.168     1.547 -> trap level
     7.696     1.425     8.839     11.16     2.279
     7.577     1.639     6.839     14.43     3.851
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      1.639m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution      conc  dilution  distance        Time
                                                 m        sec    hrs
     3.303      30.1     4.654      21.3     30.48      59.17    0.0
     1.675      59.5     3.447      28.8     60.96      126.9    0.0
     1.050      95.0     2.858      34.8     91.44      194.6    0.1
```

S= 21.3/1.4 = 15.2 @ ℄

```
Jul 24, 2002,  21:57:17  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:  11 of  16
Title    Cast 2 - Chronic                                                nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.06791         1  0.06791      1000       0.0        22     30.48     91.44
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    8.534    0.3048    0.3048    0.9307    0.6581    0.6581      0.10        50
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.3048        45       1.0  -2.16673       100         0     5.985     16910
hor angle red space p amb den p current  far dif   far vel K:vel/cur Stratif #
       90    1000.0   5.90588    0.4500     0.003      0.45     2.068   0.02597
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
      0.0      0.45 0.0359617         2     18.79             0.08189   0.07934
        1      0.45 0.0359617         2     18.79            buoy flux puff-ther
        2      0.45  0.670191      2.78     18.59            5.388E-06     1.181
        3      0.45   1.14621      3.34     18.34            jet-plume jet-cross
        4      0.45   2.52231      5.04     17.93                1.717    0.5587
        5      0.45   3.45733      6.15     17.47            plu-cross jet-strat
        6      0.45   3.68999      6.43     17.37              0.05913     1.752
        7      0.45   4.06373      6.89     17.25            plu-strat
        8      0.45   4.59381      7.55     17.11                1.770
        9      0.45   7.05087     10.58     16.34              hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.06791 m3/s, 1.550 MGD, 2.398 cfs.                        >0.0 to 100 m3/s range
Help: F1.  Quit: &lt;esc&gt;.  Configuration:ATN00.  FILE: WARREN1.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
        m         m                              m
    8.534    0.3048     100.0     1.000     0.000

    8.444    0.3993     70.71     1.411    0.1008
    8.354    0.5133     50.00     1.992    0.2300
    8.258    0.6467     35.36     2.814    0.4075
    8.150    0.8011     25.00     3.977    0.6658
    8.025    0.9797     17.68     5.623     1.055
    7.877     1.187     12.50     7.950     1.655
    7.701     1.430     8.839     11.24     2.583
    7.492     1.716     6.250     15.90     4.020
    7.358     1.898     5.148     19.30     5.163 -> trap level
    7.244     2.053     4.420     22.48     6.319
    6.956     2.453     3.125     31.80     10.75
    6.866     2.614     2.759     36.02     15.54
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      2.614m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution       conc  dilution  distance        Time
                                                  m      sec    hrs
     2.197      45.3      2.422      41.1     30.48    33.21    0.0
     1.113      89.6      1.725      57.7     60.96    100.9    0.0
    0.6905     144.6      1.401      71.1     91.44    168.7    0.0
```

S=41.1 / 1.4 = 29.4 @ ℄

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Title Cast 3 - Chronic nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.06791	1	0.06791	1000	0.0	22	30.48	91.44
port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
8.534	0.3048	0.3048	0.9307	0.6581	0.6581	0.10	50
port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.3048	45	1.0	-2.16673	100	0	6.655	20910
hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	1000.0	4.36253	0.4500	0.003	0.45	2.068	0.02181
depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.45	0.375718	2.43	18.73		0.06754	0.06417
1	0.45	0.375718	2.43	18.73		buoy flux	puff-ther
2	0.45	0.542280	2.62	18.62		4.358E-06	1.268
3	0.45	0.573017	2.65	18.58		jet-plume	jet-cross
4	0.45	0.700926	2.81	18.55		1.910	0.5587
5	0.45	0.978056	3.14	18.42		plu-cross	jet-strat
6	0.45	1.19374	3.41	18.37		0.04782	1.929
7	0.45	2.55655	5.09	17.95		plu-strat	
8	0.45	4.10189	6.97	17.37		1.939	
9	0.45	4.58998	7.54	17.09		hor dis>=	

CORMIX1 flow category algorithm is turned off.

0.06791 m3/s, 1.550 MGD, 2.398 cfs. >0.0 to 100 m3/s range

Help: F1. Quit: <esc>. Configuration:ATNO0. FILE: WARREN1.VAR;

UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume dep m	plume dia m	poll conc	dilution	hor dis m	
8.534	0.3048	100.0	1.000	0.000	
8.444	0.3996	70.71	1.411	0.1008	
8.355	0.5140	50.00	1.993	0.2302	
8.259	0.6476	35.36	2.817	0.4086	
8.151	0.8019	25.00	3.981	0.6696	
8.025	0.9802	17.68	5.627	1.064	
7.877	1.187	12.50	7.956	1.662	
7.701	1.431	8.839	11.25	2.575	
7.606	1.562	7.484	13.29	3.180	-> trap level
7.494	1.717	6.250	15.91	4.025	
7.257	2.057	4.420	22.50	6.939	
7.216	2.155	4.039	24.62	9.559	

-> local maximum rise or fall

FARFIELD CALCULATION (based on Brooks, 1960, see guide)

Farfield dispersion based on wastefield width of 2.155m

--4/3 Power Law-- conc	dilution	-Const Eddy Diff- conc	dilution	distance m	Time sec	hrs
2.572	38.8	3.148	31.6	30.48	46.49	0.0
1.303	76.6	2.286	43.6	60.96	114.2	0.0
0.8147	122.6	1.877	53.1	91.44	182.0	0.1

S= 31.6/1.4 = 22.6 @ ℄

```
Jul 24, 2002,  21:57:17  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:  13 of  16
Title   Cast 4 - Chronic                                               nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.06791         1   0.06791      1000      0.0        22     30.48     91.44
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    8.534    0.3048    0.3048    0.9307    0.6581    0.6581      0.10        50
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.3048        45       1.0  -2.16673       100         0     12.04     68440
hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
       90    1000.0 -0.171917    0.4500     0.003      0.45     2.068  0.007000
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
      0.0      0.45 -0.562906      1.34     19.27             0.02120   0.01961
        1      0.45 -0.562906      1.34     19.27           buoy flux puff-ther
        2      0.45 -0.430897       1.5     19.22           1.331E-06     1.882
        3      0.45 -0.404012      1.53      19.2           jet-plume jet-cross
        4      0.45 -0.379137      1.56     19.19               3.455    0.5587
        5      0.45 -0.346641       1.6     19.18           plu-cross jet-strat
        6      0.45 -0.314145      1.64     19.17             0.01461     3.444
        7      0.45 -0.214656      1.76     19.13           plu-strat
        8      0.45 -0.197408      1.78     19.12               3.438
        9      0.45 -0.149671      1.84     19.11             hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.06791 m3/s, 1.550 MGD, 2.398 cfs.                       >0.0 to 100 m3/s range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: WARREN1.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
        m         m                              m
    8.534    0.3048     100.0     1.000     0.000

    8.445    0.4007     70.71     1.413    0.1008
    8.356    0.5163     50.00     1.998    0.2306
    8.262    0.6511     35.36     2.825    0.4121
    8.156    0.8065     25.00     3.994    0.6840
    8.033    0.9856     17.68     5.648     1.110
    7.886     1.193     12.50     7.986     1.786
    7.710     1.436     8.839     11.29     2.858
    7.500     1.721     6.250     15.97     4.526
    7.249     2.058     4.420     22.58     7.065
    6.949     2.456     3.125     31.94     10.83
    6.593     2.929     2.210     45.17     16.44
    6.570     2.960     2.164     46.12     16.86 -> trap level
    6.175     3.490     1.563     63.88     26.06
    5.971     3.822     1.305     76.49     40.31
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      3.822m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution        conc  dilution  distance         Time
                                                   m       sec    hrs
     1.010      98.9     1.127      88.6     60.96     45.88    0.0
    0.5856     170.6    0.8569     116.6     91.44     113.6    0.0
```

S= 88.6/1.4 = 63.3 @ ¢

```
 Jul 24, 2002,  21:57:17  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:  14 of  16
 Title    Cast 5 - Chronic                                             nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp  far inc   far dis
   0.06791         1   0.06791      1000       0.0        22    30.48     91.44
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     8.534    0.3048    0.3048    0.9307    0.6581    0.6581     0.10        50
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048        45       1.0  -2.16673       100         0     6.510     20010
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
        90    1000.0   4.65628    0.4500     0.003      0.45     2.068   0.02731
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.45 -0.561729       1.4     19.49             0.07726   0.06706
         1      0.45 -0.561729       1.4     19.49           buoy flux puff-ther
         2      0.45 -0.134144       1.9     19.26           4.554E-06     1.249
         3      0.45  0.566239      2.74     18.96           jet-plume jet-cross
         4      0.45   1.19028      3.47     18.62               1.868    0.5587
         5      0.45   1.75248      4.13     18.32           plu-cross jet-strat
         6      0.45   2.45535      4.97        18             0.04997     1.804
         7      0.45   2.87534      5.47      17.8           plu-strat
         8      0.45   3.70316       6.5     17.58               1.773
         9      0.45   5.48803      8.67      16.9             hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.06791 m3/s, 1.550 MGD, 2.398 cfs.                     >0.0 to 100 m3/s range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: WARREN1.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.3048     100.0     1.000     0.000

     8.444    0.3995     70.71     1.411    0.1008
     8.354    0.5139     50.00     1.993    0.2301
     8.259    0.6476     35.36     2.816    0.4084
     8.151    0.8021     25.00     3.981    0.6692
     8.026    0.9808     17.68     5.628     1.065
     7.879     1.189     12.50     7.957     1.676
     7.703     1.432     8.839     11.25     2.626
     7.531     1.669     6.606     15.05     3.837 -> trap level
     7.495     1.718     6.250     15.91     4.129
     7.251     2.056     4.420     22.50     6.749
     7.081     2.329     3.467     28.68     11.93
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      2.329m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution      conc  dilution  distance          Time
                                                 m        sec   hrs
     2.423      41.1     2.837      35.1     30.48      41.22   0.0
     1.224      81.5     2.042      48.8     60.96      109.0   0.0
    0.7630     130.9     1.670      59.7     91.44      176.7   0.0
```

S = 35.1 / 1.4 = 25.1 @ ℄

Jul 24, 2002, 21:57:18 ERL-N PROGRAM PLUMES, Ed 3, 3/11/94 Case: 15 of 16

Title Cast 6 - Chronic nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.06791	1	0.06791	1000	0.0	22	30.48	91.44
port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
8.534	0.3048	0.3048	0.9307	0.6581	0.6581	0.10	50
port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.3048	45	1.0	-2.16673	100	0	4.827	11000
hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	1000.0	10.2413	0.4500	0.003	0.45	2.068	0.01936
depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.45	3.51393	6.3	17.77		0.08748	0.1219
1	0.45	3.51393	6.3	17.77		buoy flux	puff-ther
2	0.45	3.77157	6.61	17.66		8.282E-06	1.023
3	0.45	4.95422	8.04	17.18		jet-plume	jet-cross
4	0.45	5.92653	9.22	16.8		1.385	0.5587
5	0.45	7.84359	11.55	16.06		plu-cross	jet-strat
6	0.45	9.53934	13.57	15.23		0.09088	1.695
7	0.45	10.0033	14.12	14.99		plu-strat	
8	0.45	10.0334	14.15	14.95		1.875	
9	0.45	10.4227	14.64	14.87		hor dis>=	

CORMIX1 flow category algorithm is turned off.

0.06791 m3/s, 1.550 MGD, 2.398 cfs. >0.0 to 100 m3/s range

Help: F1. Quit: <esc>. Configuration:ATN00. FILE: WARREN1.VAR;

UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume dep m	plume dia m	poll conc	dilution	hor dis m	
8.534	0.3048	100.0	1.000	0.000	
8.444	0.3982	70.71	1.409	0.1008	
8.352	0.5109	50.00	1.988	0.2296	
8.254	0.6429	35.36	2.806	0.4045	
8.144	0.7957	25.00	3.963	0.6533	
8.015	0.9727	17.68	5.600	1.015	
7.864	1.178	12.50	7.915	1.539	
7.683	1.419	8.839	11.19	2.286	
7.468	1.703	6.250	15.82	3.323	
7.211	2.037	4.420	22.37	4.735	
6.907	2.433	3.125	31.62	6.628	
6.548	2.905	2.210	44.72	9.205	
6.380	3.129	1.910	51.73	10.62	-> trap level
6.130	3.467	1.563	63.25	13.19	
5.863	3.897	1.243	79.50	19.71	

-> local maximum rise or fall

FARFIELD CALCULATION (based on Brooks, 1960, see guide)

Farfield dispersion based on wastefield width of 3.897m

--4/3 Power Law-- conc	dilution	-Const Eddy Diff- conc	dilution	distance m	Time sec	hrs
1.165	84.9	1.197	82.6	30.48	23.94	0.0
0.6631	149.9	0.8871	111.8	60.96	91.67	0.0
0.4262	233.7	0.7231	137.3	91.44	159.4	0.0

S = 82.6/1.4 = 59.0 @ ℄

```
 Jul 24, 2002,  21:57:18  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:  16 of  16
 Title   Cast 7 - Chronic                                              nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.06791         1   0.06791      1000       0.0       22     30.48     91.44
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     8.534    0.3048    0.3048    0.9307    0.6581    0.6581      0.10        50
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048        45       1.0  -2.16673       100         0     3.441      5592
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
        90    1000.0   22.2482    0.4500     0.003      0.45     2.068   0.02247
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.45   6.88544     10.49     16.85              0.1314    0.2400
         1      0.45   6.88544     10.49     16.85           buoy flux puff-ther
         2      0.45   7.14677     10.77      16.6          0.00001630    0.8167
         3      0.45   7.65011      11.4     16.48           jet-plume jet-cross
         4      0.45   11.2992     15.86     15.18              0.9875    0.5587
         5      0.45   16.9880     22.73     12.83           plu-cross jet-strat
         6      0.45   20.6196     26.97     10.69              0.1788     1.383
         7      0.45   21.7468      28.3     10.09           plu-strat
         8      0.45   22.1511     28.77      9.84               1.637
         9      0.45   22.3330     28.98      9.72             hor dis>=

CORMIX1 flow category algorithm is turned off.
 0.06791 m3/s, 1.550 MGD, 2.398 cfs.                       >0.0 to 100 m3/s range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: WARREN1.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.3048     100.0     1.000     0.000

     8.443    0.3954     70.71     1.404    0.1009
     8.348    0.5047     50.00     1.976    0.2284
     8.245    0.6334     35.36     2.784    0.3971
     8.129    0.7831     25.00     3.928    0.6267
     7.996    0.9573     17.68     5.545    0.9431
     7.839     1.161     12.50     7.833     1.377
     7.654     1.400     8.839     11.07     1.966
     7.436     1.681     6.250     15.64     2.756
     7.178     2.014     4.420     22.11     3.813
     6.875     2.410     3.125     31.27     5.234
     6.545     2.852     2.256     43.31     7.084 -> trap level
     6.523     2.883     2.210     44.22     7.229
     6.123     3.449     1.563     62.54     10.80
     6.037     3.652     1.399     69.87     14.78
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      3.652m
   --4/3 Power Law--    -Const Eddy Diff-
      conc  dilution        conc  dilution  distance          Time
                                                   m        sec    hrs
     1.187      82.6       1.272      77.0     30.48      34.88    0.0
    0.6705     147.5      0.9491     103.7     60.96      102.6    0.0
    0.4366     227.4      0.7823     126.2     91.44      170.3    0.0
```

S= 77.0/1.4 = 55.0 @ ℄

E2.1

Eight 4-Inch Ports at 5-Foot Spacing
Acute Mixing Zone (10-foot radius)

```
 Aug 26, 2002,  10:51:31  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   1 of  16
 Title   Cast 0 - Acute                                                nonlinear
  tot flow  # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.1008         8   0.01260    1.219       0.0        22     30.48     91.44
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    8.534    0.1016    0.1016     1.554     1.099     1.099      0.10        50
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.3048        45       1.0  -2.16673       100         0     10.65     8.115
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
       90     1.219   19.1527    0.2600     0.003      0.26     5.978   0.01034
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.26  0.628957      2.69     18.45               0.1445    0.2095
         1      0.26  0.628957      2.69     18.45            buoy flux puff-ther
         2      0.26   1.32819      3.51     18.07             0.002166    0.8236
         3      0.26   2.36815      4.80     17.78            jet-plume jet-cross
         4      0.26   4.20105      7.07     17.25                1.019    0.5382
         5      0.26   10.3592     14.59     15.01            plu-cross jet-strat
         6      0.26   15.0184     20.24     13.15               0.1502    0.9840
         7      0.26   18.6133     24.57     11.61            plu-strat
         8      0.26   19.0678     25.12     11.43               0.9671
         9      0.26   19.2268     25.33     11.45              hor dis>=

CORMIX1 flow category algorithm is turned off.
 8   L ÷ 9.75 m                                                1 to any  range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.1016     100.0     1.000     0.000

     8.470    0.1390     70.71     1.405   0.06718
     8.394    0.1888     50.00     1.979    0.1532
     8.309    0.2533     35.36     2.790    0.2607
     8.217    0.3349     25.00     3.937    0.3933
     8.118    0.4354     17.68     5.559    0.5571
     8.011    0.5568     12.50     7.853    0.7626
     7.893    0.7010     8.839     11.10     1.027
     7.761    0.8707     6.250     15.69     1.373
     7.610     1.070     4.420     22.18     1.835
     7.493     1.224     3.492     28.07     2.238 -> merging
     7.430     1.318     3.125     31.36     2.473    S= 38.7   @3.048 m
     7.179     1.749     2.210     44.34     3.496
     6.953     2.176     1.746     56.12     4.537 -> trap level
     6.837     2.430     1.563     62.70     5.163
     6.709     2.873     1.332     73.55     7.094
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of       11.41m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution       conc  dilution  distance          Time
                                                  m       sec    hrs
     1.058      93.0     1.168      84.1     30.48     89.95    0.0
    0.6651     148.8    0.9214     107.0     60.96     207.2    0.1
    0.4616     215.1    0.7794     126.8     91.44     324.4    0.1
```

```
 Aug 26, 2002,  10:51:31  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   2 of  16
 Title   Cast 1 - Acute                                                nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
    0.1008         8   0.01260     1.219       0.0        22     30.48     91.44
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     8.534    0.1016    0.1016     1.554     1.099     1.099      0.10        50
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048        45       1.0  -2.16673       100         0     11.65     9.701
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
        90     1.219   15.6673    0.2600     0.003      0.26     5.978   0.01053
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.26 -0.100467      1.78     18.63              0.1336    0.1753
         1      0.26 -0.100467      1.78     18.63           buoy flux puff-ther
         2      0.26-0.0374683      1.86     18.62            0.001812    0.8741
         3      0.26 0.0255279      1.94     18.61           jet-plume jet-cross
         4      0.26  0.194373      2.08     18.29               1.114    0.5382
         5      0.26  0.989764      3.14     18.36           plu-cross jet-strat
         6      0.26   1.95966      4.32        18              0.1257     1.024
         7      0.26   2.68083      5.22     17.82           plu-strat
         8      0.26   13.4033     18.50     14.72              0.9812
         9      0.26   17.6431     23.46     12.29               hor dis>=

CORMIX1 flow category algorithm is turned off.
 8  L ÷ 9.75 m                                                  1 to any  range
Help: F1.  Quit: <esc>.  Configuration:ATN00.  FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.1016     100.0     1.000     0.000

     8.469    0.1391     70.71     1.407   0.06743
     8.394    0.1892     50.00     1.983    0.1538
     8.309    0.2542     35.36     2.797    0.2620
     8.218    0.3365     25.00     3.949    0.3959
     8.120    0.4384     17.68     5.579    0.5623
     8.016    0.5617     12.50     7.886    0.7737
     7.909    0.7029     8.962     11.00     1.039 -> trap level
     7.905    0.7093     8.839     11.15     1.052
     7.786    0.8859     6.250     15.77     1.448
     7.668     1.096     4.420     22.32     2.236
     7.660     1.128     4.210     23.43     2.562
 -> local maximum rise or fall
Plumes not merged, Brooks method may be invalid.
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      9.661m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution        conc  dilution  distance         Time
                                                   m       sec   hrs
     2.936      33.7     3.441      28.7     30.48     107.4   0.0
     1.809      55.0     2.712      36.6     60.96     224.6   0.1
     1.248      79.8     2.300      43.2     91.44     341.8   0.1
```

Critical
Acute
Case
S=23.4

Note: Actual dilution may be higher than 23.4 because calculation terminates at 2.562 m from diffuser < m.z. length of 3.048 m

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Title Cast 2 - Acute nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.1008	8	0.01260	1.219	0.0	22	30.48	91.44
port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
8.534	0.1016	0.1016	1.554	1.099	1.099	0.10	50
port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.3048	45	1.0	-2.16673	100	0	17.31	21.43
hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	1.219	5.90588	0.2600	0.003	0.26	5.978	0.008657
depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.26	0.0359617	2	18.79		0.08189	0.07934
1	0.26	0.0359617	2	18.79		buoy flux	puff-ther
2	0.26	0.670191	2.78	18.59		0.0008201	1.138
3	0.26	1.14621	3.34	18.34		jet-plume	jet-cross
4	0.26	2.52231	5.04	17.93		1.656	0.5382
5	0.26	3.45733	6.15	17.47		plu-cross	jet-strat
6	0.26	3.68999	6.43	17.37		0.05688	1.307
7	0.26	4.06373	6.89	17.25		plu-strat	
8	0.26	4.59381	7.55	17.11		1.162	
9	0.26	7.05087	10.58	16.34		hor dis>=	

CORMIX1 flow category algorithm is turned off.

8 L ÷ 9.75 m 1 to any range

Help: F1. Quit: <esc>. Configuration:ATN00. FILE: WARREN2.VAR;

UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume dep	plume dia	poll conc	dilution	hor dis	
m	m			m	
8.534	0.1016	100.0	1.000	0.000	
8.469	0.1395	70.71	1.411	0.06811	
8.393	0.1902	50.00	1.992	0.1556	
8.309	0.2562	35.36	2.814	0.2655	
8.219	0.3399	25.00	3.977	0.4024	
8.124	0.4433	17.68	5.622	0.5746	
8.023	0.5681	12.50	7.949	0.7979	
7.913	0.7161	8.839	11.24	1.102	
7.791	0.8893	6.250	15.90	1.539	
7.650	1.092	4.420	22.48	2.194	
7.629	1.123	4.210	23.60	2.310	-> trap level
7.559	1.224	3.615	27.48	2.730	-> merging
7.482	1.351	3.125	31.79	3.266	
7.251	1.804	2.210	44.96	5.637	S= 30.0 @ 3.048 m
7.166	2.050	1.924	51.65	8.601	

-> local maximum rise or fall

FARFIELD CALCULATION (based on Brooks, 1960, see guide)

Farfield dispersion based on wastefield width of 10.58m

--4/3 Power Law--		-Const Eddy Diff-				
conc	dilution	conc	dilution	distance	Time	
				m	sec	hrs
1.534	64.9	1.690	58.8	30.48	84.15	0.0
0.9386	106.2	1.315	75.7	60.96	201.4	0.1
0.6415	155.5	1.105	90.2	91.44	318.6	0.1

```
Aug 26, 2002,  10:51:32  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   4 of  16
Title    Cast 3 - Acute                                                nonlinear
  tot flow    # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.1008           8   0.01260     1.219       0.0        22     30.48     91.44
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     8.534    0.1016    0.1016     1.554     1.099     1.099      0.10        50
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048        45       1.0  -2.16673       100         0     19.25     26.50
 hor angle red space p amb den p current   far dif  far vel K:vel/cur Stratif #
        90     1.219   4.36253    0.2600     0.003     0.26     5.978  0.007269
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.26  0.375718      2.43     18.73             0.06754   0.06417
         1      0.26  0.375718      2.43     18.73            buoy flux puff-ther
         2      0.26  0.542280      2.62     18.62            0.0006633     1.222
         3      0.26  0.573017      2.65     18.58            jet-plume jet-cross
         4      0.26  0.700926      2.81     18.55                1.841    0.5382
         5      0.26  0.978056      3.14     18.42            plu-cross jet-strat
         6      0.26   1.19374      3.41     18.37              0.04600     1.439
         7      0.26   2.55655      5.09     17.95            plu-strat
         8      0.26   4.10189      6.97     17.37                1.273
         9      0.26   4.58998      7.54     17.09              hor dis>=

CORMIX1 flow category algorithm is turned off.
 8  L ÷ 9.75 m                                                1 to any  range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.1016     100.0     1.000     0.000

     8.469    0.1395     70.71     1.411   0.06822
     8.393    0.1904     50.00     1.993    0.1558
     8.309    0.2565     35.36     2.817    0.2660
     8.219    0.3403     25.00     3.981    0.4033
     8.124    0.4437     17.68     5.627    0.5761
     8.022    0.5682     12.50     7.955    0.8003
     7.912    0.7157     8.839     11.25     1.103
     7.789    0.8890     6.250     15.91     1.532
     7.727    0.9784     5.329     18.66     1.793 -> trap level
     7.649     1.092     4.420     22.50     2.174
     7.559     1.226     3.615     27.50     2.715 -> merging
     7.485     1.354     3.125     31.82     3.292          S= 30.0 @ 3.048 m
     7.370     1.633     2.486     40.00     5.554
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      10.17m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution       conc  dilution  distance         Time
                                                  m      sec    hrs
     1.856      53.6      2.107      47.2     30.48    95.87    0.0
     1.138      87.6      1.649      60.4     60.96    213.1    0.1
    0.7816     127.7      1.391      71.6     91.44    330.3    0.1
```

```
 Aug 26, 2002,  10:51:32  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   5 of  16
 Title    Cast 4 - Acute                                                 nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
    0.1008         8   0.01260     1.219       0.0        22     30.48     91.44
   port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     8.534    0.1016    0.1016     1.554     1.099     1.099      0.10        50
  port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048        45       1.0  -2.16673       100         0     34.82     86.73
  hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
        90     1.219 -0.171917    0.2600     0.003      0.26     5.978  0.002333
      depth   current   density  salinity      temp  amb conc  N (freq) red grav.
        0.0      0.26 -0.562906      1.34     19.27              0.02120   0.01961
          1      0.26 -0.562906      1.34     19.27            buoy flux puff-ther
          2      0.26 -0.430897       1.5     19.22            0.0002027     1.814
          3      0.26 -0.404012      1.53      19.2            jet-plume jet-cross
          4      0.26 -0.379137      1.56     19.19                3.331    0.5382
          5      0.26 -0.346641       1.6     19.18            plu-cross jet-strat
          6      0.26 -0.314145      1.64     19.17              0.01406     2.569
          7      0.26 -0.214656      1.76     19.13            plu-strat
          8      0.26 -0.197408      1.78     19.12                2.257
          9      0.26 -0.149671      1.84     19.11              hor dis>=

CORMIX1 flow category algorithm is turned off.
 8  L ÷ 9.75 m                                                   1 to any  range
Help: F1.  Quit: <esc>.  Configuration:ATN00.  FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.1016     100.0     1.000     0.000

     8.469    0.1397     70.71     1.413   0.06854
     8.393    0.1909     50.00     1.998    0.1567
     8.309    0.2575     35.36     2.825    0.2677
     8.220    0.3419     25.00     3.994    0.4065
     8.126    0.4461     17.68     5.648    0.5824
     8.026    0.5715     12.50     7.986    0.8135
     7.917    0.7196     8.839     11.29     1.132
     7.795    0.8929     6.250     15.97     1.593
     7.654     1.095     4.420     22.58     2.284
     7.562     1.228     3.615     27.61     2.839 -> merging
     7.483     1.355     3.125     31.94     3.377   S= 29.3 @ 3.048 m
     7.239     1.805     2.210     45.17     5.373
     6.890     2.496     1.563     63.87     8.942
     6.777     2.724     1.428     69.90     10.26 -> trap level
     6.403     3.511     1.105     90.33     15.89
     6.217     4.036    0.9619     103.8     24.20
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      12.57m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution       conc  dilution  distance         Time
                                                  m       sec    hrs
    0.9582     104.2     0.9596     104.0     30.48     24.16    0.0
    0.6340     157.5     0.7632     130.8     60.96     141.4    0.0
    0.4219     236.8     0.6249     159.8     91.44     258.6    0.1
```

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Title Cast 5 - Acute nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.1008	8	0.01260	1.219	0.0	22	30.48	91.44
port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
8.534	0.1016	0.1016	1.554	1.099	1.099	0.10	50
port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.3048	45	1.0	-2.16673	100	0	18.83	25.36
hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	1.219	4.65628	0.2600	0.003	0.26	5.978	0.009105
depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.26	-0.561729	1.4	19.49		0.07726	0.06706
1	0.26	-0.561729	1.4	19.49		buoy flux	puff-ther
2	0.26	-0.134144	1.9	19.26		0.0006931	1.204
3	0.26	0.566239	2.74	18.96		jet-plume	jet-cross
4	0.26	1.19028	3.47	18.62		1.801	0.5382
5	0.26	1.75248	4.13	18.32		plu-cross	jet-strat
6	0.26	2.45535	4.97	18		0.04807	1.346
7	0.26	2.87534	5.47	17.8		plu-strat	
8	0.26	3.70316	6.5	17.58		1.163	
9	0.26	5.48803	8.67	16.9		hor dis>=	

CORMIX1 flow category algorithm is turned off.

8 L ÷ 9.75 m 1 to any range

Help: F1. Quit: <esc>. Configuration:ATN00. FILE: WARREN2.VAR;

UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume dep m	plume dia m	poll conc	dilution	hor dis m	
8.534	0.1016	100.0	1.000	0.000	
8.469	0.1395	70.71	1.411	0.06820	
8.393	0.1904	50.00	1.993	0.1558	
8.309	0.2565	35.36	2.816	0.2660	
8.219	0.3403	25.00	3.980	0.4032	
8.124	0.4439	17.68	5.627	0.5761	
8.023	0.5687	12.50	7.956	0.8008	
7.914	0.7167	8.839	11.25	1.107	
7.791	0.8900	6.250	15.91	1.547	
7.718	0.9955	5.183	19.18	1.870	-> trap level
7.652	1.093	4.420	22.50	2.211	
7.561	1.226	3.615	27.51	2.765	-> merging
7.485	1.354	3.125	31.82	3.335	S = 29.6 @ 3.048 m
7.288	1.809	2.210	45.00	7.060	

-> local maximum rise or fall

FARFIELD CALCULATION (based on Brooks, 1960, see guide)

Farfield dispersion based on wastefield width of 10.34m

--4/3 Power Law-- conc	dilution	-Const Eddy Diff- conc	dilution	distance m	Time sec	hrs
1.703	58.5	1.905	52.2	30.48	90.08	0.0
1.042	95.7	1.486	67.0	60.96	207.3	0.1
0.7139	139.8	1.251	79.7	91.44	324.5	0.1

```
Aug 26, 2002,  10:51:33  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   7 of  16
Title    Cast 6 - Acute                                                 nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.1008          8   0.01260     1.219    : 0.0         22     30.48     91.44
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    8.534    0.1016    0.1016     1.554     1.099     1.099      0.10        50
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.3048        45       1.0  -2.16673       100         0     13.96     13.94
hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
       90     1.219   10.2413    0.2600     0.003      0.26     5.978  0.006455
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
      0.0      0.26   3.51393       6.3     17.77             0.08748    0.1219
        1      0.26   3.51393       6.3     17.77            buoy flux puff-ther
        2      0.26   3.77157      6.61     17.66             0.001261    0.9864
        3      0.26   4.95422      8.04     17.18            jet-plume jet-cross
        4      0.26   5.92653      9.22      16.8                1.335    0.5382
        5      0.26   7.84359     11.55     16.06            plu-cross jet-strat
        6      0.26   9.53934     13.57     15.23              0.08742     1.265
        7      0.26   10.0033     14.12     14.99            plu-strat
        8      0.26   10.0334     14.15     14.95                1.231
        9      0.26   10.4227     14.64     14.87              hor dis>=

CORMIX1 flow category algorithm is turned off.
 8  L ÷ 9.75 m                                                1 to any  range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.1016     100.0     1.000     0.000

     8.469    0.1393     70.71     1.409   0.06780
     8.393    0.1898     50.00     1.988    0.1548
     8.309    0.2552     35.36     2.806    0.2639
     8.218    0.3381     25.00     3.963    0.3992
     8.121    0.4404     17.68     5.600    0.5682
     8.018    0.5637     12.50     7.915    0.7841
     7.904    0.7098     8.839     11.19     1.069
     7.776    0.8811     6.250     15.82     1.457
     7.629     1.081     4.420     22.36     1.994
     7.521     1.227     3.540     27.92     2.441 -> merging
     7.451     1.334     3.125     31.62     2.758
     7.198     1.772     2.210     44.72     3.992    S=34.7  @ 3.048 m
     6.837     2.446     1.563     63.24     5.922
     6.629     2.861     1.332     74.17     7.151 -> trap level
     6.351     3.458     1.105     89.43     9.168
     6.115     4.108    0.9356     105.6     13.43
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      12.64m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution       conc  dilution  distance          Time
                                                  m       sec    hrs
    0.8376     118.1     0.8769     112.8     30.48     65.59    0.0
    0.5315     186.9     0.6888     143.9     60.96     182.8    0.1
    0.3665     271.6     0.5776     171.9     91.44     300.0    0.1
```

```
Aug 26, 2002,  10:51:33  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   8 of  16
Title    Cast 7 - Acute                                                nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.1008          8   0.01260     1.219       0.0        22     30.48     91.44
 port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
    8.534    0.1016    0.1016     1.554     1.099     1.099      0.10        50
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
   0.3048        45       1.0  -2.16673       100         0     9.954     7.086
hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
       90     1.219   22.2482    0.2600     0.003      0.26     5.978  0.007491
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
      0.0      0.26   6.88544     10.49     16.85               0.1314    0.2400
        1      0.26   6.88544     10.49     16.85            buoy flux puff-ther
        2      0.26   7.14677     10.77      16.6             0.002480    0.7872
        3      0.26   7.65011      11.4     16.48            jet-plume jet-cross
        4      0.26   11.2992     15.86     15.18               0.9520    0.5382
        5      0.26   16.9880     22.73     12.83            plu-cross jet-strat
        6      0.26   20.6196     26.97     10.69               0.1720     1.032
        7      0.26   21.7468      28.3     10.09            plu-strat
        8      0.26   22.1511     28.77      9.84                1.074
        9      0.26   22.3330     28.98      9.72              hor dis>=

CORMIX1 flow category algorithm is turned off.
 8   L ÷ 9.75 m                                                1 to any   range
Help: F1.  Quit: <esc>.  Configuration:ATN00.  FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.1016     100.0     1.000     0.000

     8.470    0.1388     70.71     1.404   0.06696
     8.394    0.1885     50.00     1.976    0.1526
     8.309    0.2527     35.36     2.784    0.2596
     8.216    0.3338     25.00     3.928    0.3913
     8.116    0.4338     17.68     5.545    0.5534
     8.008    0.5545     12.50     7.833    0.7559
     7.889    0.6980     8.839     11.07     1.014
     7.756    0.8671     6.250     15.64     1.350
     7.603     1.065     4.420     22.11     1.793
     7.482     1.224     3.467     28.18     2.188 -> merging
     7.422     1.311     3.125     31.26     2.397
     7.170     1.738     2.210     44.21     3.352  S= 40.1 @ 3.048 m
     6.817     2.407     1.563     62.51     4.873
     6.801     2.440     1.541     63.39     4.951 -> trap level
     6.384     3.437     1.105     88.41     8.090
     6.381     3.564     1.067     91.53     9.509
 -> local maximum rise or fall -> begin overlap
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      12.10m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution       conc  dilution  distance          Time
                                                  m       sec    hrs
    0.8945     109.6    0.9638     101.6     30.48     80.66    0.0
    0.5668     174.3    0.7605     129.3     60.96     197.9    0.1
    0.3936     251.9    0.6422     153.6     91.44     315.1    0.1
```

Nov 20, 2002, 18:12:45 ERL-N PROGRAM PLUMES, Ed 3, 3/11/94 Case: 2 of 16

Title Cast 1 - Acute – 90th %. current speeds nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.1008	8	0.01260	1.219	0.0	22	30.48	91.44
port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
8.534	0.1016	0.1016	1.554	1.099	1.099	0.10	50
port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.3048	45	1.0	-2.16673	100	0	11.65	272.1
hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	1.219	15.6673	0.7900	0.003	0.26	1.967	0.01053
depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.79	-0.100467	1.78	18.63		0.1336	0.1753
1	0.79	-0.100467	1.78	18.63		buoy flux	puff-ther
2	0.79	-0.0374683	1.86	18.62		0.001812	0.6035
3	0.79	0.0255279	1.94	18.61		jet-plume	jet-cross
4	0.79	0.194373	2.08	18.29		1.114	0.1771
5	0.79	0.989764	3.14	18.36		plu-cross	jet-strat
6	0.79	1.95966	4.32	18		0.004479	1.024
7	0.79	2.68083	5.22	17.82		plu-strat	
8	0.79	13.4033	18.50	14.72		0.9812	
9	0.79	17.6431	23.46	12.29		hor dis>=	

44

CORMIX1 flow category algorithm is turned off.
0.79 m/s, 2.592 ft/s >=0.0 to 2.0 m/s range
Help: F1. Quit: <esc>. Configuration:ATNO0. FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume dep	plume dia	poll conc	dilution	hor dis	
m	m			m	
8.534	0.1016	100.0	1.000	0.000	
8.507	0.1328	70.71	1.407	0.03128	
8.479	0.1701	50.00	1.982	0.07213	
8.450	0.2135	35.36	2.796	0.1304	
8.416	0.2633	25.00	3.948	0.2196	
8.376	0.3207	17.68	5.576	0.3612	
8.329	0.3873	12.50	7.880	0.5885	
8.273	0.4654	8.839	11.14	0.9521	
8.205	0.5572	6.250	15.75	1.529	
8.124	0.6657	4.420	22.27	2.446	
8.105	0.6922	4.095	24.03	2.715	-> trap level
8.029	0.7943	3.125	31.49	3.973	
7.932	0.9404	2.241	43.94	7.847	S=26.0 @ 3.048 m

-> local maximum rise or fall
Plumes not merged, Brooks method may be invalid.
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of 9.473m

--4/3 Power Law--		-Const Eddy Diff-				
conc	dilution	conc	dilution	distance	Time	
				m	sec	hrs
1.714	57.7	1.924	51.3	30.48	87.05	0.0
1.028	96.6	1.488	66.5	60.96	204.3	0.1
0.6961	143.0	1.249	79.3	91.44	321.5	0.1

E2.2

Eight 4-Inch Ports at 5-Foot Spacing
Chronic Mixing Zone (100-foot radius)

```
 Aug 26, 2002,  10:51:33  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   9 of  16
 Title   Cast 0 - Chronic                                              nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.06791         8  0.008489     1.219    : 0.0        22     30.48     91.44
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     8.534    0.1016    0.1016     1.047    0.7404    0.7404      0.10        50
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048        45       1.0  -2.16673       100         0     7.176     62.45
 hor angle red space p amb den p current  far dif   far vel K:vel/cur Stratif #
        90     1.219   19.1527    0.4500     0.003      0.46     2.327   0.01034
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.45  0.628957      2.69     18.45              0.1445    0.2095
         1      0.45  0.628957      2.69     18.45            buoy flux puff-ther
         2      0.45   1.32819      3.51     18.07             0.001459    0.4621
         3      0.45   2.36815      4.80     17.78            jet-plume jet-cross
         4      0.45   4.20105      7.07     17.25               0.6864    0.2095
         5      0.45   10.3592     14.59     15.01            plu-cross jet-strat
         6      0.45   15.0184     20.24     13.15              0.01952    0.8077
         7      0.45   18.6133     24.57     11.61            plu-strat
         8      0.45   19.0678     25.12     11.43               0.8761
         9      0.45   19.2268     25.33     11.45              hor dis>=

CORMIX1 flow category algorithm is turned off.
 8  L ÷ 9.75 m                                                 1 to any  range
Help: F1.  Quit: <esc>.  Configuration:ATN00.  FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.1016     100.0     1.000     0.000

     8.501    0.1339     70.71     1.405   0.03711
     8.467    0.1735     50.00     1.979   0.08396
     8.431    0.2204     35.36     2.790    0.1465
     8.392    0.2750     25.00     3.937    0.2348
     8.347    0.3382     17.68     5.559    0.3645
     8.295    0.4115     12.50     7.853    0.5576
     8.232    0.4971     8.839     11.10    0.8427
     8.158    0.5975     6.250     15.69     1.254
     8.068    0.7159     4.420     22.17     1.834
     7.962    0.8557     3.125     31.35     2.631
     7.836     1.021     2.210     44.33     3.715
     7.685     1.218     1.563     62.69     5.194
     7.679     1.227     1.541     63.56     5.265 -> merging
     7.486     1.535     1.105     88.65     7.489
     7.330     1.815    0.8975     109.1     9.609 -> trap level
     7.208     2.046    0.7813     125.4     11.58
     6.976     2.566    0.6087     160.9     19.84
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      11.10m
   --4/3 Power Law--   -Const Eddy Diff-
     conc  dilution       conc  dilution  distance         Time
                                                 m        sec   hrs
   0.6060     161.6     0.6071     161.4     30.48      23.14   0.0
   0.4814     204.4     0.5323     184.5     60.96      89.40   0.0
   0.3639     271.5     0.4598     214.1     91.44      155.7   0.0
```

Aug 26, 2002, 10:51:34 ERL-N PROGRAM PLUMES, Ed 3, 3/11/94 Case: 10 of 16

Title Cast 1 - Chronic nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.06791	8	0.008489	1.219	0.0	22	30.48	91.44
port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
8.534	0.1016	0.1016	1.047	0.7404	0.7404	0.10	50
port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.3048	45	1.0	-2.16673	100	0	7.846	74.66
hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	1.219	15.6673	0.4500	0.003	0.45	2.327	0.01053
depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.45	-0.100467	1.78	18.63		0.1336	0.1753
1	0.45	-0.100467	1.78	18.63		buoy flux	puff-ther
2	0.45	-0.0374683	1.86	18.62		0.001221	0.4905
3	0.45	0.0255279	1.94	18.61		jet-plume	jet-cross
4	0.45	0.194373	2.08	18.29		0.7505	0.2095
5	0.45	0.989764	3.14	18.36		plu-cross	jet-strat
6	0.45	1.95966	4.32	18		0.01633	0.8401
7	0.45	2.68083	5.22	17.82		plu-strat	
8	0.45	13.4033	18.50	14.72		0.8889	
9	0.45	17.6431	23.46	12.29		hor dis>=	

CORMIX1 flow category algorithm is turned off.

8 L ÷ 9.75 m 1 to any range

Help: F1. Quit: <esc>. Configuration:ATN00. FILE: WARREN2.VAR;

UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume dep	plume dia	poll conc	dilution	hor dis	
m	m			m	
8.534	0.1016	100.0	1.000	0.000	
8.501	0.1340	70.71	1.407	0.03722	
8.467	0.1738	50.00	1.982	0.08423	
8.431	0.2209	35.36	2.796	0.1471	
8.393	0.2757	25.00	3.948	0.2364	
8.348	0.3392	17.68	5.577	0.3687	
8.296	0.4129	12.50	7.881	0.5689	
8.233	0.4989	8.839	11.14	0.8722	
8.160	0.5999	6.250	15.75	1.331	
8.072	0.7190	4.420	22.27	2.037	
8.069	0.7242	4.359	22.58	2.073	-> trap level
7.970	0.8602	3.125	31.50	3.234	
7.924	0.9439	2.610	37.73	4.984	

-> local maximum rise or fall

Plumes not merged, Brooks method may be invalid.

FARFIELD CALCULATION (based on Brooks, 1960, see guide)

Farfield dispersion based on wastefield width of 9.477m

--4/3 Power Law--		-Const Eddy Diff-			Time	
conc	dilution	conc	dilution	distance		
				m	sec	hrs
2.311	42.7	2.431	40.5	30.48	56.66	0.0
1.671	59.3	2.041	48.4	60.96	124.4	0.0
1.254	79.1	1.772	55.8	91.44	192.1	0.1

```
Aug 26, 2002,  10:51:34  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:  11 of  16
 Title    Cast 2 - Chronic                                               nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.06791         8  0.008489     1.219      0.0        22     30.48     91.44
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     8.534    0.1016    0.1016     1.047    0.7404    0.7404      0.10        50
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048        45       1.0  -2.16673       100         0     11.66     164.9
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
        90     1.219   5.90588    0.4500     0.003      0.45     2.327  0.008657
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.45 0.0359617         2     18.79             0.08189   0.07934
         1      0.45 0.0359617         2     18.79            buoy flux puff-ther
         2      0.45  0.670191      2.78     18.59            0.0005525    0.6388
         3      0.45   1.14621      3.34     18.34            jet-plume jet-cross
         4      0.45   2.52231      5.04     17.93                1.115    0.2095
         5      0.45   3.45733      6.15     17.47            plu-cross jet-strat
         6      0.45   3.68999      6.43     17.37             0.007391     1.073
         7      0.45   4.06373      6.89     17.25            plu-strat
         8      0.45   4.59381      7.55     17.11                1.052
         9      0.45   7.05087     10.58     16.34              hor dis>=

CORMIX1 flow category algorithm is turned off.
 8  L ÷ 9.75 m                                                   1 to any  range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.1016     100.0     1.000     0.000

     8.500    0.1344     70.71     1.411   0.03752
     8.467    0.1747     50.00     1.992   0.08497
     8.432    0.2222     35.36     2.814    0.1489
     8.393    0.2775     25.00     3.976    0.2408
     8.349    0.3415     17.68     5.621    0.3800
     8.297    0.4156     12.50     7.946    0.5971
     8.235    0.5020     8.839     11.24    0.9387
     8.162    0.6034     6.250     15.89     1.479
     8.115    0.6679     5.148     19.29     1.913 -> trap level
     8.075    0.7230     4.420     22.47     2.352
     7.973    0.8644     3.125     31.78     3.934
     7.891    0.9959     2.368     41.93     7.874
 -> local maximum rise or fall
Plumes not merged, Brooks method may be invalid.
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      9.529m
   --4/3 Power Law--    -Const Eddy Diff-
      conc  dilution        conc  dilution  distance        Time
                                                   m         sec    hrs
     2.158      46.1       2.242      44.3     30.48       50.24    0.0
     1.561      63.8       1.879      52.9     60.96       118.0    0.0
     1.165      85.5       1.625      61.2     91.44       185.7    0.1
```

```
 Aug 26, 2002,  10:51:34  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:  12 of  16
 Title   Cast 3 - Chronic                                               nonlinear
  tot flow  # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.06791        8  0.008489     1.219     : 0.0        22     30.48     91.44
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     8.534    0.1016    0.1016     1.047    0.7404    0.7404      0.10        50
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048        45       1.0  -2.16673       100         0     12.97     203.9
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
        90     1.219   4.36253    0.4500     0.003      0.45     2.327  0.007269
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.45  0.375718      2.43     18.73             0.06754   0.06417
         1      0.45  0.375718      2.43     18.73           buoy flux puff-ther
         2      0.45  0.542280      2.62     18.62           0.0004469    0.6856
         3      0.45  0.573017      2.65     18.58           jet-plume jet-cross
         4      0.45  0.700926      2.81     18.55               1.240    0.2095
         5      0.45  0.978056      3.14     18.42           plu-cross jet-strat
         6      0.45   1.19374      3.41     18.37            0.005978     1.181
         7      0.45   2.55655      5.09     17.95           plu-strat
         8      0.45   4.10189      6.97     17.37               1.153
         9      0.45   4.58998      7.54     17.09             hor dis>=

CORMIX1 flow category algorithm is turned off.
 8   L ÷ 9.75 m                                                1 to any  range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.1016     100.0     1.000     0.000

     8.500    0.1345     70.71     1.411   0.03757
     8.467    0.1748     50.00     1.993   0.08509
     8.432    0.2224     35.36     2.816    0.1491
     8.393    0.2778     25.00     3.980    0.2414
     8.349    0.3418     17.68     5.627    0.3817
     8.297    0.4159     12.50     7.955    0.6008
     8.235    0.5023     8.839     11.25    0.9451
     8.161    0.6036     6.250     15.90     1.481
     8.073    0.7230     4.420     22.49     2.306
     7.969    0.8640     3.125     31.80     3.560
     7.926    0.9210     2.759     36.03     4.163 -> trap level
     7.845     1.031     2.210     44.98     5.575
     7.744     1.196     1.652     60.18     10.53
 -> local maximum rise or fall -> begin overlap
Plumes not merged, Brooks method may be invalid.
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      9.729m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution      conc  dilution  distance          Time
                                                 m        sec   hrs
     1.546      64.3     1.588      62.6     30.48      44.33   0.0
     1.127      88.4     1.334      74.6     60.96      112.1   0.0
    0.8401     118.7     1.151      86.5     91.44      179.8   0.0
```

```
Aug 26, 2002,  10:51:34  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:  13 of  16
Title    Cast 4 - Chronic                                                nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.06791         8  0.008489     1.219       0.0        22     30.48     91.44
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     8.534    0.1016    0.1016     1.047    0.7404    0.7404      0.10        50
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048        45       1.0  -2.16673       100         0     23.46     667.4
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
        90     1.219 -0.171917    0.4500     0.003      0.45     2.327  0.002333
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.45 -0.562906      1.34     19.27             0.02120   0.01961
         1      0.45 -0.562906      1.34     19.27           buoy flux puff-ther
         2      0.45 -0.430897       1.5     19.22           0.0001365     1.018
         3      0.45 -0.404012      1.53      19.2           jet-plume jet-cross
         4      0.45 -0.379137      1.56     19.19               2.244    0.2095
         5      0.45 -0.346641       1.6     19.18           plu-cross jet-strat
         6      0.45 -0.314145      1.64     19.17            0.001826     2.109
         7      0.45 -0.214656      1.76     19.13           plu-strat
         8      0.45 -0.197408      1.78     19.12               2.044
         9      0.45 -0.149671      1.84     19.11             hor dis>=

CORMIX1 flow category algorithm is turned off.
 8  L ÷ 9.75 m                                                  1 to any  range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.1016     100.0     1.000     0.000

     8.500    0.1346     70.71     1.413   0.03771
     8.467    0.1752     50.00     1.998   0.08544
     8.432    0.2230     35.36     2.825    0.1500
     8.393    0.2786     25.00     3.994    0.2436
     8.349    0.3428     17.68     5.647    0.3877
     8.298    0.4172     12.50     7.986    0.6170
     8.236    0.5038     8.839     11.29    0.9867
     8.163    0.6054     6.250     15.97     1.584
     8.075    0.7250     4.420     22.58     2.541
     7.971    0.8663     3.125     31.94     4.055
     7.847     1.034     2.210     45.17     6.408
     7.704     1.223     1.584     62.99     9.811 -> merging
     7.698     1.232     1.563     63.87     9.990
     7.497     1.560     1.105     90.33     15.97
     7.213     2.082    0.7813     127.7     26.26  S= 140.5 @ 30.48 m
     6.981     2.528    0.6302     158.4     36.27 -> trap level
     6.816     2.858    0.5524     180.7     45.21
     6.738     3.132    0.5014     199.1     62.61
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of       11.67m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution      conc  dilution  distance        Time
                                                 m      sec   hrs
    0.4450     224.3    0.4676     213.5     91.44    64.06   0.0
```

```
 Aug 26, 2002,  10:51:35  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:  14 of  16
 Title    Cast 5 - Chronic                                                nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.06791         8  0.008489     1.219       0.0        22     30.48     91.44
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     8.534    0.1016    0.1016     1.047    0.7404    0.7404      0.10        50
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048        45       1.0  -2.16673       100         0     12.69     195.1
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
        90     1.219   4.65628    0.4500     0.003      0.45     2.327  0.009105
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.45 -0.561729       1.4     19.49             0.07726   0.06706
         1      0.45 -0.561729       1.4     19.49           buoy flux puff-ther
         2      0.45 -0.134144       1.9     19.26           0.0004670    0.6756
         3      0.45  0.566239      2.74     18.96           jet-plume jet-cross
         4      0.45   1.19028      3.47     18.62               1.213    0.2095
         5      0.45   1.75248      4.13     18.32           plu-cross jet-strat
         6      0.45   2.45535      4.97        18            0.006247     1.105
         7      0.45   2.87534      5.47      17.8           plu-strat
         8      0.45   3.70316       6.5     17.58               1.054
         9      0.45   5.48803      8.67      16.9             hor dis>=

CORMIX1 flow category algorithm is turned off.
 8  L ÷ 9.75 m                                                  1 to any  range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.1016     100.0     1.000     0.000

     8.500    0.1345     70.71     1.411   0.03756
     8.467    0.1748     50.00     1.993   0.08507
     8.432    0.2224     35.36     2.816    0.1491
     8.393    0.2778     25.00     3.980    0.2413
     8.349    0.3417     17.68     5.626    0.3815
     8.297    0.4159     12.50     7.954    0.6009
     8.235    0.5024     8.839     11.25    0.9472
     8.162    0.6038     6.250     15.90     1.495
     8.090    0.7028     4.672     21.28     2.203 -> trap level
     8.075    0.7233     4.420     22.49     2.374
     7.972    0.8647     3.125     31.81     3.884
     7.857     1.032     2.210     44.99     7.666
     7.852     1.050     2.134     46.57     9.016
 -> local maximum rise or fall
Plumes not merged, Brooks method may be invalid.
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      9.583m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution        conc  dilution  distance           Time
                                                   m        sec   hrs
     1.967      50.6     2.034      48.9     30.48      47.70   0.0
     1.426      69.9     1.706      58.4     60.96      115.4   0.0
     1.063      93.8     1.473      67.6     91.44      183.2   0.1
```

```
 Aug 26, 2002,  10:51:35  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:  15 of  16
 Title    Cast 6 - Chronic                                              nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.06791         8  0.008489     1.219      0.0        22     30.48     91.44
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     8.534    0.1016    0.1016     1.047    0.7404    0.7404      0.10        50
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048        45       1.0  -2.16673       100         0     9.407     107.3
 hor angle red space p amb den p current  far dif   far vel K:vel/cur Stratif #
        90     1.219   10.2413    0.4500     0.003      0.45     2.327  0.006455
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.45   3.51393       6.3     17.77             0.08748    0.1219
         1      0.45   3.51393       6.3     17.77           buoy flux puff-ther
         2      0.45   3.77157      6.61     17.66           0.0008492    0.5535
         3      0.45   4.95422      8.04     17.18           jet-plume jet-cross
         4      0.45   5.92653      9.22      16.8              0.8997    0.2095
         5      0.45   7.84359     11.55     16.06           plu-cross jet-strat
         6      0.45   9.53934     13.57     15.23             0.01136     1.038
         7      0.45   10.0033     14.12     14.99           plu-strat
         8      0.45   10.0334     14.15     14.95               1.115
         9      0.45   10.4227     14.64     14.87             hor dis>=

CORMIX1 flow category algorithm is turned off.
 8  L ÷ 9.75 m                                                  1 to any  range
Help: F1.  Quit: <esc>.  Configuration:ATN00.  FILE: WARREN2.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                             m
     8.534    0.1016     100.0     1.000     0.000

     8.500    0.1342     70.71     1.409   0.03738
     8.467    0.1743     50.00     1.988   0.08463
     8.432    0.2216     35.36     2.806    0.1481
     8.393    0.2767     25.00     3.963    0.2387
     8.348    0.3403     17.68     5.600    0.3744
     8.296    0.4142     12.50     7.914    0.5820
     8.234    0.5002     8.839     11.19    0.8985
     8.160    0.6012     6.250     15.82     1.373
     8.071    0.7201     4.420     22.36     2.069
     7.965    0.8607     3.125     31.62     3.067
     7.839     1.027     2.210     44.72     4.474
     7.688     1.225     1.563     63.23     6.413 -> merging
     7.487     1.546     1.105     89.42     9.333
     7.202     2.061    0.7813     126.5     13.84
     6.891     2.650    0.5921     166.9     19.11 -> trap level
     6.800     2.828    0.5524     178.8     20.83
     6.580     3.358    0.4613     214.2     30.09
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of       11.89m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution       conc  dilution  distance        Time
                                                  m        sec    hrs
    0.4598     214.9     0.4598     214.9     30.48     0.8588    0.0
    0.4040     244.9     0.4270     231.6     60.96      68.59    0.0
    0.3051     325.2     0.3668     270.1     91.44      136.3    0.0
```

Aug 26, 2002, 10:51:35 ERL-N PROGRAM PLUMES, Ed 3, 3/11/94 Case: 16 of 16

Title Cast 7 - Chronic nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.06791	8	0.008489	1.219	0.0	22	30.48	91.44
port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
8.534	0.1016	0.1016	1.047	0.7404	0.7404	0.10	50
port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.3048	45	1.0	-2.16673	100	0	6.706	54.53
hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	1.219	22.2482	0.4500	0.003	0.45	2.327	0.007491
depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.45	6.88544	10.49	16.85		0.1314	0.2400
1	0.45	6.88544	10.49	16.85		buoy flux	puff-ther
2	0.45	7.14677	10.77	16.6		0.001671	0.4417
3	0.45	7.65011	11.4	16.48		jet-plume	jet-cross
4	0.45	11.2992	15.86	15.18		0.6414	0.2095
5	0.45	16.9880	22.73	12.83		plu-cross	jet-strat
6	0.45	20.6196	26.97	10.69		0.02235	0.8470
7	0.45	21.7468	28.3	10.09		plu-strat	
8	0.45	22.1511	28.77	9.84		0.9733	
9	0.45	22.3330	28.98	9.72		hor dis>=	

CORMIX1 flow category algorithm is turned off.

8 L ÷ 9.75 m 1 to any range

Help: F1. Quit: <esc>. Configuration:ATNO0. FILE: WARREN2.VAR;

UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume dep	plume dia	poll conc	dilution	hor dis	
m	m			m	
8.534	0.1016	100.0	1.000	0.000	
8.501	0.1338	70.71	1.404	0.03702	
8.467	0.1733	50.00	1.976	0.08373	
8.431	0.2200	35.36	2.784	0.1460	
8.392	0.2744	25.00	3.928	0.2335	
8.347	0.3375	17.68	5.545	0.3613	
8.294	0.4107	12.50	7.832	0.5502	
8.232	0.4961	8.839	11.07	0.8265	
8.157	0.5963	6.250	15.64	1.222	
8.068	0.7144	4.420	22.11	1.774	
7.961	0.8541	3.125	31.26	2.530	
7.835	1.020	2.210	44.20	3.550	
7.684	1.216	1.563	62.50	4.930	
7.678	1.224	1.541	63.37	4.995	-> merging
7.486	1.530	1.105	88.38	7.031	
7.220	2.014	0.7922	123.3	10.39	-> trap level
7.207	2.039	0.7813	125.0	10.58	
6.863	2.782	0.5563	175.5	19.89	

-> local maximum rise or fall

FARFIELD CALCULATION (based on Brooks, 1960, see guide)

Farfield dispersion based on wastefield width of 11.32m

--4/3 Power Law--		-Const Eddy Diff-			Time	
conc	dilution	conc	dilution	distance		
				m	sec	hrs
0.5537	176.4	0.5547	176.0	30.48	23.53	0.0
0.4388	223.7	0.4858	201.6	60.96	91.26	0.0
0.3312	297.7	0.4194	234.2	91.44	159.0	0.0

APPENDIX – C

(Wastewater Treatment Facility Upgrade & Expansion Plan)

City of Warrenton
Department of Public Works

ENGINEERING REPORT

WASTEWATER TREATMENT FACILITY UPGRADE & EXPANSION PLAN

with added flows from outside City's sewer service areas, including: Miles Crossing Sanitary Sewer District & Fort Clatsop

APPENDIX C
of

WASTEWATER FACILITIES PLAN

September 2002

REGISTERED PROFESSIONAL ENGINEER
66975PE
OREGON
July 09, 2001
H. RICHARD ESVELT
9-12-02
EXPIRES: 12/31/03

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CITY OF WARRENTON, OREGON
ENGINEERING REPORT - TREATMENT FACILITY ANALYSIS

TABLE OF CONTENTS

ATTACHMENT 1 Recommended WWTP Upgrade & Expansion Detailed Construction Cost Estimate

ATTACHMENT 2 "Technical Memorandum - City of Warrenton Sewer Lagoon Upgrade Alternatives, Wastewater Facilities Analysis", Draft, April 18, 2001; (revised for conformance with Facilities Plan Chapter 7, 4/04/2002)

Attachment 2 - Table of Contents

CHAPTER 1
INTRODUCTION AND DESIGN PARAMETERS

1.1 INTRODUCTION

This Engineering Report has been prepared as a part of the "City of Warrenton Wastewater Facilities Plan" (Facilities Plan), prepared by HLB & Associates.

1.1.1 Evaluation of Alternatives in Attachment 2 - Technical Memorandum

The draft City of Warrenton technical memorandum "Wastewater Facilities Analysis", April 18, 2001 (included herein as Attachment 2), was a preliminary evaluation of alternatives for upgrade and capacity expansion of the City's wastewater treatment plant (WWTP). The 4/18/01 memorandum evaluated expansion of the WWTP with two types of treatment processes.

Both alternatives assumed that an increase in effluent mass load allocation would be granted by State of Oregon Department of Environmental Quality (ODEQ) without consideration of receiving water requirements (established in the "City of Warrenton Mixing Zone Study, see 1.3.1, below) and changes to the existing outfall configuration (the existing constructed ditch and tide gate and natural channel across Alder Cove). The "Mixing Zone Study", which along with this report, provides the receiving water quality part of the justification for the requested increase in effluent mass loading.

The first alternative evaluated was with an aerated lagoon-type treatment, using aeration basin(s) followed by settling ponds and man made wetlands for algae and nutrient removal. This alternative was developed for a wastewater treatment plant with minimal operation and maintenance requirements, a continuation of the existing type of wastewater treatment and disposal. This process is capable of achieving effluent BOD and TSS concentrations of 30 mg/L monthly average and 40 mg/L weekly average, year-around in a coastal climate since the wetlands will provide treatment during winter months. However, wetlands do not provide ammonia removal and will sometimes discharge high ammonia concentrations during one or two months during the winter.

The second alternative was using secondary level of effluent treatment process, batch extended aeration activated sludge (also called a sequencing batch reactor or SBR process), sludge (also called biosolids) storage lagoons and ultraviolet light (UV) disinfection. This process was selected for evaluation because of the poor soils foundation conditions at the site, since the SBR could be constructed with earthen-dike basins where differential settlement would not cause structural and process problems. This process is capable of achieving effluent BOD and TSS concentrations of 30 mg/L monthly average and 40 mg/L weekly average, during winter months and 20 mg/L monthly average and 30 mg/L weekly average during the warmer months of the year.

The costs for the two alternatives were approximately the same (within the accuracy of the estimate) and because the SBR process provided the higher level of wastewater treatment (secondary treatment) and easily accommodated future expansion at the site, the SBR process was selected for further evaluation for implementation by the City of Warrenton.

1.1.2 Purpose of This Engineering Report

This evaluation is summarized in the Facilities Plan, Section 7, along with background information presented above. However, Section 7 also includes an evaluation of a third alternative for expansion which is not evaluated within this report. The third alternative presented, used the current type of treatment, facultative lagoons.

The purpose of this report is evaluation of treatment requirements including wastewater flows and loadings, present a cost effective and environmentally sound recommended wastewater treatment and disposal facilities and, along with the Mixing Zone Study, will provide justification for a requested increase in effluent waste load allocation.

This Engineering Report utilizes the 4/18/01 memo (Attachment 2) as a preliminary cost effective analysis for wastewater treatment process selection and does not attempt to reevaluate alternatives, since the comparison of the alternatives is proportional to influent flows and loadings for this specific site, and therefore, is still valid. This report takes the recommended WWTP upgrade and expansion alternative process (with the SBR type advanced wastewater treatment) selected by the City for further evaluation for implementation. A plan is developed for wastewater facility improvement plan for upgrade and expansion of the City of Warrenton WWTP to serve the City and outside service areas (as presented below), through the year 2023, the 20-year planning period.

1.1.3 WWTP Evaluation Requirements of MAO

On December 24, 2001, the Oregon Department of Environmental Quality (DEQ) in an effort to limit and resolve ongoing NPDES Permit No. 100874 WWTP effluent discharge violations, entered into a Mutual Agreement and Order (MAO) No. WQ/M-NWR-01-281, with the City of Warrenton. Various parts of the MAO are discussed in Facilities Plan Sections 1 and 7. The MAO is included in the Facilities Plan Appendix H.

The MAO requires that the City accomplish a number of items by certain dates. Among the WWTP requirements were the following items (numbers correspond to those items in the MAO):

> 8.A. (1) a. Planning be over a 20 year planning period
> 8.A. (1) c. City consider providing sewage treatment and disposal services to other public and private wastewater sources in the Warrenton area.
> 8.A. (7) Interim Engineering Study for proposed interim improvements to existing lagoons and timelines needed to provide capacity to allow additional waste loads during the term of the MAO.

This report satisfies the requirements of items 8.A. (1) a and c. The recommended WWTP improvements include expansion of the City's wastewater treatment capacity to include service for Miles Crossing Sanitary Sewer District & Fort Clatsop.

Item 8.A. (7) was covered in the "City of Warrenton Wastewater Treatment Facilities, Request for Interim Capacity Increase", August 20, 2002, H. R. Esvelt Engineering, in accordance with the ODEQ facility plan review comments, dated April 23, 2002.

1.1.4 Treatment of Pacific Surimi Wastewater

Including Pacific Surimi wastewater into the City's WWTP was evaluated (using historic flows and loadings, supplied by Pacific Surimi consultants) in the "City of Warrenton Wastewater Treatment Facilities, Request for Interim Capacity Increase", August 20, 2002. It was concluded that Pacific Surimi wastewater could not be treated in the interim plant, due to the high waste loading and all existing lagoons of the plant being required to provide interim treatment to the City and initial connections from Miles Crossing Sanitary Sewer District.

Treating the Pacific Surimi wastewater in the recommended WWTP is also not feasible or cost effective for the following reasons:

1. The 13-acre north pond would be utilized to pretreat the high strength wastewater to levels of BOD that a municipal plant could treat and maintain the secondary treatment effluent requirements. However, Pacific Surimi is in production from mid-June to mid-September and consequently the biological activity within the lagoon would be dormant until mid June when production starts. There would not be adequate time for the growth of adequate biological community to provide the level of pretreatment required.
2. Even if the pretreatment could provide adequate pretreatment and equalization prior to pumping to the City secondary treatment plant (SBR), there would not be adequate mixed liquor (the biological community that assimilates the waste load) to treat the influx of this comparatively massive waste load.
3. The cost of the pretreatment improvements to the North Lagoon and the additional SBR aeration basins and sludge (biosolids) handling facilities to treat the Pacific Surimi wastewater would at least double the cost of the recommended treatment facility.
4. Chemical treatment would be the logical type of treatment to treat this seasonal waste load, which would be more cost effectively be provided by Pacific Surimi, since this type of treatment processes are not compatible with the recommended City WWTP.

Therefore, it is recommended that Pacific Surimi wastewater not be treated in the City WWTP.

1.2 WASTEWATER FLOWS AND LOADING PROJECTIONS

Flows and loading development for the City of Warrenton and projected over the next 20-year planning period, is covered in the Facility Plan, Section 5. This data was developed and presented in the City of Warrenton "Draft Wastewater Facilities Plan", HLB & Associates, Inc. (HLB) & H. R. Esvelt Engineering (HRE), March 2002.

Table 1-1 shows the current and projected flows and loadings for the City of Warrenton's existing and proposed expanded sewer service areas. The column under "Combined at WTP startup" includes the current City service area flows, Clatsop County's Transitional Correction Facility (proposed to be constructed on an existing City sewer line), and wastewater from outside the existing sewer service area, including Miles Crossing Sanitary Sewer District and Fort Clatsop.

TABLE 1-1 - WASTEWATER FLOW & LOADING DESIGN CRITERIA

Design Data	Current	Combined at WWTP startup	2023 New Areas	w/ new areas Design year[6] 2023
POPULATION EQUIVALENTS	5,600[1]	6,200[5]	1,000	9,500[2]
FLOWS, million gallons/day, mgd				
Annual average	0.70	0.76	0.10	1.1
Maximum Month Avg, winter	1.1	1.05	0.13	1.6[4]
Maximum day	1.5	1.6	0.16	2.3[4]
Hydraulic, PIF	3.4[3]	3.5	0.25	4.7
LOADING, pounds per day				
BOD, annual average	1,000	1,120	180	1,720[5]
max mon avg, summer	1,500	1,670	240	2,500
TSS, annual average	1,300	1,410	180	2,000
max mon avg	1,900	2,100	240	2,900
Ammonia, max mon avg	150	170	23	250

NOTES:

1. Current population equivalents (PE) based upon annual average BOD_5 loading of 1,000 pounds per day divided by standard contribution of 0.18 lb BOD/PE/day
2. 8,500 population equivalents calculated from: projected average growth for Warrenton (from HLB & Assoc.) over the next 20 years, times 5,600 PE, plus 1,000 PE from new service areas.
3. Peak flow estimated from influent flow measurement circular charts with consideration of existing undersized pump stations.
4. Increase in flows are not proportional to population growth since new sewers will be much tighter with much lower infiltration and inflow than existing.
5. Includes City growth, Clatsop County Corrections Transitional Facility and Miles Crossing Sanitary Sewer District to be connected prior to City's WWTP startup.
6. Includes future City service area growth and new service areas (Miles Crossing Sanitary Sewer District and Fort Clatsop).

1.3 DISCHARGE REQUIREMENTS

1.3.1 Establishing Effluent Limits

As per the MAO requirements and to establish the effluent requirements for the existing outfall and an extended outfall into the Columbia River, Cosmopolitan Engineering Group prepared the "City of Warrenton Mixing Zone Study", draft, September 2002. Field studies, mixing zone modeling and water quality analysis were conducted for both the existing outfall configuration and a new outfall extension to the Columbia River at a deep-water discharge location.

1.3.2 Discharge Limits for Existing Outfall Configuration

Discharge requirements based upon the current concentration and mass load limits are presented in Facility Plan Section 7.2 and are shown on Table 1-2 (NPDES Permit Oregon #100874, included in the Facility Plan Appendix G).

TABLE 1-2 - CURRENT NPDES PERMIT EFFLUENT REQUIREMENTS

Outfall Number 001 (Lagoon Discharge):	Average Effluent Concentrations		Monthly Average loading	Weekly Average loading	Daily Max load
	monthly	weekly			
BOD concentration	30 mg/L	45 mg/L	112 lb/day	169 lb/d	225 lb
TSS concentration	50 mg/L	80 mg/L	188 lb/day	300 lb/d	375 lb
Fecal Coliform	200 MPN/100mL	400 MPM/100mL			
pH	6.0 – 9.0				

The Mixing Zone Study, draft page 9, states: "With no modification to the existing outfall configuration, the discharge will not meet the minimum design requirement of 20:1 minimum dilution described in OAR 340-41-0215(1)(c). Therefore, the permit limits for BOD_5 and TSS will allow no increase in mass loading unless the outfall is extended. Increased flows would need to be compensated for with increased treatment efficiency. DEQ noted this requirement in the December 13, 2001 letter and reiterated it to the City in a meeting May 20, 2002."

The BOD effluent concentrations (the most difficult to meet of BOD and TSS) that would be required for the existing outfall configuration (with the flows shown in Table 1-1) are as follows for the design year (2023):

Monthly average BOD concentration (1.6 mgd design flow)	8.4 mg/L
Weekly average BOD concentration (1.8 mgd)	11.2 mg/L
Maximum Day BOD concentration (2.3 mgd)	11.7 mg/L

In order to meet these BOD concentrations, the TSS concentrations will have to be at least as low as the BOD. In this engineering report alternatives will be compared: 1) to meet these effluent concentrations, and 2) to modifying the effluent discharge by adding an outfall. One of the items of justification for granting an increase in the effluent waste load allocation is economic impact. To justify the increase for economic reasons the comparison must show:

- The present worth of the construction and annual operation and maintenance cost for effluent coagulation/flocculation and filtration, to meet these effluent concentrations, will be in excess of the present worth cost of an outfall, especially when future growth and more stringent effluent concentration limits beyond 20 years are considered.
- The cost of an outfall should not exceed the present worth costs of treatment processes to meet the more stringent effluent concentration limits.

The Mixing Zone Study, draft page 30, states:

"Existing Outfall. Discharges to 303(d) limited waterbodies such as the Columbia River are not allowed to measurably increase temperature at the mixing zone boundary. The water quality standards and TMP guidance document define a *no measurable increase* threshold as 0.25°F. The existing outfall with an extended mixing zone would not meet this criterion because the temperature increase would be 4.5°F for the existing WWTP, or 1.8°F for the SBR treatment plant.

Therefore, the City of Warrenton would need to implement direct effluent treatment for temperature control if the existing ditch outfall remains. These alternatives could include cooling towers, spray ponds, cooling ponds or chillers."

1.3.3 Discharge Limits for a Deep Water Outfall

For the deep water outfall, the Mixing Zone Study, Table 10, lists the only parameter with a reasonable potential to exceed water quality standards (with the recommended deep water outfall with an 8-port diffuser) to be chlorine (based upon effluent concentration shown in Table 1-3, below, with a MWMF average effluent ammonia concentration of 3 mg/L). The recommended SBR plant will use UV disinfection to prevent potential violation of this parameter and the need to handle two chemicals for chlorination and dechlorination.

A presentation of the City of Warrenton Mutual Agreement and Order (MAO) is in Facilities Plan Sections 1 and 7. The MAO requires that effluent discharge limits must be established for "compliance with regulatory mixing zone requirements" (MAO, 8.A.(1)d., signed 12/24/2001). It is anticipated that these limits will be similar to secondary treatment with nitrification for reduction of ammonia toxicity, provided that an increase in the effluent mass load allocation is approved.

Future effluent loading limits, based upon the granting of a requested increase in effluent mass load, are shown in Table 1-3 and will be used in this memorandum for development of the WWTP secondary treatment alternative with discharge to a deep water outfall.

TABLE 1-3 – REQUESTED EFFLUENT WASTE LOAD ALLOCATION/ DISCHARGE LIMITS

Outfall Number 001 (to Columbia River):	Average Effluent Concentrations		Monthly Average loading	Weekly Average loading	Daily Max load
	monthly	weekly			
Possible Winter Limits:					
BOD concentration	30 mg/L*	45 mg/L	400 lb/day	670 lb/d	860 lb
TSS concentration	30 mg/L*	45 mg/L	400 lb/day	670 lb/d	860 lb
Fecal Coliform	200 MPN/100mL	400 MPM/100mL			
pH	6.0 – 9.0				
Possible Summer Limits:					
BOD concentration	20 mg/L	30 mg/L	270 lb/day	400 lb/d	530 lb
TSS concentration	20 mg/L	30 mg/L	270 lb/day	400 lb/d	530 lb
Fecal Coliform	200 MPN/100mL	400 MPM/100mL			
pH	6.0 – 9.0				

* or 85% monthly average removal, whichever is more stringent.

The WWTP upgrade and expansion, with the recommended SBR treatment process, presented herein, is based upon the design criteria shown in Table 1-1 and the anticipated effluent discharge concentrations and limits shown on Table 1-3. Alternative wastewater treatment alternatives will be evaluated based upon the disposal alternatives evaluated in the receiving water mixing zone analysis (MAO requirement 8.A. (1) d).

CHAPTER 2
WASTEWATER TREATMENT PROCESS & OUTFALL SELECTION

2.1 EXISTING FACILITIES/EVALUATION OF TREATMENT ALTERNATIVES

Section 7 of the Facilities Plan [along with the Technical Memorandum "City of Warrenton Wastewater Treatment Facilities Analysis", April 18, 2001 (included as Attachment 2 to this Memorandum)] presents and evaluates the following:

1. a history of the existing WWTP and improvements,
2. evaluation of the existing treatment capability of the existing lagoon treatment and that the existing plant influent loading is in excess of existing plant capacity,
3. a discussion of why expansion of the current lagoon type wastewater treatment was not feasible (in Section 7),
4. alternative treatment process development and evaluation (Attachment 1),
5. preliminary site plans for the two alternatives evaluated (Attachment 1), and
6. construction and annual operating cost estimates for the two alternative treatment processes evaluated in the 4/18/01 draft Technical Memorandum (1. aerated lagoon, settling lagoons and wetlands, and 2. batch extended aeration activated sludge, SBR).

The City of Warrenton, subsequent to this memorandum, decided that pursuing a treatment process that produced an effluent quality to meet secondary discharge requirements and provided adequate space for future plant expansion, therefore, the SBR secondary treatment process was recommended for implementation. The Mutual Agreement and Order (MAO) reinforced this decision. However, the MAO presented items to be addressed (including wastewater treatment to service areas outside of the existing City service area and more stringent effluent discharge limits) that were not addressed in the 4/18/01 Technical Memorandum. These are included in the influent flow and loading criteria shown on Table 1-1.

2.2 ALTERNATIVE TREATMENT PROCESS DEVELOPMENT CRITERIA

As discussed above and in the Facilities Plan, Section 7, an important factor in developing alternative treatment plant upgrade processes, is that expansion of the treatment plant outside of the existing lagoon dikes will require a long and costly permitting process, and obtaining a permit for replacing large areas of natural wetlands will be difficult if not impossible. For these reasons, the plant upgrade and expansion should be kept within the current plant area boundaries.

Criteria for developing an acceptable long-term (20 year) wastewater treatment solution for the City of Warrenton is as follows:

- plant must be capable of meeting anticipated NPDES permit effluent requirements, as currently permitted or for more stringent limits, as established for "compliance with regulatory mixing zone requirements" (MAO, 8.A.(1)d., signed 12/24/2001) which were evaluated in the “City of Warrenton Mixing Zone Study”;

- proposed processes should utilize existing facilities to the greatest extent possible and practical;
- be compatible with existing site conditions, as discussed above;
- proposed improvements must be contained within the current plant footprint;
- proposed improvements must be capable of treating future (year 2023) flows and loadings, with layout capability for expansion beyond 2023 capacity; and
- improvements must be planned for utilization of equipment and meeting treatment requirements as recommended in the "Interim Capacity Increase", referenced above.

2.3 RECOMMENDED WWTP UPGRADE & EXPANSION PLAN

As presented above, the batch extended aeration activated sludge process (sequencing batch reactor, called SBR herein) using earthen dike, lined lagoons are recommended for implementation for the upgrade and expansion of the City of Warrenton WWTP. The following is a summary of reasons/justification for recommending the SBR process with ultraviolet (UV) light disinfection:

1. The process has proven to be capable of treating wastewater to meet the anticipated discharge limits, through a wide variation of influent flow and loading conditions,
2. Is an easily operated process, provided a manufacturer with acceptable equipment is selected during the equipment bidding process, with easily understood and achieved operator flexibility to accommodate changed influent and upset conditions,
3. Fits the existing limited hydraulic profile and existing influent structure, since influent screening is adequate treatment ahead of the process,
4. Process can accommodate using earthen dike basins, which are necessary due to very poor foundation soils conditions (Concrete tankage, required in other secondary treatment processes, for clarifiers at a minimum, would have to be supported on piling of unknown length due to the unsuitable, organic soils on the site).
5. Utilizes the existing dikes and lagoons for biosolids stabilization,
6. Fits the site well for location inside existing dikes and for expansion,
7. Compatible with UV disinfection, which provides excellent disinfection, capable of meeting anticipated discharge limits with future flows, provides disinfection without introducing toxic chlorine into the treated effluent.

2.4 EVALUATION OF OUTFALL ALTERNATIVES

2.4.1 Existing Outfall Configuration

The comparison of the SBR secondary treatment process with added filtration to meet the effluent requirements presented in section 1.3.2, above. As presented, the ODEQ will not approve an increase in the effluent waste load allocation. The BOD and TSS concentrations needed to meet the currently permitted effluent waste load allocation are:

Monthly average BOD concentration (1.6 mgd design flow)	8.4 mg/L
Weekly average BOD concentration (1.8 mgd)	11.2 mg/L
Maximum Day BOD concentration (2.3 mgd)	11.7 mg/L

In order to meet these effluent concentrations, chemical addition and filtration will need to be added to the SBR treatment process.

The Mixing Zone Analysis goes on (draft page 28) to require a fecal coliform concentration limit of less than 28 MPN per 100 mL, "...in order to meet the fecal coliform water quality standard of 14 MPN per 100 mL at the mixing zone boundary." Additional UV disinfection is added to the SBR recommended process to meet this limit.

The project cost for construction of the additional processes to meet the effluent concentrations shown above, are summarized in Table 2-1.

TABLE 2-1 – Additional Project Cost to Recommended SBR Plant for Discharge to Existing Outfall Configuration

Estimate of Additional Costs:

1.	Additional UV disinfection	$ 141,000
2.	Effluent Equalization Basin, earthen dikes	443,000
3.	Filter & filter/chemical feed building	739,000
4.	Chemical storage & feed systems	125,000
5.	Total Estimated Construction Cost	$ 1,448,000
6.	Contingency (20%)	290,000
7.	Engineering, survey, soils, inspection, permits (25%)	434,000
	ESTIMATED PROJECT COST	$ 2,172,000

2.4.2 Deep Water Outfall to Columbia River

The effluent requirements for the deep-water outfall are shown in Table 1-3. The project cost to add effluent pumping to the recommended SBR treatment plant is shown in Table 2-2.

TABLE 2-2 – Additional Project Cost for Effluent Pumping to Recommended SBR Plant for Deep Water Outfall to Columbia River

Estimate of Additional Costs:

1.	Effluent Pumping Station	$ 362,000
2.	Effluent pump station controls & wiring	14,000
3.	Total Estimated Construction Cost	$ 376,000
4.	Contingency (20%)	75,000
5.	Engineering, survey, soils, inspection, permits (25%)	113,000
6.	Subtotal of additional plant costs	$ 564,000
7.	Estimate of Outfall construction from Mixing Zone Study	$ 1,130,000
	ESTIMATED PROJECT COST	$ 1,694,000

2.4.3 Recommended Outfall Alternative and Request for Effluent Waste Load Allocation Increase

As can be seen from Tables 2-1 and 2-2, the project cost for addition of effluent pumping and the deep water outfall to the Columbia River is less than the project cost for addition of the effluent filtration and additional UV disinfection. The annual operation and maintenance costs will be much less for effluent pumping and outfall than for effluent equalization, pumping from equalization basin to filtration, chemical addition and effluent filtration and additional UV disinfection. Therefore, based upon a cost effective bases alone, the Deep Water Outfall is recommended.

There are four reasons, in addition to not being cost effective, that continued discharge through the existing outfall configuration is not feasible:

1. As presented in Chapter 1, the Mixing Zone Study states: "Therefore, the City of Warrenton would need to implement direct effluent treatment for temperature control if the existing ditch outfall remains. These alternatives could include cooling towers, spray ponds, cooling ponds or chillers." The cost to construct and operate alternatives for effluent wastewater temperature reduction is prohibitive and has not been included in this evaluation.
2. The maximum monthly average ammonia toxicity concentration would be less than 1.0 mg/L, which would require larger SBR aeration basins for longer detention times, adding further costs to the alternative.

3. Mixing Zone Study, draft page 31, states: "Advanced treatment for metals removal may be required, particularly for copper". This technology has not been developed far enough for even much larger treatment plants, let alone for a small City.
4. In 20 years the City will not have any alternatives for further expansion of the wastewater treatment plant with discharge to the Columbia River, without going to a stringent process such as microfiltration.

This engineering report presents that the outfall to deep water in the Columbia River is the most cost effective and environmentally sound alternative. This is in agreement with the Mixing Zone Study's recommendation on page 31 (draft) of:

> "The recommended alternative is to construct a new outfall with an 8-port diffuser to the Columbia River channel. All water quality standards would be met within the proposed 100-foot mixing zone radius. The diffuser is recommended over the open-ended configuration due to the greater dilution achieved."

The recommended alignment and profile are shown on Figure 10 of the Mixing Zone Study.

The City of Warrenton requests that the Oregon DEQ grant it an increase in the Effluent Waste Load Allocation to the loadings shown on Table 1-3, with implementation of the recommended WWTP covered in Chapter 3, including the effluent pumping and deep water outfall to the Columbia River, recommended in the "City of Warrenton Mixing Zone Study", draft September 2002, Cosmopolitan Engineering Group.

CHAPTER 3
RECOMMENDED WASTEWATER TREATMENT PLANT

3.1 DESCRIPTION OF RECOMMENDED WWTP

The recommended WWTP with the batch extended aeration activated sludge, SBR, process is developed as a secondary treatment level process with nitrification (to remove ammonia) and denitrification (to return alkalinity to the process used up in the nitrification process to keep pH balanced and reduce total nitrogen in the effluent) to provide capability of:

1. meeting BOD and total suspended solids (TSS) effluent concentration limits (Table 1-3),
2. flexibility of layout to add additional basins to treat wastewater from future growth,
3. adding coagulation, flocculation, filtration and instrumentation/alarms for producing wastewater to meet reuse requirements, in the future if customers are found to justify the cost, and
4. provide capability of adding processes for possible increasingly stringent discharge limits in future years.

For the recommended WWTP, no construction phasing is anticipated to be cost effective, except installation of the biosolids tank and possible dewatering when biosolids must be removed from the sludge storage lagoon.

<u>Plant Reliability</u>:

The recommended plant will have Class II Reliability, as per USEPA's technical bulletin EPA430-99-74-001, "Design Criteria for Mechanical, Electrical, and Fluid System and Component Reliability". Backup/reliability provisions are presented under each item.

<u>Headworks</u>:

Construction of a new headworks with:

- an in-channel fine screen (full peak flow capacity, tips out of channel for maintenance),
- an influent flow measurement will be downstream of the in-channel fine screen with the existing Parshall flume (flume will back flow up into the fine screen as the flows increase to provide efficient screen operation),
- a bypass manually cleaned bar screen with full peak flows capacity, and
- a mechanical grit chamber with air lift and grit classifier.

An in-channel fine screen is necessary to remove rubber and plastic products out of the wastewater to keep the aeration basins 'clean', and prevent equipment and pump fouling/plugging. The screenings are washed and compacted and grit is dewatered, so combination is acceptable for disposal with the solid waste. The structure will be enclosed to protect equipment and contain washed/dewatered screenings and grit. Sampling will be flow paced with existing sampler.

Septage Receiving:

A septic tank pumper/hauler septage-receiving station is also recommended. The station will be accessible through a separate gate for truck access (septic tank pumper truck drivers will be issued a key to the gate and card for billing and to turn on septage-receiving equipment) during unmanned hours of the plant. Septage will be pumped through a fine screen and discharged directly to the sludge storage ponds. This will keep from adding any additional loading to the secondary treatment process flow train and since septage is already mostly stabilized in septic tank, is best discharged directly to the sludge storage lagoons, which have a minimum of two years detention time (uncontaminated with raw/fresh sludge or septage) before disposal.

SBR Process:

Process control for the process is provided through a programmable logic controller located in a manufacture supplied control panel. The panel controller can adjust all aspects of the process, including, but not limited to:

- Basins in operation, whether 2 or 3 basins and which basins are in operation
- Cycle operation described below
- Waste sludge pump on time per cycle (to control solids wasted from each basin and therefore mixed liquor concentration in the basin)
- Operating sequences, including influent valves, aeration blowers, mixers, and decanters
- Level monitoring in each basin is fed back to controller for level override of cycle, high water alarm, low water decanter close
- Dissolved oxygen monitoring in each basin fed to controller to turn blowers off and on to maintain a specified dissolved oxygen concentration in the basin

A valve vault, with motorized influent valves, distributes flow from the headworks to one of the three SBR aeration basins, on a sequencing basis, with one valve open to a basin at all times. Normal operation will be with three basins in service but process control will operate with two basins in service, during average flow rate conditions, to allow the operator to take one basin off line, and drain the basin for maintenance. A blind flange and space will be left in the valve vault for addition of a fourth valve for future expansion to a fourth SBR basin.

Three earthen dike SBR basins along the West end of the existing South lagoon will make up the three-basin SBR treatment process. HDPE liner is recommended for basin lining to make the basins water tight, with concrete cover to protect the liner. Fine bubble diffusers, recommended for energy savings, will provide aeration. The diffusers will be fixed on the bottom of the basin, accessible for maintenance when the basin is taken out of service for annual maintenance. Aeration air will be from blowers installed in the electrical/blower building and will be controlled with on/off cycles from dissolved oxygen meters and control system for each basin, to maintain a preset dissolved oxygen concentration in each basin for process control and energy savings. Each basin will include two high-speed floating mixers, a series of level controls that can override the timed cycle control program and one floating effluent decanter. Decanter and waste sludge pump will be accessed from a walkway. Four blowers will be provided, each capable of providing design airflows to each basin, with one blower as a standby.

The SBR batch process will be set up for providing 5 cycles per day per basin during summer months when the loadings are high and flows are average or below. 5 cycles per day provide longer aeration in each cycle and more total aeration hours per day (keeping the blowers/design aeration requirements smaller) and longer mix fill cycles for denitrification. During winter months when the flows are higher (maximum wet weather monthly flows) and the loading lower, the basins will operate at 6 cycles per day per basin to process more water on normal cycles through the day. At flows above the peak wet weather day flow, the process will automatically switch to 8 cycles per day which will provide continuous discharge over the 24 hours with 3 basins in service to accommodate peak hour flows.

An uninstalled waste sludge pump will be provided as backup pump. Clarified effluent will be decanted through the effluent piping to a UV building.

Disinfection:

Treated/settled effluent will flow by gravity to UV disinfection. UV system will be sized to accommodate the peak decant flow rate (which matches the plant peak hourly flow). UV disinfection process, as proposed, would include: concrete channels, building enclosure, hoist and lift for removing the UV modules from the channel for cleaning and other maintenance, the low-pressure UV equipment. UV structure will include effluent flow measurement and refrigerated, flow paced, composite sampler. A treated effluent pump will pump treated effluent throughout the plant for wash down and other uses (including for use with a belt filter press for biosolids dewatering).

Two fully assembled UV modules will be provided as standby for installation upon module failure. A minimum of two banks of UV lamps will be provided in each channel.

Outfall and Effluent Pump Station:

Disinfected effluent from the UV structure flows by gravity to an In-Plant Pump Station, which will allow gravity flow or pump the treated/disinfected effluent through and outfall to the shipping channel in the Columbia River. An 18-inch diameter HDPE outfall pipeline is recommended (see above evaluation and "City of Warrenton Mixing Zone Study"). The outfall will operate by gravity during average daily flows and lower tides. A motor operated butterfly valve will allow gravity flow out of the Effluent Pump Station wet well, until the level raises to a preset water level elevation (see Hydraulic Profile, Figure 2). At this water level, the valve will close and the lead pump will start at low speed. As the elevation in the wet well raises, the pump speed/pumped flow rate is increased to match the incoming flow. When the pump reaches maximum flow and the water level continues to rise, the second pump comes on. As the flow and/or tide drops, the reverse occurs. Three effluent pumps are recommended, with peak flow capacity available with two pumps on, for one standby pump (full pumping capacity with one pump out of service).

Biosolids Handling:

Waste sludge from the SBR basins (during the decant part of the operating cycle) will be pumped from the waste sludge pump in each basin through flow measurement to one of the two sludge storage lagoons. Both storage lagoons will be constructed in the existing south lagoon with the lagoon area left over from the SBR aeration basin construction. Each storage lagoon will have a biosolids storage volume of approximately four to five years, each, at the design year loading (with decanting of supernatant). Biosolids would be removed from one of the sludge holding lagoons every two to four years, depending upon desired operation.

Floating aerators will provide Mixing and aeration in each of the lagoons. An anti-erosion pad will be installed under each aerator on top of the existing lagoon liner. The existing lagoon liner will be maintained and rebuilt in all areas where it is disturbed. DEQ may require monitoring wells around the lagoon to make sure that the lagoons are not leaking.

Biosolids removal from the lagoon (which has not had waste (raw) sludge added for at least the previous two years) will meet the requirements for 40 CFR, Part 503, Class A biosolids (which have few restrictions on use by the public). Prior to pumping biosolids from the lagoon, Class A requirements will be established for the biosolids by sampling a cross section of the biosolids in the lagoon. Biosolids will be removed with the decant pumps in the decant structure which will serve both basins. Biosolids will be pumped to a storage tank added when the first lagoon is ready for biosolids removal. From the storage tank, biosolids will be pumped to a rented belt filter press for dewatering. Dewatered biosolids will be sold to the public, topsoil manufacturers, or others in accordance with State DEQ requirements for Class A biosolids.

<u>Support Facilities</u>:

The WWTP will require the following items in order to provide the City with a wastewater treatment facility with adequate operating tools, protection of equipment, and operator notification of alarm conditions during time when the plant is not staffed:

- <u>Operations Building</u>, containing a full laboratory, an office, lavatories, a small shop, and alarm panel and telephone dialer.
- <u>Electrical/blower building</u> will contain electrical room, standby generator and blower room (SBR aeration blowers). Electrical equipment, including SBR control panel and programmable controller, automatic transfer switch, standby generator, and power distribution equipment will be housed in the building. The standby generator will be sized for operating the full wastewater treatment plant, under normal equipment operation (which includes peak flows/loadings).
- <u>Modifications to lagoon pump station #3</u> to receive electrical feed from the treatment plant power/standby generator and drains from the laboratory and basin drains.
- Force main from Hammond pump station and lagoon pump station will be extended directly to the influent channel.

The design criteria and anticipated effluent requirements are shown again on Table 3-1.

TABLE 3-1 - RECOMMENDED WWTP DESIGN CRITERIA

Design Data	Combined at WWTP startup	Design year 2023
FLOWS, million gallons/day, mgd		
Annual average	0.76	1.1
Maximum Month Avg, winter	1.05	1.6
Maximum day	1.6	2.3
Hydraulic, PIF	3.5	4.7
LOADING, pounds per day		
BOD, annual average	1,120	1,720
max mon avg, summer	1,670	2,500
TSS, annual average	1,410	2,000
max mon avg	2,100	2,900
Ammonia, max mon avg	170	250

REQUESTED EFFLUENT WASTE LOAD ALLOCATION & DISCHARGE LIMITS

Outfall Number 001 (to Columbia River):	Average Effluent Concentrations monthly	Average Effluent Concentrations weekly	Monthly Average loading	Weekly Average loading	Daily Max load
Possible Winter Limits:					
BOD concentration	30 mg/L*	45 mg/L	400 lb/day	670 lb/d	860 lb
TSS concentration	30 mg/L*	45 mg/L	400 lb/day	670 lb/d	860 lb
Fecal Coliform	200 MPN/100mL	400 MPM/100mL			
pH	6.0 – 9.0				
Possible Summer Limits:					
BOD concentration	20 mg/L	30 mg/L	270 lb/day	400 lb/d	530 lb
TSS concentration	20 mg/L	30 mg/L	270 lb/day	400 lb/d	530 lb
Fecal Coliform	200 MPN/100mL	400 MPM/100mL			
pH	6.0 – 9.0				

* or 85% monthly average removal, whichever is more stringent.

The design data for the recommended treatment plant is shown in Table 3-2. The preliminary mechanical equipment list and electrical power requirements are shown on Table 3-3.

The SBR plant layout is shown on Figure 1. Figure 2 is the hydraulic profile for the recommended plant and Figure 3 is the schematic flow diagram.

TABLE 3-2 Recommended WWTP Design Data
Batch Extended Aeration Activated Sludge, SBR

Influent Structure (headworks)		
In-channel fine screen, type	in-channel fine screen	
channel/screen width, inches	36	
capacity, mgd	5	
Parshall flume flow measurement, throat width, inch	12	
Capacity, mgd	6	
Grit Chamber, diameter, feet	10	
Capacity, mgd	8	
SBR - Aeration Basins, number earthen diked basins	3	
Number of cycles per basin per day, winter (up to 2.4 mgd)	6	
Summer, during maximum monthly loading	5	
@ Peak flow override mode (flows above 2.4 mgd)	8	
	low water	high water
Volume, million gallons, each basin	0.26	0.45
Total volume of all three, mgd	0.78	1.35
Depth, feet	7.6’	10.3’
Max decant volume/cycle, gallons	190,000	
Operation to 2.4 mgd:		
decant flow rate, max., gal/min (gpm)	2,300	
Operation 2.3 mgd to 4.7 mgd:		
decant flow rate, max., gal/min (gpm)	3,400	
Detention times, average, hours		
at annual average flow (1.1 mgd)	19	
at max month average flow (1.6 mgd)	14	
at max week flow (1.8 mgd)	10.6	
Basin dimensions, feet		
Side slopes	2.5:1	
bottom, invert (concrete bottom) [el –1.0’]	34’ by 60’	
at 7.6’ depth, low water [el 6.6’]	72’ by 98’	
at 10.3’ depth, high water [el 9.3’]	85.5’ by 111.5’	
at top of dike, height 12.3’ [el 11.3’]	95.5’ by 121.5’	
Mixers, horsepower per basin	2 per basin @7.5 each	
Aeration, type	fine bubble diffusers	
Blowers, number (1 standby)	4	
horsepower, each	50	
capacity @ 6.4 psig, each basin, scfm	1,100	
Diffuser capacity, for 1 basin out of service, each	2,200	
Waste sludge pump flow rate, gallons per minute	100	
motor horsepower	2	

TABLE 3-2 continued - Recommended WWTP Design Data

Disinfection, type	UV – ultraviolet light
Peak flow rate, initial, million gallons per day	5.0
Dosage at peak flow,	
after 1 year lamp life, μWatt-sec/cm^2	34,000
Effluent Pump Station	
Submersible pumps, no.	3
capacity, each, mgd	2.5
horsepower, each	22
flow rate control	depth to variable speed drives
wetwell manhole, inside diameter, feet	12
valve vault manhole, inside diameter, feet	12
gravity/pumped effluent control	motor operated butterfly valve
Sludge Storage Lagoons, no.	2
volume, each lagoon, million gallons	6.6
sludge storage time, 2023 loading, each lagoon, years	4 to 5
Aeration/mixing, type	floating aspirating aerators
number, total, both lagoons	8
horsepower, each	7.5
decanting available	multiple draw offs with return to SBR basins
return pumps, capacity, each of two	200
40 CFR, Part 503, biosolids requirements met after 2 years	Class A
Biosolids removal pumps, no.	1
pumps to	future biosolids holding tank
dewatering of biosolids	belt filter press rental

TABLE 3-3 MECHANICAL EQUIPMENT LIST - ELECTRICAL POWER

Recommended WWTP - Extended Aeration Activated Sludge - SBR

Process Component Location/equipment	Description	power, each	total connect	max draw	avg power used kWhr/day
1 Exist Lagoon Pump Station	2 pumps	5 HP	10 HP	5 HP	23.0
2 Influent Structure					
In-channel fine screen	auger/washer	2 HP	2 HP	2 HP	19.2
Parshall fume flow measurement		0.5 kW	0.5 kW	0.5 kW	12.0
Septage receiving pump		2 HP	4 HP	2 HP	2.4
Grit Chamber/classifier	drive, blower, classifier	6.5 HP	6.5 HP	6.5 HP	27.0
3 Influent Valve Vault	valves/heater	2.0 kW	3.0 kW	2.0 kW	6.4
4 SBR Aeration blowers	3 blowers	50 HP	200 HP	100 HP	760.0
5 SBR Mixers	6 mixers	7.5 HP	45 HP	15 HP	183.0
6 SBR Decanters	3 decanters	0.5 HP	1.5 HP	0.5 HP	1.0
7 Waste Sludge Pumps	3 pumps	2 HP	6 HP	2 HP	4.5
8 Waste Sludge Flow Meter		0.5 kW	0.5 kW	0.5 kW	12.0
9 UV Disinfection, low intensity	200 lamps/crane	16.5 kW	16.5 kW	16 kW	260.0
10 Sludge Storage Lagoons					
Floating Surface Aerators	8 aspirators	7.5 HP	60 HP	60 HP	470.0
Supernate/sludge pumps	2 pumps	5 HP	10 HP	5 HP	1.0
11 Laboratory/shop	lab/shop equip	10 kW	10 kW	10 kW	120.0
12 Effluent Pump Station	3 pumps	22 HP	66 HP	40 HP	200.0
Totals			335 kW	226.4 kW	2,101.5 kW-hr/day operating*

* Average operating power per day, at 3 years after startup.

3.2 ESTIMATED PROJECT AND ANNUAL OPERATING COSTS

A detailed estimate of construction costs is in the Appendix. A summary of the project costs and annual operation and maintenance costs for the recommended WWTP upgrade and expansion are shown on Table 3-4. The annual operating costs do not include the collection system O&M (except for pump station maintenance manpower), city administration and billing costs, insurance, taxes and fees.

The annual operating costs are based upon an average year, 3 years after full startup. Wages and benefits for three (3) full times operators is shown. The plant will be operated five days per week, 8 hours per day with one man at the plant on weekends for at least 4 hours per day (to perform daily maintenance and sample analysis). With the weekend work schedule, vacations, maintenance that requires at least two people, operation and maintenance of the City's pump stations, etc., is estimated to require the three full time operators.

The sludge holding lagoons will have a detention time of approximately 5 years at the design year BOD loading. Depending upon how the City wants to handle and schedule biosolids removal and disposal, the lagoon that has been out of service (no waste or raw sludge added for at least the previous year), should contain biosolids that meet Class A biosolids requirements (see above description). These biosolids could be scheduled for removal and dewatering, every 3 to 5 years. Biosolids removal from the lagoons would be removed from the lagoon with the installed pumps, and pumping to a storage tank. Biosolids would be dewatered on a belt filter press (either a rented or future purchase by the City) and hauled to final use or sale. In developing the annual operating costs for the WWTP, it was assumed that every five years the belt press would be contracted with an operator and truck haul of the dewatered biosolids. The once-in-five-year cost was divided by five for inclusion in the user charges for saving each year in a biosolids removal fund.

TABLE 3-4 - Recommended WWTP Upgrade & Expansion Summary of Construction and Annual Operating Costs

Estimate of Construction Costs:

1.	Influent Structure	$ 287,000
2.	SBR Aeration Basins	1,544,000
3.	Sludge Storage Lagoons	337,000
4.	UV disinfection	351,000
5.	Operations/Electrical Building	250,000
6.	Effluent pump station	246,000
6.	Lagoon pump station rebuild to include building drains	36,000
7.	Site Work	375,000
8.	Electrical	398,000
9.	Total Estimated Construction Cost	$ 3,824,000
10.	Contingency (20%)	765,000
11.	Engineering, survey, soils, inspection, permits (25%)	1,147,000
WWTP ESTIMATED PROJECT COST		$ 5,736,000

Estimate of plant operation and maintenance Annual Costs for 3 years after startup:
(does not include collection system, except as noted, city administration costs, billing, etc.)

1.	Manpower, 3.0 staff, full time (includes pump stations)	$ 189,000[1]
2.	Electrical power at $0.065/kW-hr	50,000[2]
3.	Laboratory/office supplies	7,000
4.	Equipment Maintenance	32,000[3]
5.	Vehicle allowance	10,000
6.	Biosolids management	30,000[4]
RECOMMENDED WWTP O&M ANNUAL COSTS		$ 318,000[5]

Notes:

1. Same salary assumed for all operators, based upon annual salary with benefits, for one operator, from City Engineer.
2. Includes all plant operation, including UV disinfection system, power costs.
3. 3 percent of equipment capital costs used to estimate maintenance. Maintenance will be lower when the plant and equipment are new, so a fund must be set up for equipment maintenance and replacement as the equipment gets older.
4. Cost is average set aside each year, assuming that City contracting for Class A biosolids dewatering (equipment rental, operator, polymer, and trucking), with beneficial final reuse with biosolids removal, dewatering and disposal contracted once every 4 years.
5. Annual operating costs do not include the collection system O&M, city administration, billing costs, insurance, taxes and fees (except for pump station manpower for operation and maintenance).

3.3 DOWNTOW PUMP STATION, WASTEWATER TREATMENT PLANT AND OUTFALL PROJECT COST ESTIMATES

The Downtown Pump Station will feed the highest flow rates to the plant and therefore construction of this pump station is essential to proper operation of the WWTP, especially the headworks, so it is included here with treatment plant and outfall project costs. The total estimated cost for the design and construction of the recommended Downtown Pump Station and associated sewers, the wastewater treatment plant, and outfall are shown in Table 3-5.

TABLE 3-5 - Project Costs - Recommended WWTP , Outfall & Downtown Pump Station Total Project Construction Cost Estimate

WWTP ESTIMATED PROJECT COST[1]	$ 5,736,000
OUTFALL TO COLUMBIA RIVER PROJECT COST[2]	$ 1,130,000
DOWNTOWN PUMP STATION PROJECT COST[3]	$ 1,123,000
MAIN TRANSMISSION/WWTP TOTAL PROJECT COST (does not include East side pump stations)	$ 7,989,000

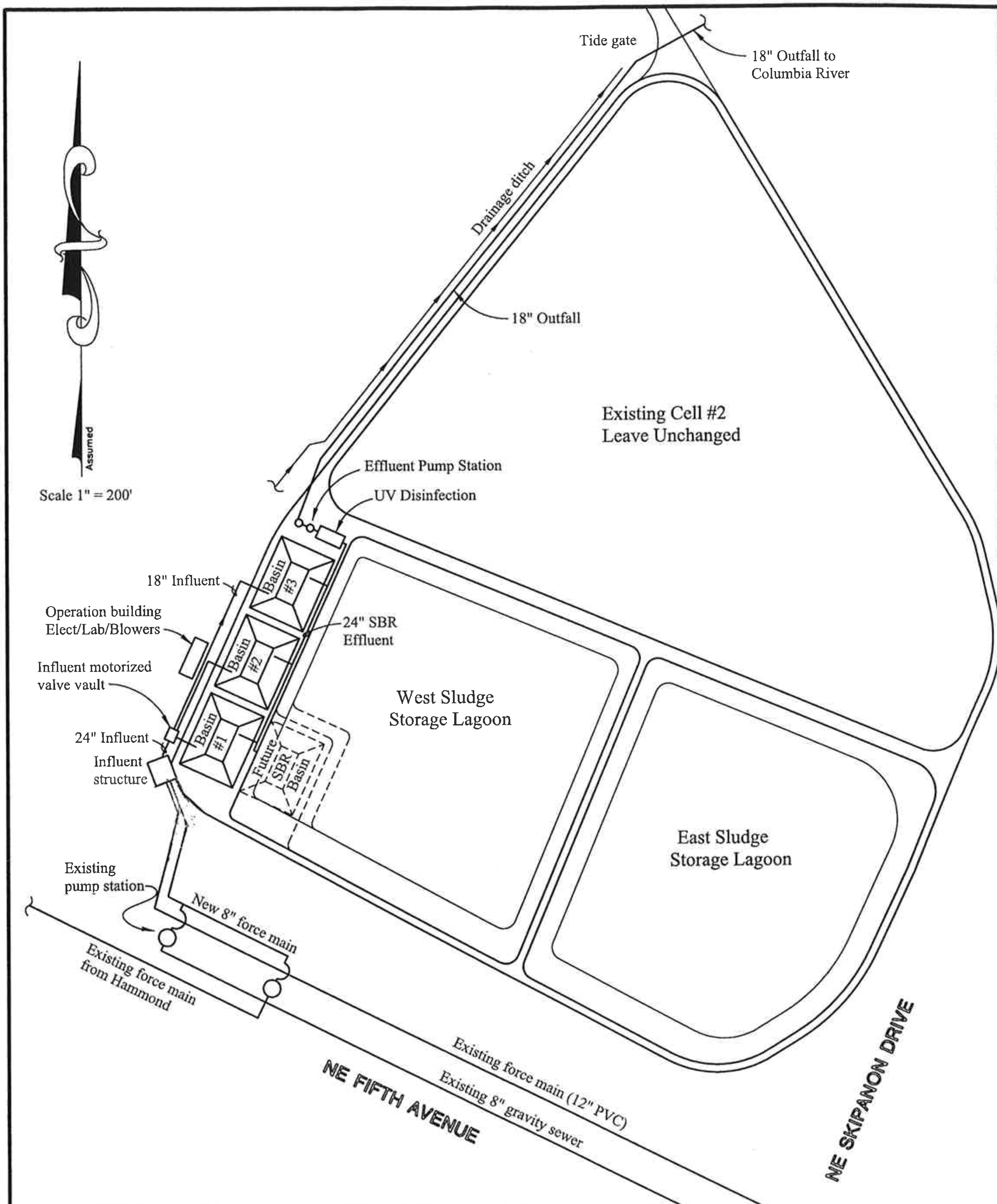
Notes:
1. See Attachment 1 for detailed cost estimate.
2. See Mixing Zone Study for cost estimate.
3. See Facility Plan, Section 7, for detailed cost breakout.

3.4 IMPLEMENTATION

The following schedule of implementation is in accordance with the Mutual Agreement and Order (MAO):

TABLE 3-6 Implementation Schedule

item	due date	status
Wastewater Facilities Plan to DEQ - draft	4/01/02	submitted 4/01/02
final	9/30/02	
environmental review (NEPA)	9/30/02	for plan
Biosolids management plan	9/30/02	submitted 2/2002
Interim capacity increase report	5/30/02	(revision underway)
One-stop meeting for project funding	6/24/02	completed in 2001
submit appropriate funding applications	12/31/02	
Community education meetings		#1 was held 3/20/02
Recommended WWTP biosolids Mngmt. Plan	12/30/02	
Predesign Report to DEQ	4/01/03	
Submittal of plans and specifications to DEQ	12/31/03 at very latest	
Award of contract(s) for construction	within 151 days of DEQ P&S approval	
Completion of construction	within 15 months of contract award	
New WWTP in full compliance with Permits	within 3 months of completion	



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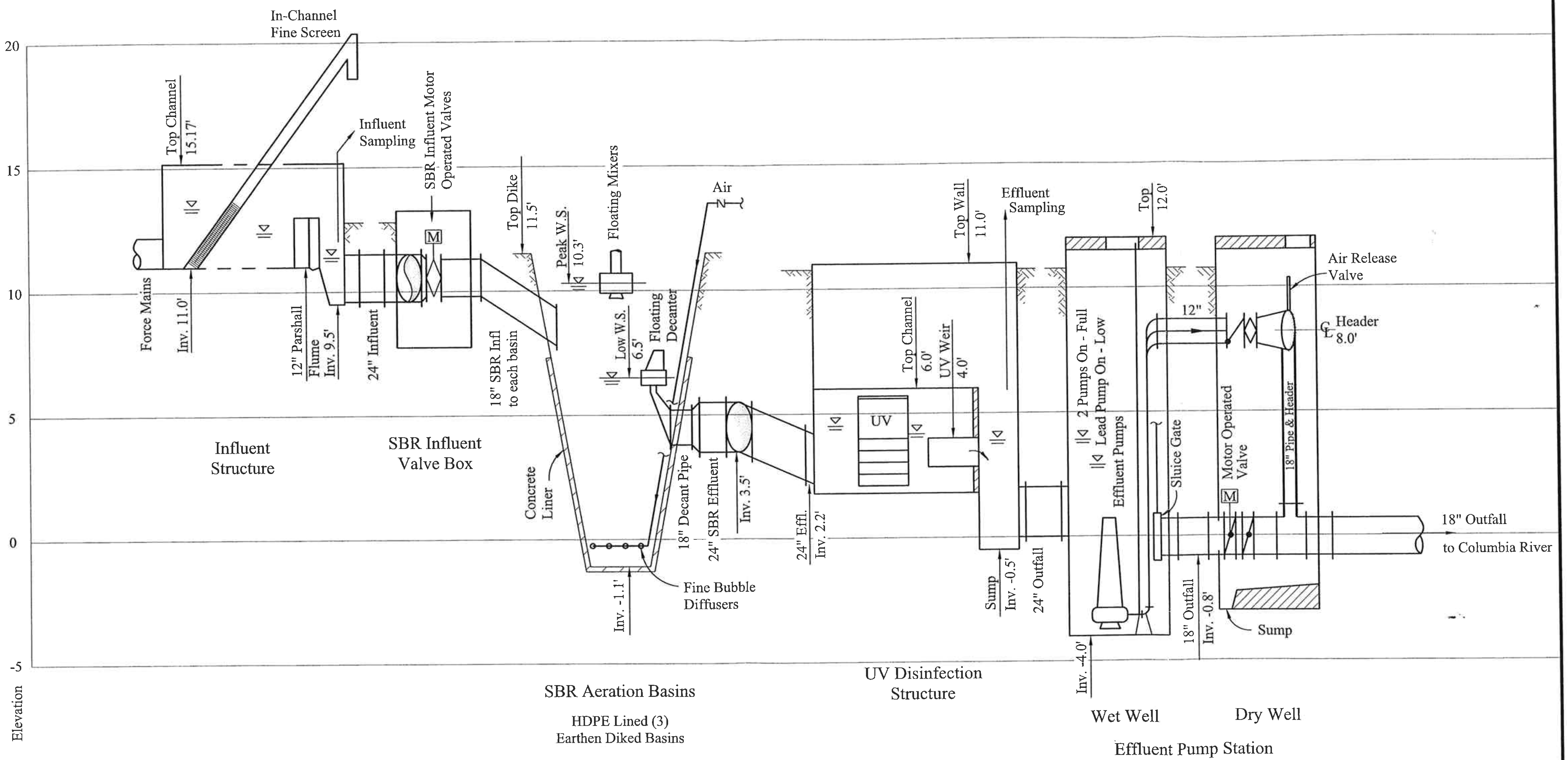
Proposed SBR System

Recommended WWTP Upgrade

FIGURE 1

Fig4.DW



WS at Peak Flow (5 MGD)

WS - Water Surface

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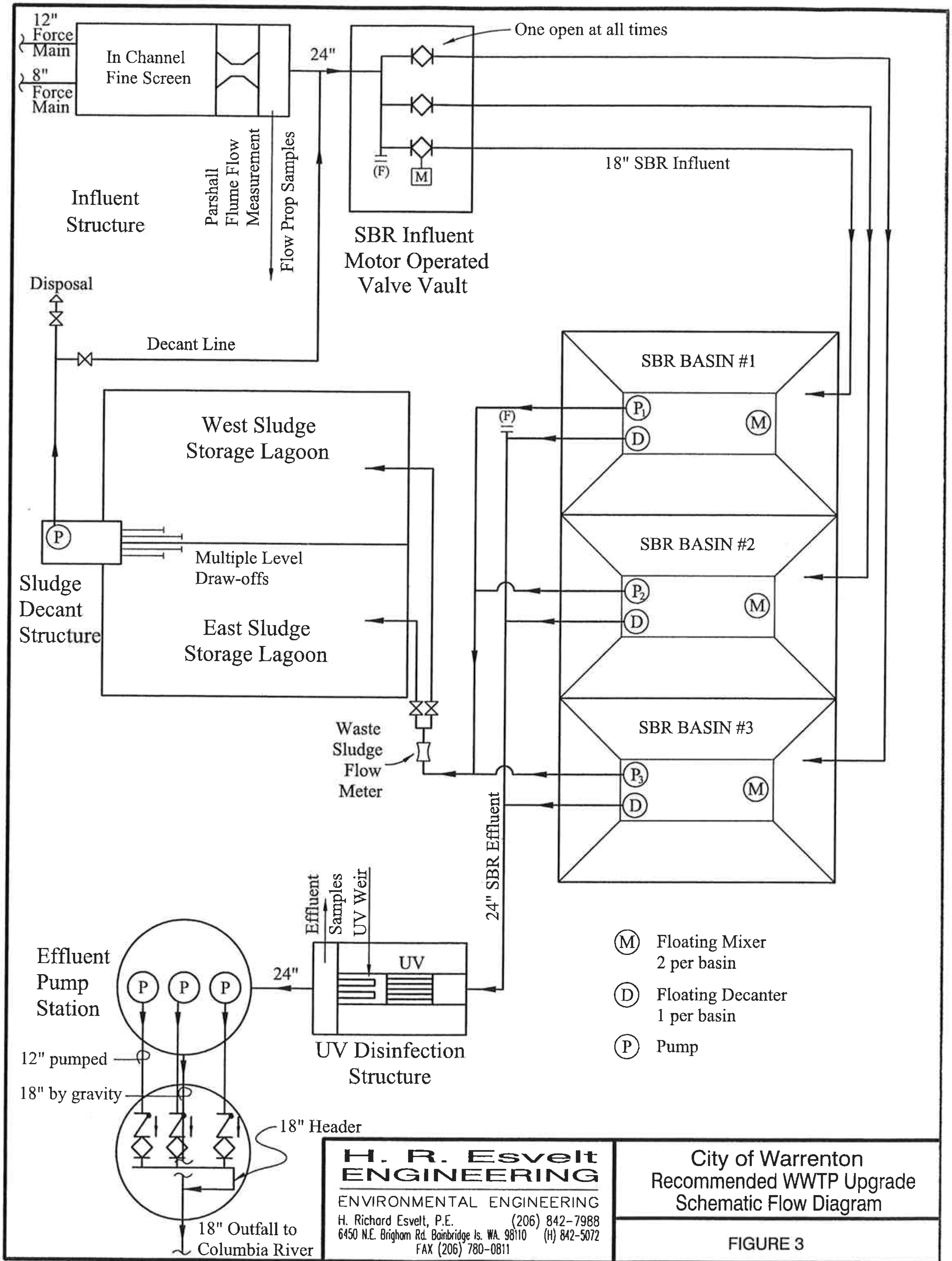
City of Warrenton
Recommended WWTP Upgrade
Hydraulic Profile

FIGURE 2

Fig4.DWG



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City of Warrenton
Recommended WWTP Upgrade
Schematic Flow Diagram

FIGURE 3

Fig4.DWG

ATTACHMENT 1

RECOMMENDED WWTP UPGRADE & EXPANSION PLAN
DETAILED CONSTRUCTION COST ESTIMATE

City of Warrenton Wastewater Treatment Plant
Recommended WWTP
Batach Extended Aeration Activated Sludge - SBR

Process Component				9/17/2002
Item Description	***Estimated Quantity***	***Units***	***Unit Cost***	***Amount with OH&P***
1. Influent Structure				
concrete, in place	64	cy	500	32,000
in-channel fine screen, installed	1	ea	69,000	69,000
Parshall flume flow measurement	1	ls	8,000	8,000
gates, manual screen, grating, piping	1	ls	32,000	32,000
grit chamber equipment, installed	1	ea	72,000	72,000
building enclosure w/separate elect room	500	sf	65	32,500
septage receiving station w/ pump to WAS	1	ls	12,000	12,000
Contractor Overhead	12	%	245,500	29,500
			Subtotal	**287,000**
2. SBR Aeration Basins				
influent valve vault	1	ls	42,000	42,000
pipe, influent 18", including support	700	lf	80	56,000
18" fittings	24	ea	2,800	67,200
10" aeration air lines	410	lf	45	18,450
24" pipe, effluent to UV structure	440	ls	85	37,400
24" fittings, influent and effluent piping	9	ea	3,400	30,600
SBR Equipment for 3 basin system	1	ls	480,000	480,000
Equipment installation	15	%	480,000	72,000
dividing dike construction	7,300	cy	16	116,800
excavation	5,000	cy	4	20,000
embankment fill	7,200	cy	16	115,200
HDPE liner for 3 basins, incl grading	60,000	sq ft	1	60,000
concrete on bottom & around top of basins	500	cy	400	200,000
access bridges to WAS pumps/decanter	3	ea	4,800	14,400
basin drain sump, transfer hoist /1 pump	1	ls	7,000	7,000
4" pumped drain piping, shallow	500	lf	20	10,000
elect feed to ea sump & 3 plug/diconnect	1	ls	17,000	17,000
post & cable guardrail arnd basins	1,700	lf	8	13,600
Contractor Overhead	12	%	1,377,650	165,400
			Subtotal	**1,544,000**
3. Sludge Storage Lagoons				
Waste sludge flow measure/diversion MH's	1	ls	16,000	16,000
dividing dike construction	6,000	cy	16	96,000
resealing of dike to liner	1	ls	22,000	22,000
decant structure, with return pumps	1	ls	52,000	52,000
aerators, in place	8	ea	9,000	72,000
errosion control pads under aerators	400	cy	30	12,000
6" sludge/decant piping from structure	1,200	lf	30	36,000
Contractor Overhead	12	%	258,000	31,000
[note: existing bentonite liner ok (2)]			**Subtotal**	**337,000**

4. UV Disinfection				
excavation/base/filter fabric	200	cy	15	3,000
walls concrete, in place	14	cy	600	9,000
base concrete, in place	38	cy	400	15,200
select import backfill	100	cy	20	2,000
effluent flow measurement	1	ls	8,000	6,000
flow paced, refrigerated sampler	1	ls	5,000	5,000
UV structure	800	sf	50	40,000
hoist & lift - electric	1	ls	14,000	14,000
Equipment installation	15	%	14,000	3,000
UV equipment with stainless steel weirs	1	ls	140,000	140,000
Equipment installation	15	%	140,000	21,000
washdown water system pumps/tank	1	ls	9,000	9,000
UV and hoist electrical hookup	1	ls	8,000	8,000
sludge lagoon monitoring wells, up to 6	1	ls	38,000	38,000
Contractor Overhead	12	%	313,200	37,600
			Subtotal	**351,000**
5. Lab/Shop & Electrical/Blower Buildings				
Lab/Shop Bldg slab on grade wood frame	840	sf	85	71,400
laboratory equipment	1	ls	35,000	35,000
safety equipment & supplies	1	ls	9,000	9,000
laboratory cabinets	1	ls	25,000	25,000
Elect/Blower Bldg slab on grade wood frame	700	sf	85	59,500
blower header, valves & piping	1	ls	18,000	18,000
communications equipment, phone service	1	ls	5,000	5,000
Contractor Overhead	12	%	222,900	27,000
			Subtotal	**250,000**
6. Effluent Pump Station				
12' dia manhole wet well w/ hatch	1	ls	34,000	34,000
pumps	3	ea	17,500	52,500
pump installation	15	%	52,500	7,900
variable frequency drives	3	ea	6,400	19,200
12" piping, pumps to header	60	lf	50	3,000
12" valves, installed	6	ea	3,000	18,000
12' dia manhole valve vault	1	ls	26,000	26,000
18" header & pipe to outfall, w/support	100	lf	80	8,000
18" fittings	16	lf	2,300	36,800
18" motor operated butterfly valve, auto	1	ls	8,600	8,600
18" butterfly isolation valve	1	ea	3,400	3,400
18" canal isolation gate valve	1	ea	2,100	2,100
Contractor Overhead	12	%	219,500	26,300
			Subtotal	**246,000**
7. Rebuild Lagoon Pump Station to include plant building drains				
pumps	2	ea	4,500	9,000
demolition & pump installation	1	ls	6,000	6,000
valve vault	1	ls	9,000	9,000
piping from pumps, valves, discharge	1	ls	8,000	8,000
Contractor Overhead	12	%	32,000	3,800
			Subtotal	**36,000**

8. Site Work				
demolition	1	ls	11,000	11,000
roadways on top of dikes, crushed rock	1,200	cy	20	24,000
dewatering, poss. jetted well-point mon.	1	ls	40,000	40,000
temporary piping/pumping	1	ls	20,000	20,000
erosion and sedimentation control	1	ls	24,000	24,000
site restoration, hydroseeding	1	ls	11,000	11,000
materials testing lab - concrete/compaction	1	ls	22,000	22,000
influent force main mods	1	ls	17,000	17,000
6" piping, building drains	700	lf	24	17,000
manholes on drain lines	3	ea	2,400	8,000
Waste sludge piping, 4" WAS	1,000	lf	20	20,000
entrance & site access roads, base/top	800	cy	24	20,000
fencing repair, new gate	1	ls	8,000	8,000
piping and hose bibbs for washdown water	1	ls	12,000	12,000
Permits, temp office, insurance, startup	1	ls	80,000	80,000
Contractor Overhead	12	%	334,000	40,100
			Subtotal	**375,000**
9. Electrical				
electrical power during construction	1	ls	7,000	7,000
power utility service changes from interim	1	ls	6,000	6,000
standby generator, transfer switch	1	ls	84,000	84,000
power distribution, conduit, trenching, etc	1	ls	98,000	98,000
power to sludge decant structure/aerators	1,200	lf	18	21,600
Lighting	1	ls	16,000	16,000
building heating, electrical	1	ls	12,000	12,000
voice/remote alarm communication system	1	ls	14,000	14,000
control system equipment & panels	1	ls	22,000	22,000
Effluent pump station controls/wiring	1	ls	12,000	12,000
Lagoon PS new control panel, power feed	1	ls	8,000	8,000
Electrical contractor overhead & profit	18	%	300,600	54,100
General Contractor markup	12	%	354,700	42,500
			Subtotal	**398,000**
TOTAL ESTIMATED COSTS				
Total Construction from above			**Subtotal**	**3,824,000**
contingency, 20% of construction	20	%	3,824,000	764,800
engineering, surveying, permitting (1)	25	%	4,588,800	1,147,200
TOTAL ESTIMATED PROJECT COST				**5,740,000**

Notes:
(1) Engineering includes, design, construction administration, on-site inspection (as needed) and geotechnical site evaluation & report. Permitting does not include biological assessment and includes application for the Army Corp of Engineers 404 & construction permits.
(2) As long as existing Bentonite liner is not desturbed, synthetic liner not required. Monitoring wells may be required at boundaries.
(3) Electircal assumes power service installation during interim capacity increase.

ATTACHMENT 2
TO:

ENGINEERING REPORT

WASTEWATER TREATMENT FACILITY UPGRADE & EXPASION PLAN

including added flows from sewer service areas outside City, including Miles Crossing Sanitary Sewer District & Fort Clatsop
dated April 4, 2002

DRAFT

originally dated
April 18 2001
revised for conformance with Facilities Plan Chapter 7
4/04/2002

prepared by:

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CITY OF WARRENTON, OREGON - TREATMENT FACILITY ANALYSIS-draft

TABLE OF CONTENTS

CHAPTER 1
DESIGN PARAMETERS

1.1 WASTEWATER FLOWS AND LOADING PROJECTIONS

Current wastewater flows and loadings were developed based upon daily monitoring reports for 1996 through February 2001. A new influent Parshall flume flow measurement was constructed and started up in March 2000. Flows previous to March 2000 were adjusted based upon flow manual measurement and calibration of old equipment. An estimate was developed of the amount the recorded flows were above actual flows and the monitoring reports and corresponding loadings were adjusted for these past years. Influent BOD5 and TSS were not sampled and monitored more than once per month until May 1999, when 3 samples were taken and analyzed per week on the influent.

The current flows and loadings are shown on Table 1-1.

Growth projections were evaluated in the Facilities Plan, with data from city and county planning agencies. The growth rate through the planning year of 2023 (the earliest an upgraded wastewater treatment plant is projected to be completed) was estimated by linear projection of the estimated growth rate.

Note that a significant percentage of the flows and loadings are coming from sources other than the City (City population approximately 4,100, while population equivalents based upon annual average wastewater loading (measured by BOD5) is currently approximately 6,700.

Table 1-1 also shows the projected flows and loadings for the 2023 planning year for component process sizing for the alternative wastewater treatment processes.

NOTE - FLOWS AND LOADINGS SHOWN ON TABLE 1-1 WERE BASED UPON FLOWS THAT WERE DETERMINED TO BE HIGH, DUE TO THE FLOW MEETER NOT BEING IN CALIBRATION, THEREFORE, THESE PROJECTED FLOWS AND CORRESPONDING LOADINGS ARE ALSO HIGH. SEE TABLE IN 4/04/2002 TECH MEMO AND FACILITIES PLAN TABLE 1.1 FOR UPDATED FLOW AND LOADING PROJECTIONS.

TABLE 1-1 DESIGN CRITERIA DEVELOPMENT

Design Data	Current	Design year 2023

These flows were based upon historical flow measurements that were NOT correct

THIS TABLE IS VOID

POPULATION EQUIVALENTS	6,700[1]	10,700[2]
FLOWS, million gallons/day, mgd		
Annual average	1.10	1.65
Maximum Month WW Average	1.70	2.50
Maximum day	2.83	4.00
Hydraulic, PIF	5.0[3]	6.5[4]
LOADING, pounds per day		
BOD, annual average	1,200	1,930[5]
max monthly average	1,700	2,700
max week	2,200	3,500
TSS, annual average	1,700	2,700
max monthly average	2,400	3,800
Ammonia, max mon avg	170	280

NOTES:

1. Current population equivalents (PE) based upon annual average BOD_5 loading of 1,200 pounds per day divided by contribution of 0.18 lb BOD/PE/day
2. 10,700 population equivalents calculated from projected average growth for Warrenton (from HLB & Assoc.) over the next 22 years times 6,700 PE.
3. Peak flow estimated from maximum day flow (straight line estimate).
4. Peak flows are not proportional to average growth since new sewers will be much tighter with much lower infiltration and inflow.
5. 10,700 PE times 0.18 lb BOD/PE/day.

1.2 ESTABLISHED AND ASSUMED DISCHARGE REQUIREMENTS

Discharge requirements from the current NPDES limits are shown on Table 1-2.

TABLE 1-2 - CURRENT EFFLUENT REQUIREMENTS

	flow proportional composite samples monthly average	weekly max
BOD concentration	30 mg/L	45 mg/L
TSS concentration	50 mg/L	80 mg/L
Fecal Coliform	200 MPN/100mL	400 MPM/100mL
pH	6.0 – 9.0	

Alternatives for upgrading the plant with a batch extended aeration activated sludge processes will be developed based upon secondary levels of treatment (BOD and TSS: 30 mg/L monthly average / 45 mg/L maximum week; or 85% monthly average removal, whichever is more stringent). Possible future effluent limits based upon these limits are shown in Table 1-3 and will be used for development of the secondary treatment alternative.

TABLE 1-3 – POSSIBLE FUTURE EFFLUENT REQUIREMENTS – FOR SECONDARY TREATMENT

	flow proportional composite samples monthly average	weekly max
BOD concentration	30 mg/L	45 mg/L
TSS concentration	30 mg/L	45 mg/L
Ammonia-N concentration	4 mg/L	
Fecal Coliform	200 MPN/100mL	400 MPM/100mL
pH	6.0 – 9.0	

CHAPTER 2
EXISTING FACILITIES

2.1 EXISTING FACILITIES

The existing lagoon wastewater treatment plant was constructed along with the sewage collection system in 1969 ("Lagoon Aeration Pre-design Report for City of Warrenton", HLB & Assoc, Inc., January 2000. The lagoons were last upgraded February 2000, with an influent channel with flow measurement and sampling installed on the Southeast corner of the south lagoon (cell 1). A force main diverted the influent to this location. The flow across cell 1 is from the SE corner to a floating effluent structure installed near the NE corner. A floating baffle, installed in a north-south alignment was installed in cell 2, the north lagoon to prevent short-circuiting and a more efficient flow pattern. Flow from the effluent weir from cell 2 in the SE corner, goes to a chlorine contact pipe installed in the early 1991. Disinfected effluent is discharged to a drainage ditch, which is a tidal slough draining to the Columbia River. A tide gate exists on the drainage ditch approximately 1200 feet downstream of the discharge.

The existing lagoon treatment plant is shown on Figure 3 and the sizing data is shown on Table 2-1.

TABLE 2-1 - EXISTING LAGOON TREATMENT PLANT SIZING DATA

Influent Structure, purpose	flow proportional sampling & flow measurement	
Parshall flume, throat width, inches	12	
Lagoon Surface Areas, acres		
Cell 1, primary lagoon	12.5	
Cell 2, north lagoon	13.2	
Length to width ratios		
Cell 1	2:1	
Cell 2, with installation of 500 feet long baffle	3.6:1	
Depth of cells, both, feet		
minimum	5	
maximum	7	
Volume of cells, million gallons	at 5'	at 7'
Cell 1	20.3	28.5
Cell 2	21.5	30.1
Chlorine contact tank	buried 60" ID pipe	
volume, gallons	25,000+/-	

2.2 EVALUATION OF EXISTING LAGOON TREATMENT

In a letter dated February 20, 2001, the Oregon Department of Environmental Quality (DEQ), David Mann, P.E., noted that they recognized the improvements to the lagoons that were made (see above) but pointed out that the City must act quickly to restore adequate treatment capacity. A follow-up letter dated March 23, 2001, from Richard J. Santner, Water Quality, DEQ, indicated that previous improvements to the plant had not achieved the original performance objectives and that a "technical memorandum" with a corrective action plan must be submitted to DEQ by April 30. This engineering report is intended to satisfy the requirements of the technical memorandum.

The overloading has resulted in approximately 20 violations of the NPDES permit discharge requirements (Oregon DEQ Notice of Violation, City of Warrenton, February 9, 2001). This overloading was also established in the "Technical Memorandum's for Sewer Lagoon Improvement Study, City of Warrenton", CH2M Hill, June 23, 1995; March 21, 1995 memorandum determined that at a projected loading of 1,540 pounds of BOD5 per day, the primary cell (Cell 1) would be loaded with double the loading limit of 70 kg/ha/day. The current maximum monthly average (the average daily loading during the maximum month of recent years; also the monthly average used in designing the treatment processes for loading to prevent a monthly violation) loading is 1,700 lbs BOD5/day (see Table 1-1).

The sludge has also accumulated to unacceptable levels in the lagoons (also recommended in the 2/20/2001 DEQ letter referenced above) adding to the overloading problems. The City is making arrangements and obtaining the required permits for sludge removal during the summer of 2001.

CHAPTER 3
WASTEWATER TREATMENT PROCESSES

3.1 REQUIRED UPGRADES TO EXISTING PLANT

The Warrenton lagoon wastewater treatment plant is badly overloaded (See Chapter 2) and violations in the permitted effluent requirements have been occurring regularly (See Table 1-2 for current discharge limits). Major upgrade to the treatment plant will be required to meet effluent requirements while treating the projected future flows and loadings.

Previous evaluations of lagoon capacity have looked at adding an aerated lagoon and/or additional facultative capacity, while maintaining facultative settling ponds operated in series ("Technical Memorandums for Sewer Lagoon Improvement Study, City of Warrenton", CH2M Hill, June 23, 1995, and "Lagoon Aeration Pre-design Report, for City of Warrenton" HLB & Assoc., Inc., January 2000,). However, algae blooms (which can occur year around in coastal climate), anaerobic release of soluble BOD from accumulated biosolids, pond turnover, and other factors will cause continued violations of the current effluent requirements. If aerated lagoons with facultative settling ponds are used in the future, additional treatment will be required to maintain an effluent quality that meets current and possibly more stringent future NPDES permit requirements.

3.2 ALTERNATIVE TREATMENT PROCESS DEVELOPMENT

3.2.1 Alternative Development Criteria

An important factor in developing alternative treatment plant upgrade processes, is that expansion of the treatment plant outside of the existing lagoon dikes will require a long and costly permitting process, and obtaining a permit for replacing large areas of natural wetlands will be difficult if not impossible. For these reasons, plant upgrade and expansion should be kept within the current plant area boundaries.

Criteria for developing an acceptable long-term (20 year) wastewater treatment solution for the City of Warrenton is as follows:

- plant must be capable of meeting NPDES permit effluent requirements
- proposed processes must utilize existing facilities to the greatest extent possible and practical
- proposed improvements must be contained within the current plant footprint
- proposed improvements must be capable of treating future (year 2023) flows and loadings, with layout capability for expansion beyond 2023 capacity
- improvements must be planned to provide current level of treatment during construction of the proposed improvements

3.2.2 Evaluation of Previously Recommended Addition of Aeration

The "Lagoon Aeration Pre-Design Report" recommendation to add aeration to Cell 1 (in addition to the improvements implemented in early 2000) does not meet the criteria presented above. The improvements completed in March of 2000 were: redirecting flow to southwest corner of Cell 1, and into a new influent structure with flow measurement and sampling; new Cell 1 floating effluent structure; and a 500 feet long baffle for Cell 2. The report also anticipated the removal of sludge from Cell 1 & 2, however, no sludge removal has been accomplished to date. The recommendation included 10 – 7.5 HP aspirating aerators in Cell 1 and 2 - 7.5 HP aerators in Cell 2. The recommendation to add aeration to these improvements is no longer acceptable for the following reasons:

1. Effluent discharge violations will continue even with these improvements, since the current discharge requirements of 30 mg/L BOD5 and 50 mg/L TSS , monthly averages, will not be achieved without additional treatment following or in the settling lagoon (Cell 2). The additional treatment is required to provide for secondary treatment process BOD removal and to remove algae to meet the TSS average concentrations. These limits will be met most of the year, but violations will continue with facultative lagoons following an aerated lagoon. Multiple depth draw off points will not provide an effluent that meets discharge requirements since the lagoons are shallow.
2. The recommended aeration does not provide for future flows loadings (including influent fine screening, mixing and aeration, and effluent disinfection).
3. The aerated lagoon is mixing limiting (more horsepower is required for mixing than for providing oxygen) and must provide adequate detention time to treat the year 2023 flows/loadings. The basin must be nearly completely mixed to provide the necessary level of treatment.
4. The required aerated lagoon will require a deeper aeration basin than is currently available in Cell 1 to be completely mixed.
5. DEQ requires that any unlined lagoons and lagoons with clay liners, be lined with acceptable synthetic liners at the time of plant upgrade and improvements. No liners were proposed in the project (lining 25 +/- acres of lagoons is a significant portion of any upgrade cost).
6. Additional plant improvements would be required to the proposed aeration to treat current flows and loadings (with no allowance for future growth). Needed improvements include: Cell 2 would need to be divided into multiple cells in series and redundant cells for taking individual cells out of service for regular sludge removal, daily operator attention and maximum operating flexibility. Operating flexibility needed includes: piping for flow through, and bypassing of cells, and variable depth draw-off system from each cell, in order to meet the effluent conditions. However, periodic violations will still occur with any facultative lagoon system.

Alternative No. 1, below, is developed with the same aerated lagoon treatment process, however, it has been additionally designed for treating future flows and loadings, staying within the current plant boundaries and generally meeting NPDES Permit effluent requirements.

3.2.3 Description of Viable Alternatives

Alternative No. 1 – Aerated Lagoon, Settling Pond and Wetland:

Add influent fine screening to Influent Structure, followed by flow measurement in the existing 12" throat Parshall flume and discharge to the aerated lagoon, a settling pond with some aeration and a constructed free surface wetland. An in-channel fine screen, at the influent of the plant (preferably in the existing channel), is necessary to remove rubber and plastic products out of the wastewater to keep the lagoons presentable, prevent binding up and/or clogging of the aerators and pumps, keep them out of the receiving stream, and out of the sludge which will eventually be land applied onto farmland. The screenings are washed and compacted so they are acceptable for disposal with the solid waste.

An aerated lagoon with 8 days detention time is required for treatment of the projected loadings to the plant at winter temperatures. Using the projected 2023 maximum monthly average flows (2.5 million gallons per day, mgd) the required detention volume will be 20 million gallons. The basin will be 12 feet deep with 2 feet of freeboard with mixing to provide complete mixed basin for full utilization of the required detention volume. Aspirating aerators are recommended to provide adjustable-direction mixing to keep the basin contents moving while meeting the oxygen demand. A concrete effluent structure with a fixed weir will maintain the desired water level. The aerated lagoon is proposed to be constructed in the West half of Cell 1.

The East half of Cell 1 would become a settling pond. The cell is currently lined with a bentonite liner and as long as the liner is not disturbed will be acceptable for future use. Monitoring wells may be required by DEQ for monitoring groundwater at the property line to ensure the lagoons are not leaking. (Reference: personal communication with David Mann, P.E., DEQ, April 6, 2001). The recommendation is to move the floating baffle installed in early 2000 in Cell 2 to Cell 1, at the time Cell 2 is taken out of service for wetlands construction.

Aeration would be provided in the first part of the Settling Pond to keep the contents partially mixed and aerobic. This settling pond would provide for settling and storage of sludge and would require removal (biosolids, since the sludge would be stabilized, after one year, to meet requirements of 40 CFR, Part 503 for Class B biosolids for land application). Annual removal of sludge, each summer, would be the preferable method of sludge disposal, if the City buys sludge removal and application equipment. This will keep the annual task from overwhelming City staff (which may occur if the sludge removal is done every few years). A second alternative is for biosolids removal every few years by contract.

The recommended method is biosolids removal by City staff, which will require that a biosolids dredge and a sludge haul/spreading truck be purchased by the City.

The settling pond effluent is proposed to flow through a flow control structure. The structure will include level control for settling pond, bypass lines for maintenance of the settling pond or wetland and flow splitting to the two wetlands treatment cells.

The constructed free water surface wetlands will provide effluent polishing with additional carbonaceous waste, BOD, removal by bacterial communities resident in the wetlands and plant uptake, removal of algae by the effluent passing through the plants, and settling of solids, as well as an added benefit of nutrient removal. A properly designed and constructed wetland in a coastal climate can provide a high level of treatment year around. The wetlands would be designed with two flow paths, for parallel operation, approximately 6.0 acres in each. There is not adequate elevation head available for flexibility to provide series operation (changing elevation head would require raising existing grades, including bottoms of ponds, which would be cost prohibitive). The design would include alternating open water, deeper sections and planted shallower sections.

Chlorine disinfection is proposed to treat effluent from the wetlands. Contact time will be provided in a chlorine contact basins prior to discharge through the existing outfall to the drainage ditch. Each pipeline to the basin will go through a manhole ahead of the flash-mixing chamber. A submersible pump can be dropped into one of the manholes to pump the pipe dry for maintenance. The flash mixer will quickly mix the chlorine solution into the treated effluent. The contact basin will be in two flow paths so each side can be taken off line periodically to pump any accumulated solids back to the aerated lagoon. Dechlorination equipment is proposed (dechlorination feed equipment and flash mixing). Effluent flow measurement and flow-paced, refrigerated composite sampler are included.

Note that Ultraviolet (UV) disinfection is not recommended for Alternative No. 1, since during certain times of the year effluent turbidity from a wetland inhibits transmission of the UV light.

The preliminary design data for Alternative No. 1 is shown on Table 3-1.

TABLE 3-1 - Alternative No. 1 - Aerated Lagoon, Settling Ponds and Wetlands preliminary design data

Influent Structure	
In-channel fine screen, type	step screen with washer compactor
width, feet	3.0
Parshall flume flow measurement, existing, throat width	12"
Aeration Basin, number	1
Volume, million gallons	20
Depth, feet	12.0'
Side slopes	2.5:1
Basin, area, acres	5.8
dimensions, at top of dike, height 14.0'	500' by 480'
Type of aeration	aspirating floating aerators
aerator	8 @ 25 HP
horsepower, total	200 HP
Settling Pond, number	1
Area, acres	6.3
Depth, feet	5 to 6
Volume at 6' depth, million gallons	12.4
Type of aeration	aspirating floating aerators
aerator, horsepower, total	25 HP
Wetlands, number	2
Normal operation	parallel
Surface area, acres, total	12.0
Length to wide of each wetlands	4 to 1
Water depth, meters (inches)	
average	0.60 (24")
operating range	0.30 to 0.91 (12" to 36")
BOD loading, lb/acre/day	
at annual average (400 lb/day)	33
at maximum monthly average (625 lb/day)	52
Hydraulic retention time at 60 cm depth, days	
at annual average (1.6 mgd)	4.9
at maximum monthly average (2.5 mgd)	3.2
Disinfection, type	chlorine
Contact basins, number	2
volume, total, gallons	104,000
length to width ration	25:1
Detention time, minutes	
at maximum monthly average (2.5 mgd)	60
at peak flow (6.5 mgd)	23

Alternative No. 2 – Batch Extended Aeration Activated Sludge, SBR

This alternative is developed as a full secondary treatment level process to meet more stringent BOD and total suspended solids (TSS) effluent concentration limits, with ammonia removal and maximum flexibility for future growth. [Note: Continuous flow alternatives were not considered to be cost effective for evaluation due to the requirement to construct concrete clarifiers and return/waste sludge pumping facilities on the soft soils.]

The Influent Structure modifications are proposed to be the same as for Alternative No. 1. From the Influent Structure, the flow will enter a valve vault with motorized automatic valves. The valves divert the flow to the SBR aeration basin in service (the basin that is in the aeration/fill mode of the batch cycle).

Influent from the valve vault enters one of the three SBR aeration basins by gravity flow. Each aeration basin is proposed as an earthen-diked basin, lined with a HDPE liner and a concrete bottom. Each basin will include two high speed floating surface aerators, a series of level controls that can override the timed cycle control program and one floating effluent decanter. Following the decanter is a redundant motorized butterfly valve contained in a manhole for access. Effluent is discharge in a gravity line to the chlorine contact basin.

This alternative includes construction of the SBR aeration basins in the West end of Cell 1. The remainder of Cell 1 would be converted into two sludge-holding/stabilization lagoons. Each year solids would be removed from one of the sludge holding lagoons that has not been in service (sludge wasted to it) during the previous 6 months, to insure the biosolids meet the requirements of 40 CFR, Part 503 for Class A biosolids.

Ultraviolet (UV) disinfection is proposed for Alternative No. 2. UV is an acceptable alternative method of disinfection for the proposed activated sludge process. UV disinfection process, as proposed, would include: New concrete channel, roof, hoist and lift for removing the UV modules from the channel for cleaning and other maintenance, the low pressure, low intensity UV equipment, effluent flow measurement and refrigerated, flow paced, composite sampler.

The preliminary design data for Alternative No. 2 is shown on Table 3-2.

TABLE 3-2 - Alternative No. 2 - Batch Extended Aeration Activated Sludge, SBR preliminary sizing

Influent Structure	existing	
In-channel fine screen, type	step screen with washer compactor	
channel/screen width, feet	3.0	
Parshall flume flow measurement, existing, throat width	12"	
SBR - Aeration Basins, number	3	
Number of cycles per basin per day	6 (4 hours/cycle)	
	low water	high water
Volume, million gallons, each basin	0.565	0.835
Total volume of all three, mgd	1.68	2.49
Depth, feet	9.6'	12.0'
Max decant volume/cycle, gallons	270,000	
decant flow rate, average, gal/min (gpm)	4,200	
Side slopes	2.5:1	
Basin dimensions, feet		
bottom, invert (concrete bottom) [el –3.0']	40' by 90'	
at 9.6' depth, low water [el 6.6']	88' by 138'	
at 12.0' depth, high water [el 9.0']	100' by 150'	
at top of dike, height 14.0' [el 11.0']	110' by 160'	
O2 requirements, max week AOR, pounds per day	4,700	
Type of aeration	high speed floating aerators	
aerator, number & horsepower, each	2 @ 40 HP	
total connected horsepower	240	
maximum horsepower on at one time	170	
Waste sludge pump flow rate, gallons per minute	100	
motor horsepower	2	
Disinfection, type	UV – ultraviolet light	
Peak flow rate, initial, million gallons per day	6.0	
space for future, million gallons per day	8.0	
Dosage at peak flow, after 1 year lamp life, μWatt-sec/cm^2	34,000	
Sludge Storage Lagoons, no.	2	
volume, total, million gallons	22	
sludge storage time, 2023 loading, each lagoon, years	1	
decanting available	multiple draw offs with return to SBR basins	
40 CFR, Part 503, biosolids requirements met after 1 year	Class A	

3.2.4 Appurtenant Facilities

Either alternative will require the following items in order to provide the City with a wastewater treatment facility with adequate operating tools, protection of equipment, operator notification of alarm conditions during time when the plant is not staffed and to improve pumping performance:

- Operations/Electrical Building containing a full laboratory, electrical, lavatory and small shop. Electrical equipment to be housed in the building include the automatic transfer switch, standby generator, power distribution equipment and alarm panel and telephone dialer.
- Modifications to lagoon pump station #3 to receive flow from the Operations Building and electrical feed from the treatment plant power/standby generator.
- Force main from Hammond pump station and lagoon pump station will be extended directly to the influent channel.

3.2.5 Phasing of Alternative Implementation

Alternative No. 1, Aerated Lagoon, Settling Pond and Wetland, can be phased by installation of the Aerated Lagoon, Operations/Electrical Building, in an initial phase with Wetlands, Settling Pond and Chlorine Contact Basin improvements constructed in a future phase. The DEQ would like the City to implement the first phase as soon as possible and the phasing should help accommodate this request. A first phase would not include a standby generator and the operation of the remainder of Cell 1 and Cell 2 would be unchanged.

It should be noted that some effluent violations will continue, even with the addition of the Aerated Lagoon, since the current discharge requirements cannot be achieved 12 months per year without additional treatment modifications following the aerated lagoon. The additional treatment is required to: provide for secondary treatment process-level BOD removal and remove algae to meet the TSS average concentrations. These limits will be met most of the year, but violations will continue with shallow, facultative lagoons following an aerated lagoon. Multiple-depth draw off points will not provide an effluent that meets discharge requirements year around, since the lagoons are shallow. Therefore, construction of the wetlands in Cell 2 should closely follow phase 1 completion.

Alternative No. 2, SBR Extended Aeration Activated Sludge, secondary treatment plant could be phased by adding the Sludge Holding Lagoons dividing dike (splitting the lagoon into two basins) and installing UV disinfection, in future upgrades.

3.3 EVALUATION OF ALTERNATIVES

3.3.1 Discussion

Both alternatives meet the development criteria presented in 3.2, above.

Advantages:

Alternative No 1, Aerated Lagoon, will require less operator attention and will make use of the entire lagoon area. If flows/loadings reach design levels and/or discharge requirements become more stringent than the aerated lagoon process can achieve, the Alternative 1 process can be expanded in the future by building batch extended aeration activated sludge basins in the Settling Pond and turning the Aerated Lagoon into sludge storage lagoon. The wetlands would stay in service, after such an upgrade, for additional nutrient reduction.

Alternative No. 2, SBR, will produce the higher quality effluent of the two alternatives since it is a full secondary wastewater treatment plant (consistently lower BOD5, TSS and ammonia average effluent concentrations) and the effluent will be disinfected with UV and not chlorine (which remains toxic in the receiving stream, unless a "dechlorination" chemical is added). Alternative 2 can be expanded beyond the projected 2023 flows and loading capacity by adding a fourth SBR aeration basin, on the north side of the proposed 3 basins. The sludge storage lagoons have capacity beyond the 2023 projections without further modifications. Cell 2 land area would remain available in the future for further expansion and/or use as industrial wastewater treatment or pretreatment. Using the remainder of Cell 1 for sludge storage and stabilization, and dividing it into two lagoons, each lagoon has the capacity for holding one year of sludge production at design year loadings. One year of holding (with sludge diverted into the other lagoon during the entire year) should produce sludge that meets the requirements of 40CFR, Part 503 for Class A biosolids.

Both alternatives can be constructed while maintaining at least the current level of treatment: No additional land area is necessary with either alternative, since both are proposed to be constructed within the existing lagoon areas.

For *Alternative No. 1, Aerated Lagoon,* a new dike would be constructed across Cell 1 while still in operation, with the flow temporarily diverted to east of the new dike location. Aerators would be temporarily installed in the East half of Cell 1 during construction of the aerated lagoon, flow control structure and chlorine contact basin. After the aerated lagoon is put in operation the flow would be temporarily diverted around the east half of Cell 1 for construction of the settling pond. Aerators and the floating baffle would be installed last before diversion of aerated lagoon effluent into the settling pond. Flow would temporarily be diverted from the settling pond to the chlorine contact basin during grading and construction of the free surface wetlands.

For *Alternative 2, SBR Activated Sludge,* a new dike would be constructed across Cell 1 (while still in operation) with the flow temporarily diverted to east of the dike location. Aerators would be temporarily installed in the East half of Cell 1 during construction of the SBR aeration basins and installation of the equipment and construction of the ultraviolet (UV) disinfection system. After the SBR-type extended aeration activated sludge system is put in operation with effluent to the chlorine contact basin, the east half of Cell 1 would be taken out of service and the sludge holding lagoons constructed.

3.3.2 Construction and Operation & Maintenance Costs

Alternative No. 1 - Aerated Lagoon, Settling Ponds and Wetlands

The preliminary design data for this alternative is presented in Table 3-1.

A summary of the construction cost estimate and comparative operation and maintenance (O&M) costs are shown in Table 3-3. The O&M costs include comparative costs only and do not include such items as City administrative costs, vehicle costs, insurance, potable water, solids waste disposal costs, etc. The sludge disposal cost assumes that the City owns a biosolids dredge and sludge truck suitable for land applying biosolids. A more detailed construction cost estimate is included in Appendix A.

Alternative No. 2 - Batch Extended Aeration Activated Sludge, SBR

The preliminary design data for this alternative is presented in Table 3-2.

A summary of the construction cost estimate and comparative operation and maintenance (O&M) costs are shown in Table 3-4. The O&M costs include comparative costs only and do not include such items as City administrative costs, vehicle costs, insurance, potable water, solids waste disposal costs, etc. The sludge disposal cost assumes that the City owns a biosolids dredge and sludge truck suitable for land applying biosolids. A more detailed construction cost estimate is included in Appendix A.

TABLE 3-3 - Alternative No. 1 - Aerated Lagoon, Settling Ponds and Wetlands
Summary of Construction and Comparative O&M Costs

		Phase 1	Phase 2
Estimate of Construction Costs:			
1.	Influent Structure	$ 151,000	$ 0
2.	Aerated Lagoon	739,000	
3.	Settling Pond		170,000
4.	Wetlands		609,000
5.	Chlorine Contact Basins		349,000
6.	Operations/Electrical Building	149,000	
7.	Site Work	173,000	134,000
8.	Electrical	177,000[6]	77,000
9.	Total Construction Cost	$ 1,389,000	$ 1,339,000
10.	Contingency (20%)	277,000	268,000
11.	Engineering, survey, permits (25% of 9+10)	416,000	402,000
12.	Biosolids removal equipment (no markup)	150,000	-
TOTAL ESTIMATED PROJECT COST		$ 2,232,000	$ 2,009,000
	Total of both phases	$ 4,241,000	

Estimate of Comparative Operation and Maintenance Annual Costs:		
1.	Manpower, 1.5 staff, full time	$ 95,000[1]
2.	Electrical power at $0.065/kW-hr	48,000
3.	Laboratory/office supplies	3,000
4.	Chemical costs	2,000[2]
5.	Equipment Maintenance	16,000[3]
6.	Biosolids management	18,000[4]
TOTAL COMPARATIVE O&M ANNUAL COSTS		$ 182,000[5]

Notes:

1. Assumed annual salary with benefits
2. Includes operation of sodium hypochlorite generation system.
3. 3 percent of equipment, including assumed $150,000 for dredge and liquid haul sludge truck for field application.
4. Assumes that City owns biosolids removal equipment and sludge truck
5. Annual cost is for comparison with other alternative and does not include related City costs that would be the same with either alternative.
6. Emergency standby generator and automatic transfer switch in phase 2.

TABLE 3-4 - Alternative No. 2 – Batch Extended Aeration Activated Sludge - SBR
Summary of Construction and Comparative O&M Costs

		Phase 1	Phase 2
Estimate of Construction Costs:			
1.	Influent Structure	$ 155,000	$ 0
2.	SBR Aeration Basins	1,206,000	80,000
3.	Sludge Storage Lagoons		309,000
4.	UV disinfection		390,000
5.	Operations/Electrical Building	155,000	
6.	In-plant pump station and plant drain piping	82,000	
7.	Site Work	260,000	85,000
8.	Electrical	264,000	47,000
9.	Total Construction Cost	$ 2,122,000	$ 911,000
10.	Contingency (20%)	424,000	182,000
11.	Engineering, survey, permits (25% of 9+10)	636,000	273,000
12.	Biosolids removal equipment (no markup)	150,000	
TOTAL ESTIMATED PROJECT COST		$ 3,332,000	$ 1,366,000
	Total of both phases	$ 4,698,000	

Estimate of Comparative Operation and Maintenance Annual Costs:		
1.	Manpower, 2.0 staff, full time	$ 126,000[1]
2.	Electrical power at $0.065/kW-hr	48,000[2]
3.	Laboratory/office supplies	4,000
4.	Equipment Maintenance	24,000[3]
5.	Biosolids management	18,000[4]
TOTAL COMPARATIVE O&M ANNUAL COSTS		$ 217,000[5]

Notes:

1. Same salary assumed for both operators, based upon annual salary with benefits, for one operator, from City Engineer.
2. Includes operation of UV disinfection system power costs.
3. 3 percent of equipment, including assumed $150,000 for dredge and liquid haul sludge truck for field application.
4. Assumes that City owns biosolids removal equipment and sludge truck
5. Annual cost is for comparison with other alternative and does not include related City costs that would be the same with either alternative.

3.3.3 Evaluation of Alternatives

The following are items for consideration in selecting an alternative treatment plant to meet the City of Warrenton wastewater treatment requirements:

- The construction cost of Alternative No. 1, Aerated Lagoon, is the lowest when adding the two phases together.
- The comparative annual cost of Alternative No.1, Aerated Lagoon, is lower than for Alternative No. 2, SBR, due to the additional level of treatment provided by Alternative No. 2; which requires: more operator attention, laboratory analysis for process control and maintenance for more equipment and controls.
- Alternative No. 2, SBR, will discharge a "higher quality" effluent with lower BOD5, suspended solids, ammonia and nutrients and provides the most flexibility for future expansion and UV disinfection.
- Disadvantages for Alternative No. 1, Aerated Lagoon, include: This alternative may continue to have occasional discharge violations due to the wetlands being a natural system without short term operating control systems (for example, high TSS from algae breakthrough). The disinfection for this alternative will continue to be chlorine with possible future addition of a chemical feed system for dechlorination (provisions will be included in the disinfection system for the addition of dechlorination in the future).

3.4 RECOMMENDED TREATMENT PROCESS

Alternative No. 2, sequencing batch reactor (SBR) type extended aeration activated sludge secondary treatment with nitrification for ammonia reduction with two sludge storage lagoons, each with capacity to hold one-year of sludge production to meet 40 CFR, Part 503 requirements for Class A biosolids, is recommended for upgrade and expansion of the City of Warrenton Wastewater Treatment Plant. The reasons for this recommendation are as follows:

- The recommended process would meet the anticipated effluent requirements for secondary treatment with ammonia reduction, based upon anticipated results of the City of Warrenton Mutual Agreement and Order (MAO), effluent discharge limits that must be established for "compliance with regulatory mixing zone requirements" (MAO, 8.A.(1)d., signed 12/24/2001).
- The Alternative No. 2 secondary treatment process will handle additional flows and loadings proposed for addition to the City of Warrenton sewer service area.
- The plant will be capable of handling the high flows and low loadings of winter months and the lower flows and higher loadings from tourists during with summer months, while consistently meeting anticipated effluent requirements.

Effluent toxicity to receiving waters will be much less with ammonia reduction and ultraviolet light (UV) disinfection, as compared to Alternative 1 with chlorine disinfection and wetlands effluent polishing (with the limited ammonia removal).

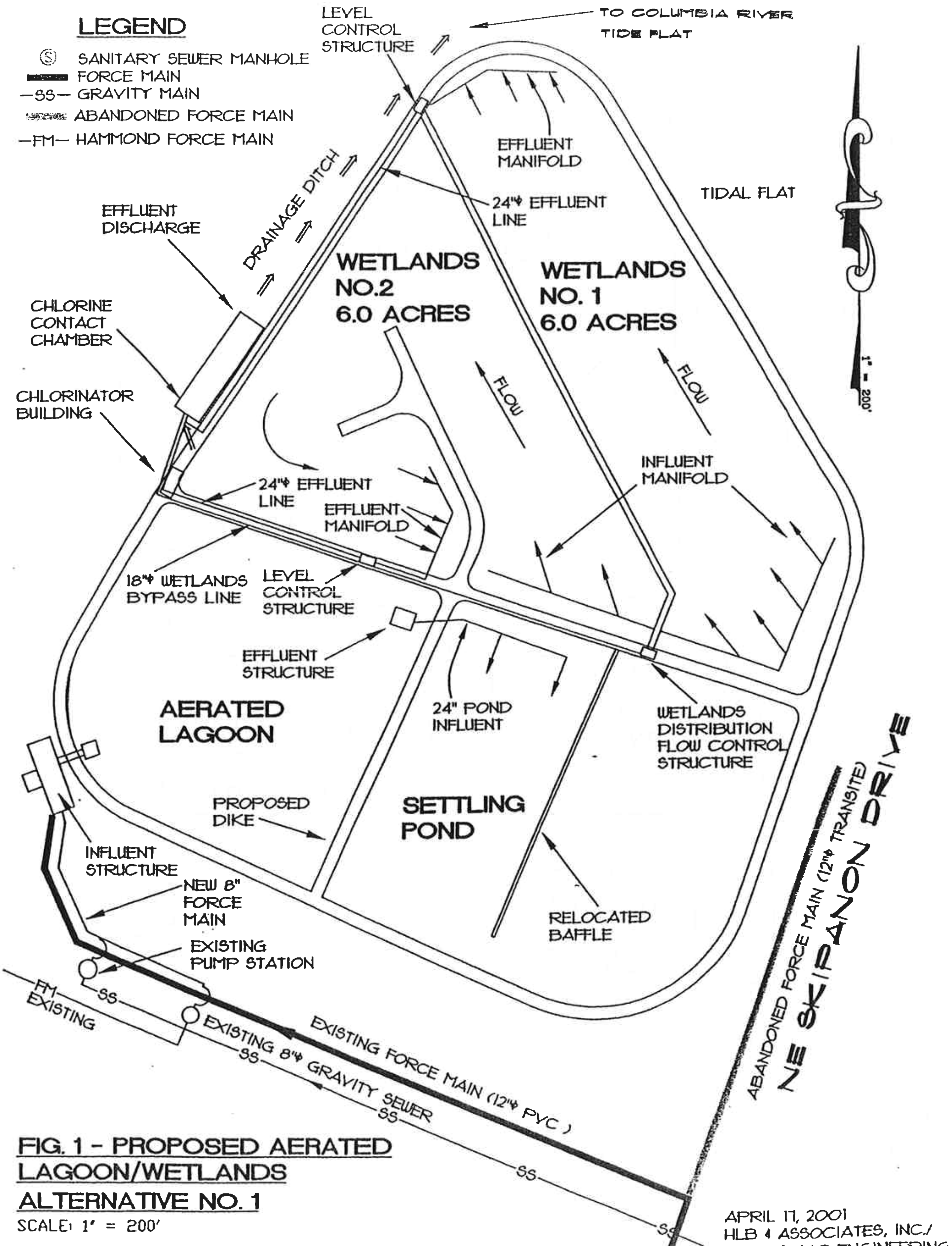
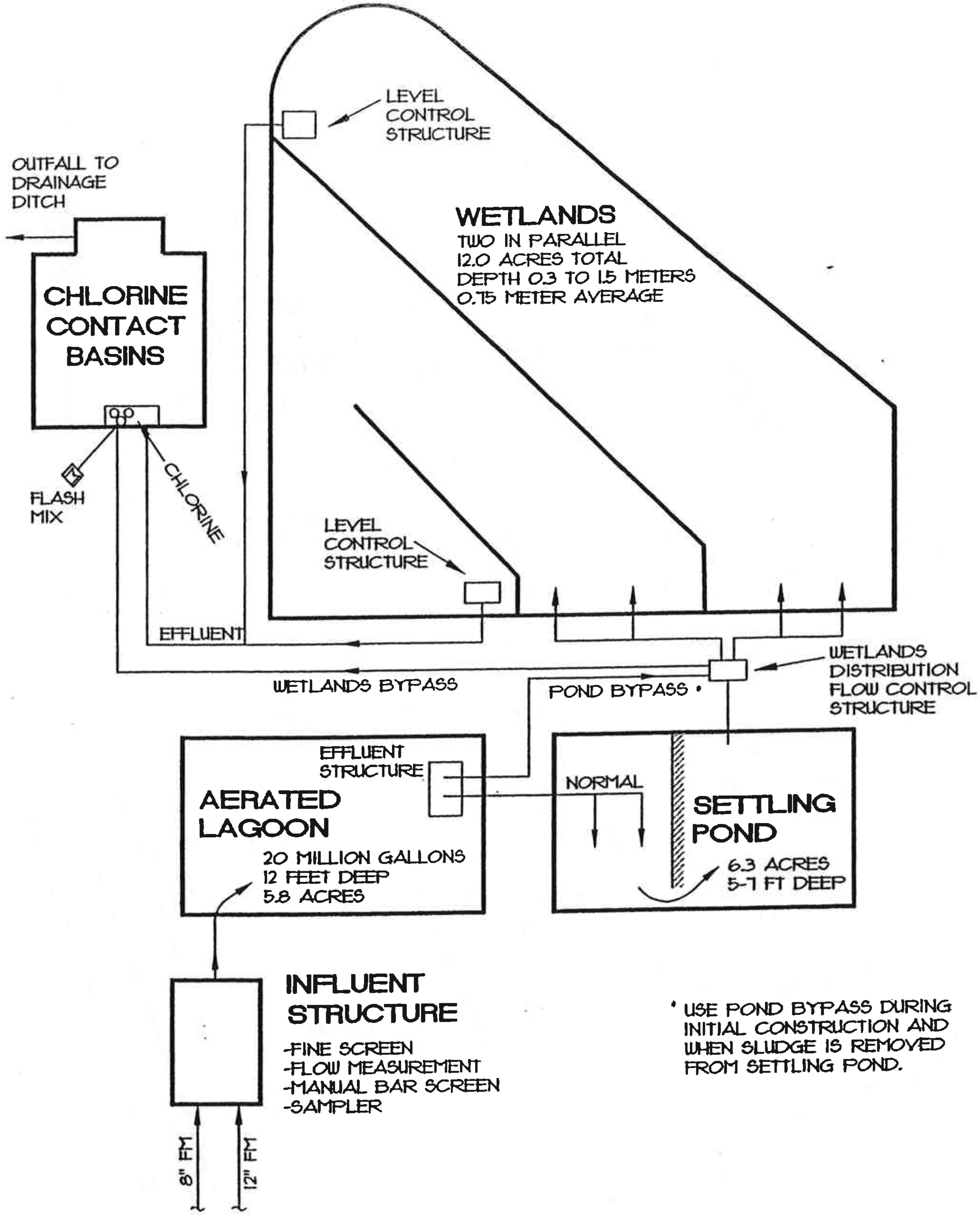


FIG. 1 - PROPOSED AERATED LAGOON/WETLANDS ALTERNATIVE NO. 1

SCALE: 1" = 200'

APRIL 17, 2001
HLB & ASSOCIATES, INC./
H. R. ESVELT ENGINEERING



* USE POND BYPASS DURING INITIAL CONSTRUCTION AND WHEN SLUDGE IS REMOVED FROM SETTLING POND.

FIG. 2 - AERATED LAGOON SCHEMATIC FLOW DIAGRAM ALTERNATIVE NO. 1

NOT TO SCALE

APRIL 17, 2001
HLB & ASSOCIATES, INC./
H. R. ESVELT ENGINEERING

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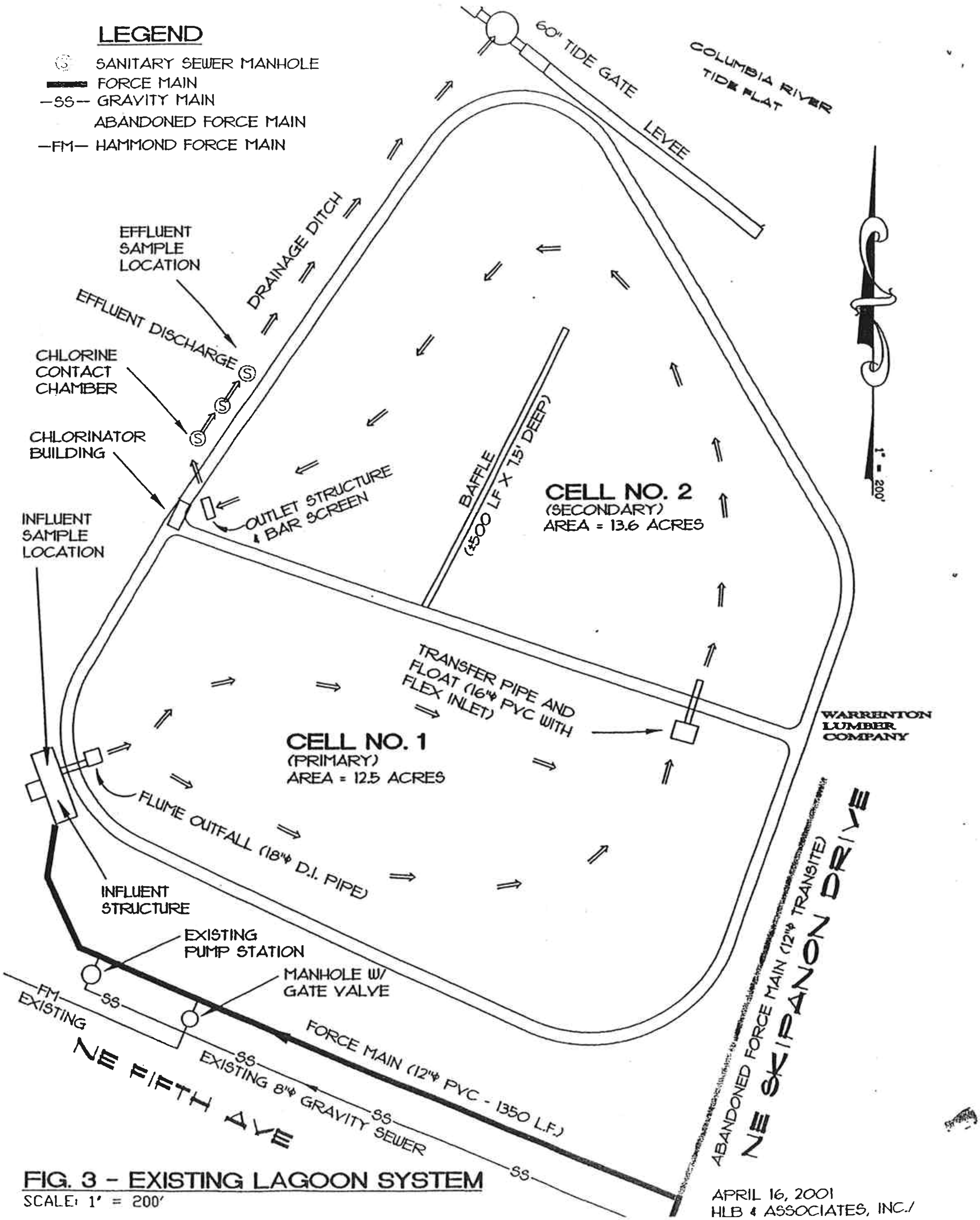


FIG. 3 - EXISTING LAGOON SYSTEM
SCALE: 1" = 200'

APRIL 16, 2001
HLB & ASSOCIATES, INC.

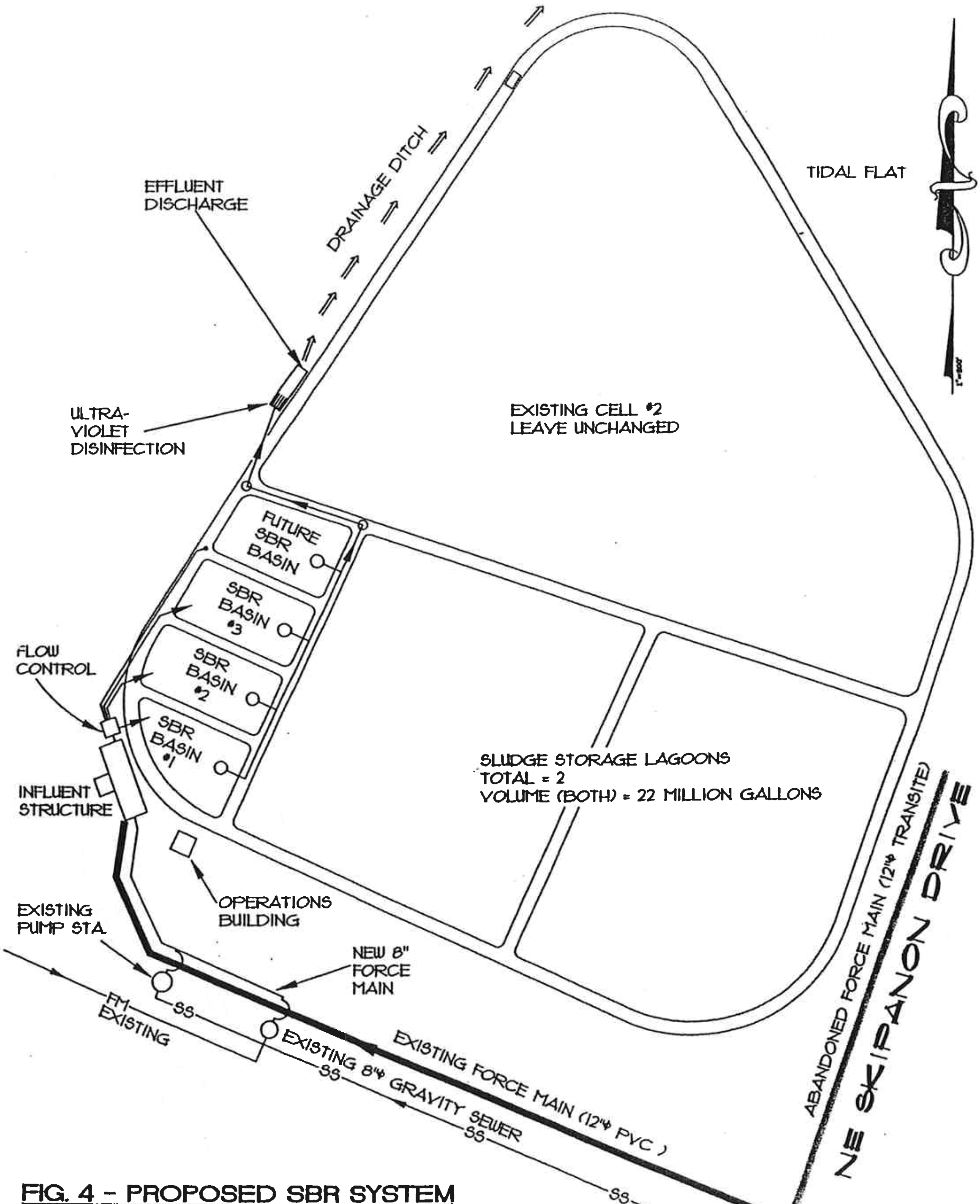


FIG. 4 - PROPOSED SBR SYSTEM
ALTERNATIVE NO. 2

SCALE: 1" = 200'

DRAWING: 3487-7300-06-04.DWG

APRIL 18, 2001
HLB & ASSOCIATES, INC./
H. R. ESVELT ENGINEERING

11

ATTACHMENT 3

WARRENTON WASTEWATER FACILITIES
Equalization/Filtration to Meet Current Effluent Waste Load Allocation with SBR Process – Exist Discharge

City of Warrenton, Oregon - Wastewater Treatment Plant
Equalization/Filtration to meet current effluent waste load allocation with SBR process - exist discharge

Process Component *Item Description*	*Estimated Quantity*	*Units*	*Unit Cost*	10/22/2002 *Amount with OH&P*
1. Effluent Equalization Basin - earthen diked				
dike construction	6,400	cy	16	102,400
excavation	5,200	cy	4	20,800
HDPE 80 mil liner	24,000	sf	1	24,000
concrete protection over liner	400	cy	160	64,000
Effluent wet well 96" dia, with valve vault	1	ls	35,000	35,000
filter feed pumps, 3 - 1 is standby	3	ea	13,000	39,000
variable speed drives for flow rate control	3	ea	4,200	12,600
installation of pumps and controls	15	%	51,600	7,800
piping, valves, flow meter, misc, installed	1	ls	78,000	78,000
Contractor Overhead	12	%	383,600	46,100
			Subtotal	**430,000**
2.Filter & filter/chemical feed building				
Filter2, installed	2	ea	210,000	420,000
building concrete foundation, base	54	cy	400	22,000
building for filter and chemical feed	1,600	sf	70	112,000
Piping, valves, misc, installed	1	ls	38,000	38,000
flash mix & flocc tank	1	ls	24,000	24,000
Electrical equipment, installed	1	ls	43,000	43,000
Contractor Overhead	12	%	659,000	80,000
			Subtotal	**739,000**
3. Chemical Storage/Feed Systems (alum, caustic, polymer)				
Alum - delivered & fed from in 55 gal drum	1	ls	19,000	19,000
caustic soda - 55 gal drums w/feed/spill	1	ls	21,000	21,000
Polymer feed system - liquid or dry	1	ea	55,000	55,000
ventilation for chemical storage	1	ls	8,000	8,000
building access - loading dock, roll up doors	1	ls	13,000	8,000
Contractor Overhead	12	%	111,000	13,400
			Subtotal	**125,000**
ESTIMATED COST TO ADD EFFLUENT EQUALIZATION & FILTRATION				
Total Construction from above			**Subtotal**	1,294,000
Tax, contingency, engineering, permitting	60	%	1,294,000	777,000
TOTAL ESTIMATED PROJECT COST				**2,071,000**

Annual Operation and Maintenance Cost for Effluent Filtration

electrical for pumping/aeration/filtration	$8,000
polymers, alum	91,000
additional labor, 1.5 hrs/day	19,700
Total annual additional cost	$118,700

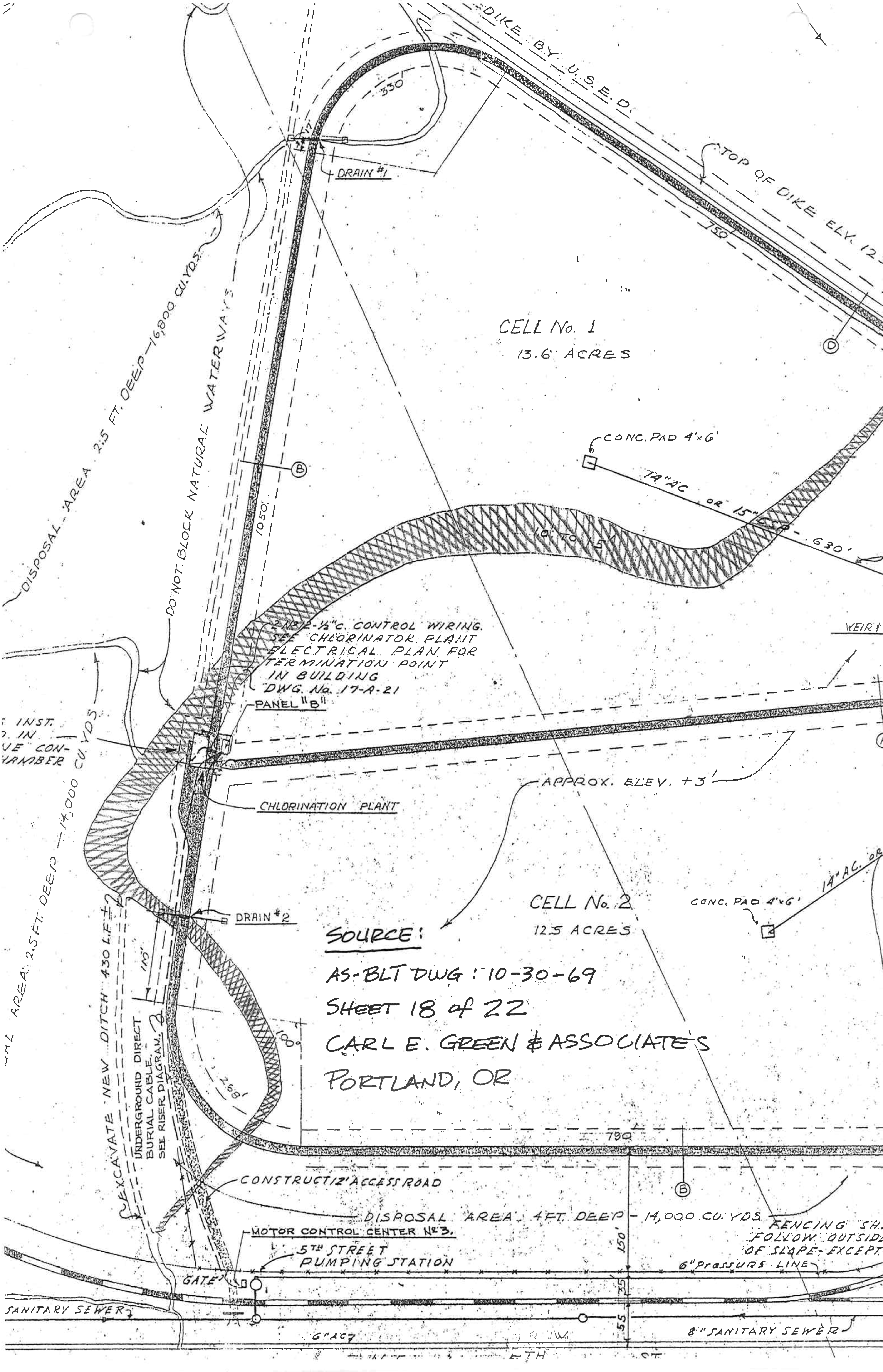
APPENDIX – D

(Supporting Information for History of Outfall Ditch & Tide Gate)

Aerial Photo #1

Date: 1953

Pre-Lagoon


DIKE BY U.S.E.D.
TOP OF DIKE ELV. 12±
750
330
DRAIN #1
CELL No. 1
13.6 ACRES
CONC. PAD 4'x6'
14"AC OR 15"
630'
10' TO 15'
1050'
DISPOSAL AREA 2.5 FT. DEEP—16,800 CU.YDS.
DO NOT BLOCK NATURAL WATERWAYS
2 No. 12-½"C. CONTROL WIRING. SEE CHLORINATOR PLANT ELECTRICAL PLAN FOR TERMINATION POINT IN BUILDING DWG. No. 17-A-21
PANEL "B"
WEIR
APPROX. ELEV. +3'
CHLORINATION PLANT
CELL No. 2
12.5 ACRES
CONC. PAD 4'x6'
14" AC. OR
DRAIN #2
AREA 2.5 FT. DEEP—14,000 CU.YDS.
EXCAVATE NEW DITCH 430 L.F.±
UNDERGROUND DIRECT BURIAL CABLE. SEE RISER DIAGRAM.
115'
100'
268'
790
CONSTRUCT 12' ACCESS ROAD
DISPOSAL AREA 4FT. DEEP—14,000 CU.YDS.
FENCING SHALL FOLLOW OUTSIDE OF SLOPE EXCEPT
MOTOR CONTROL CENTER No. 3.
5TH STREET PUMPING STATION
GATE
6" Pressure LINE
150'
35
55
SANITARY SEWER
8" SANITARY SEWER
6" AC
SOURCE:
AS-BLT DWG: 10-30-69
SHEET 18 of 22
CARL E. GREEN & ASSOCIATES
PORTLAND, OR

Aerial Photo #2

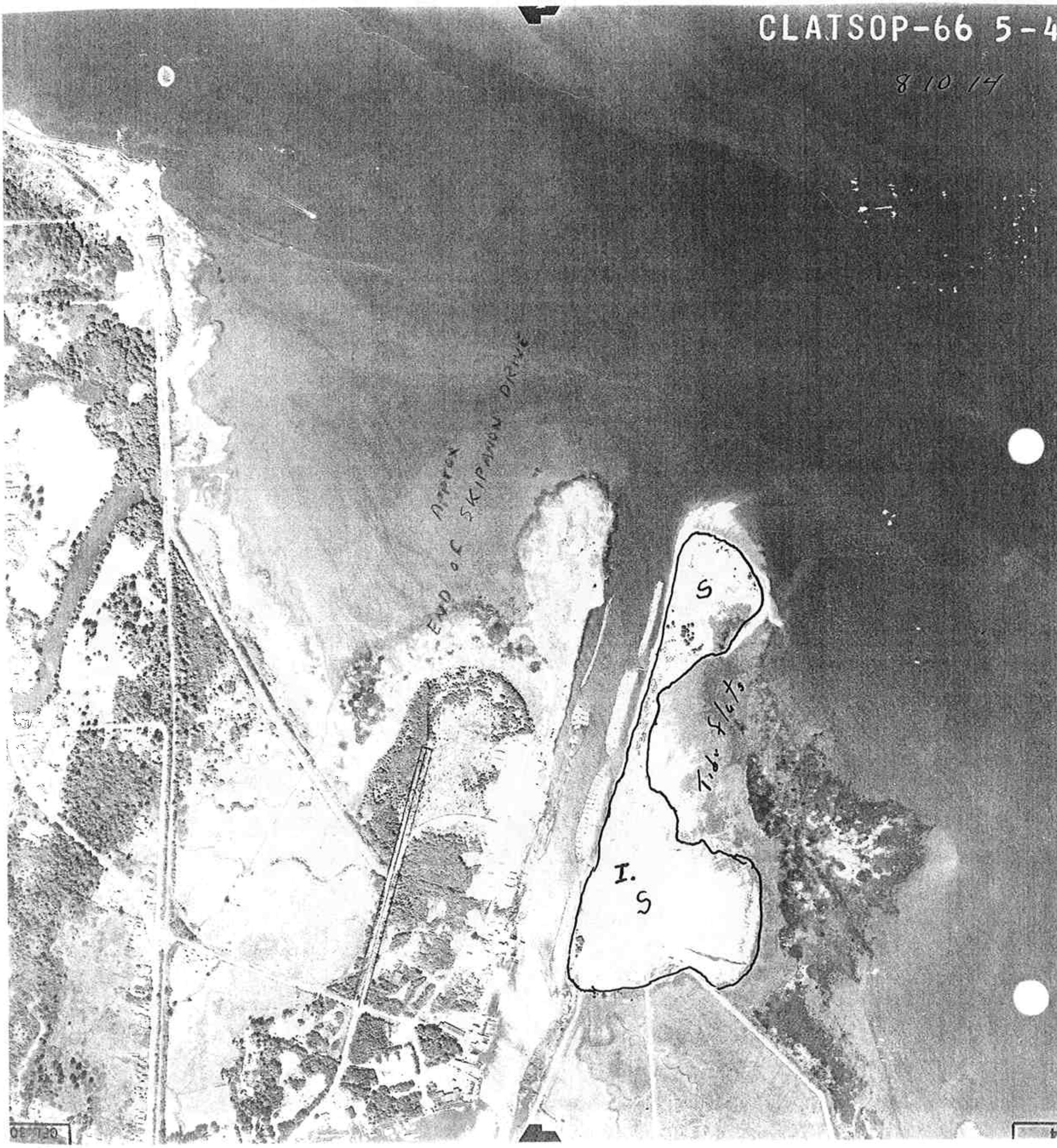
Date: 1958

Pre-Lagoon

Aerial Photo #3

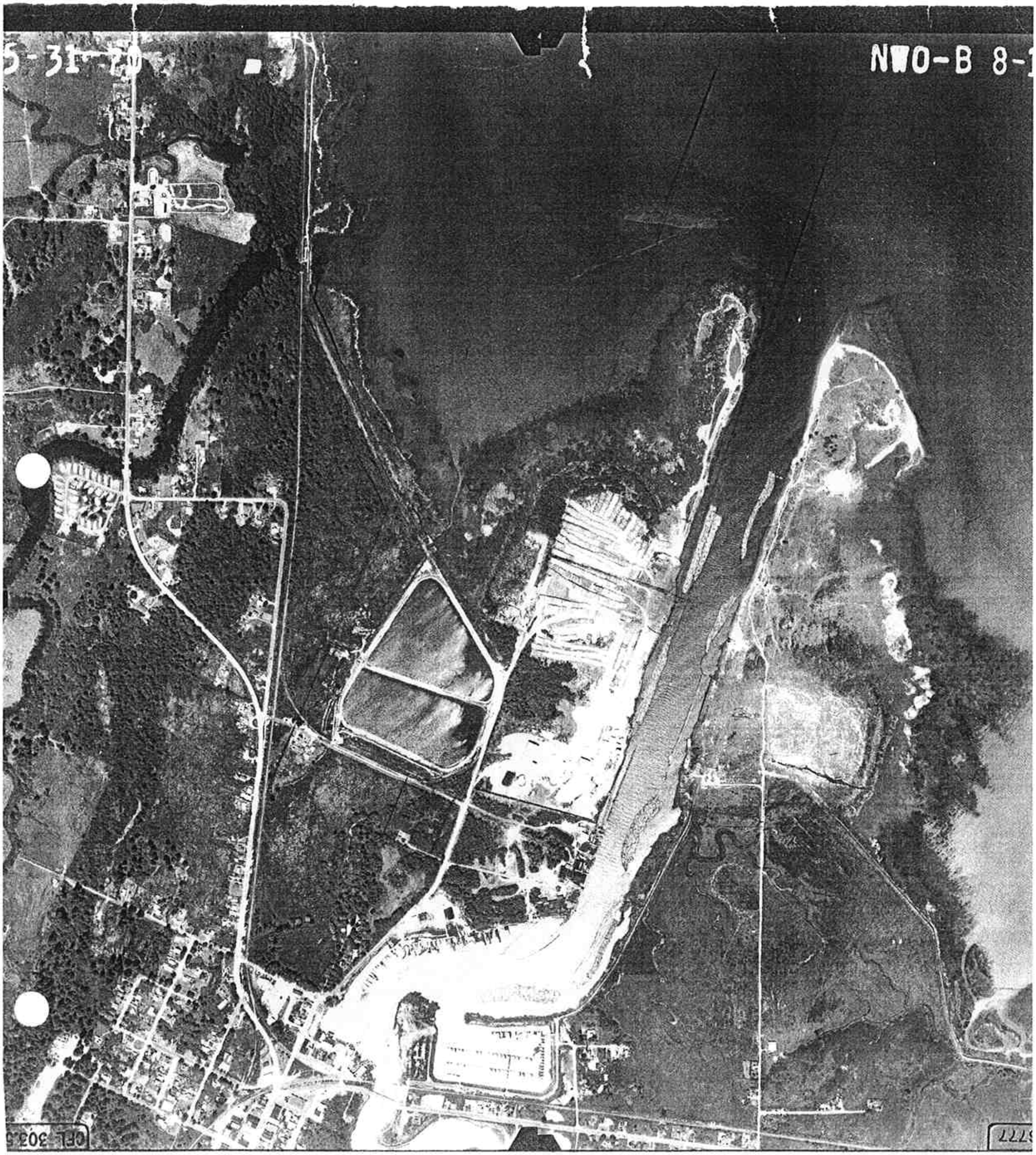
Date: 1966

Pre-Lagoon



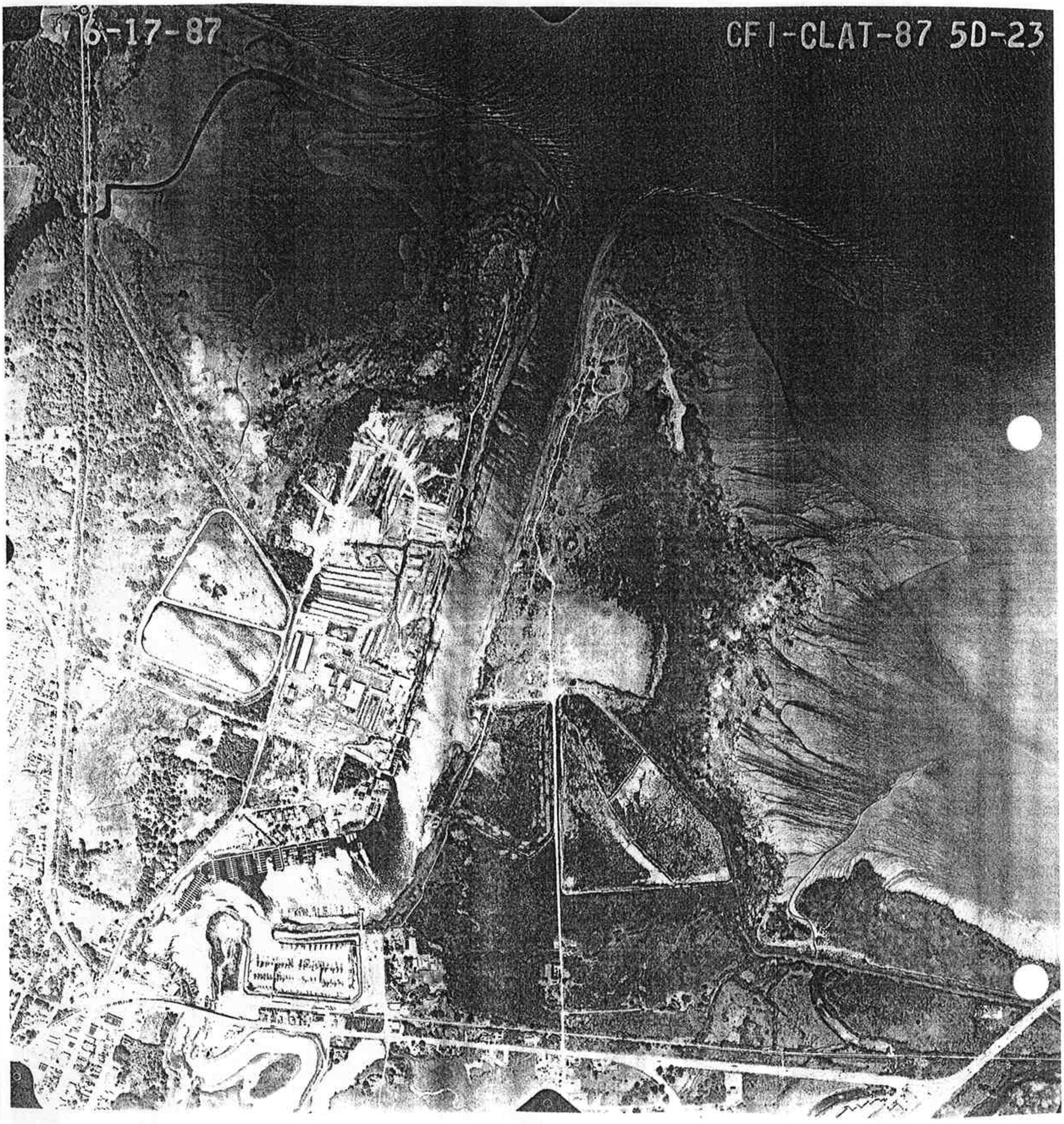
Aerial Photo #4

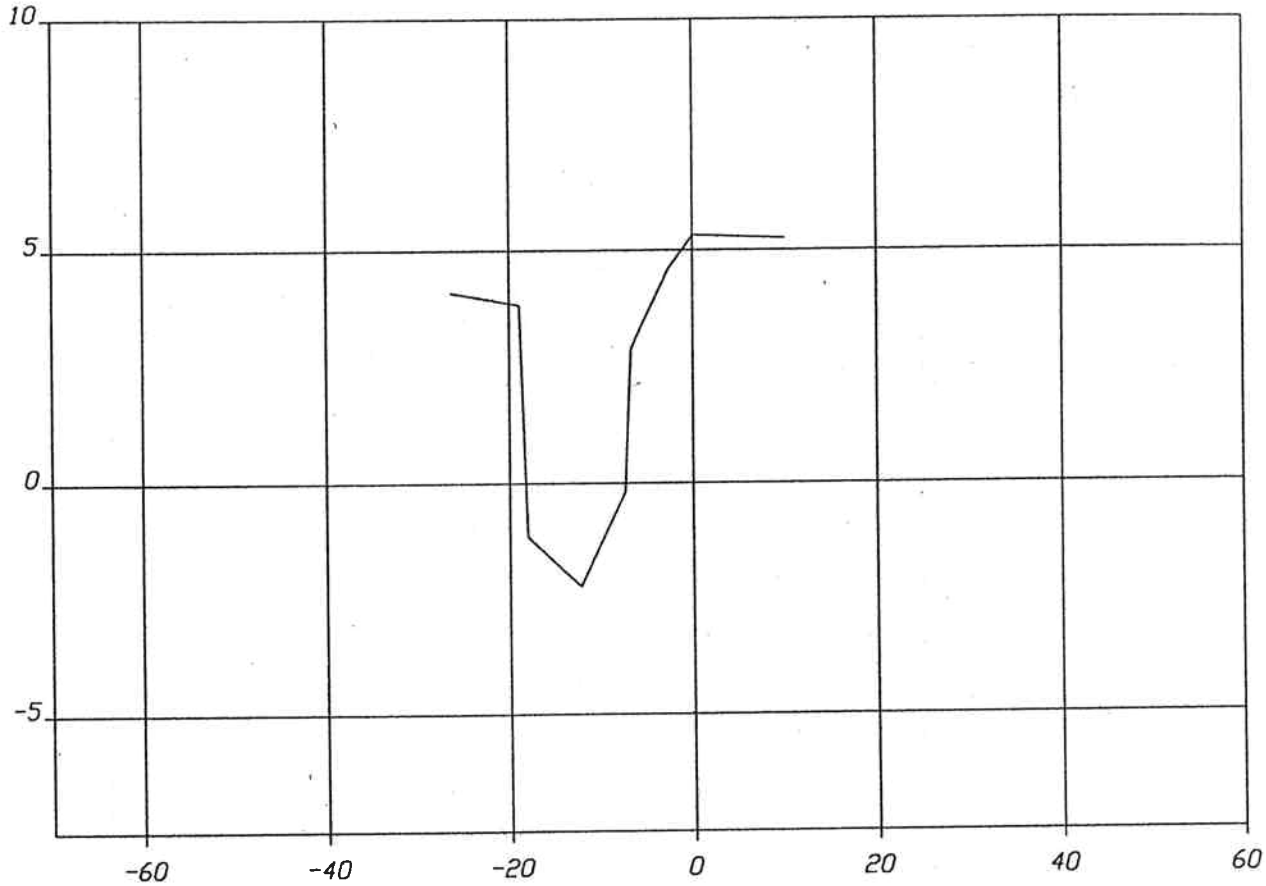
Date: 1970



Aerial Photo #5

Date: 1987





1+00

SCALE: HORIZ. 1" = 20'
VERT. 1" = 4'

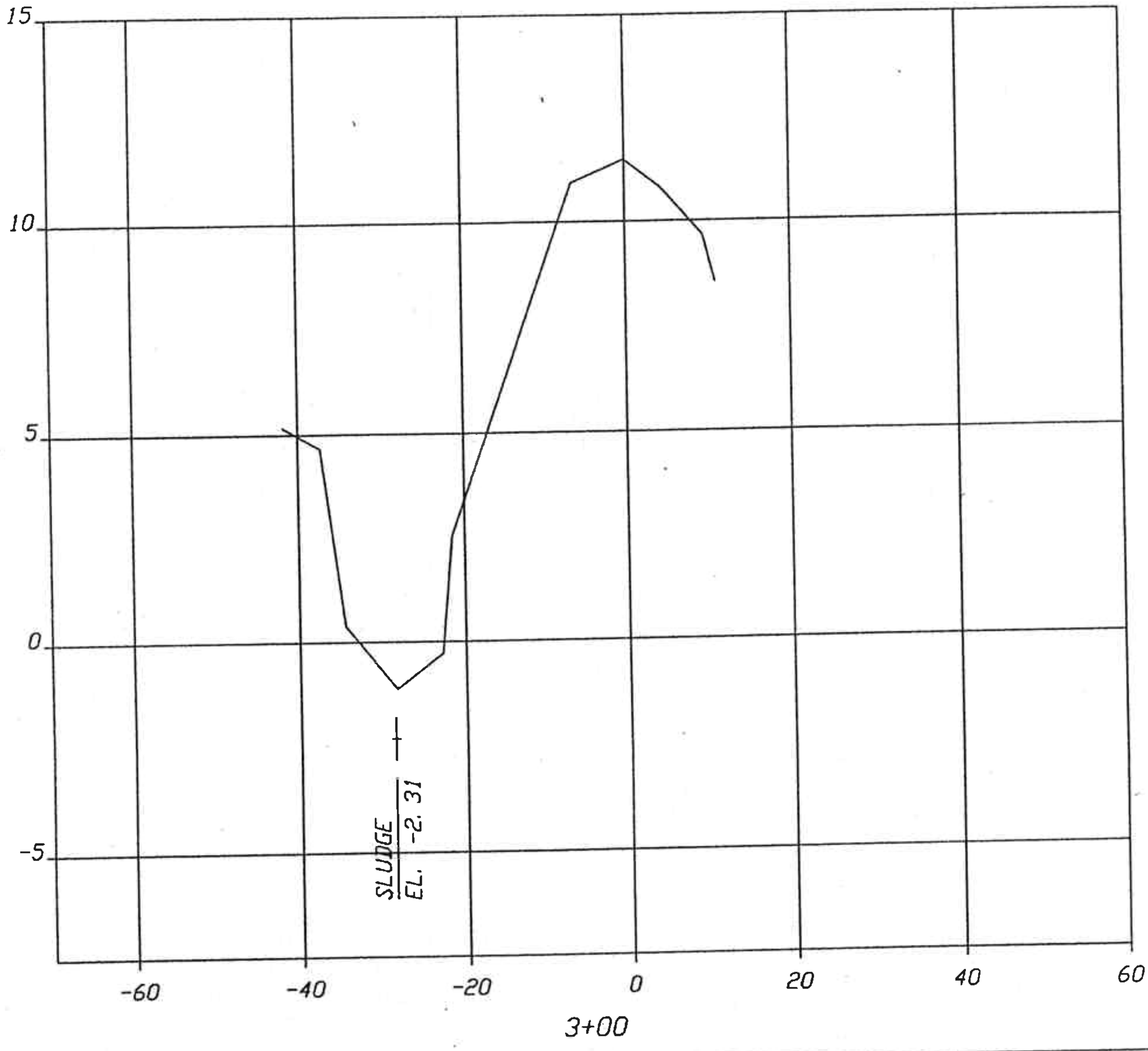
BASIS OF ELEVATIONS:
NATIONAL GEODETIC VERTICAL DATUM (NGVD) AS MEASURED FROM U. S. C. & G. S. BENCH MARK "NO. 2 1935" HAVING AN ELEVATION OF 8.23 FEET N. G. V. D. (PUBLISHED ELEVATION OF 11.83 FT. M. L. L. W.)

CROSS-SECTIONS OF OUTFALL DITCH
FROM THE CITY OF WARRENTON SEWER LAGOON
IN WARRENTON, OREGON

FOR: CITY OF WARRENTON
SHEET 4 OF 11

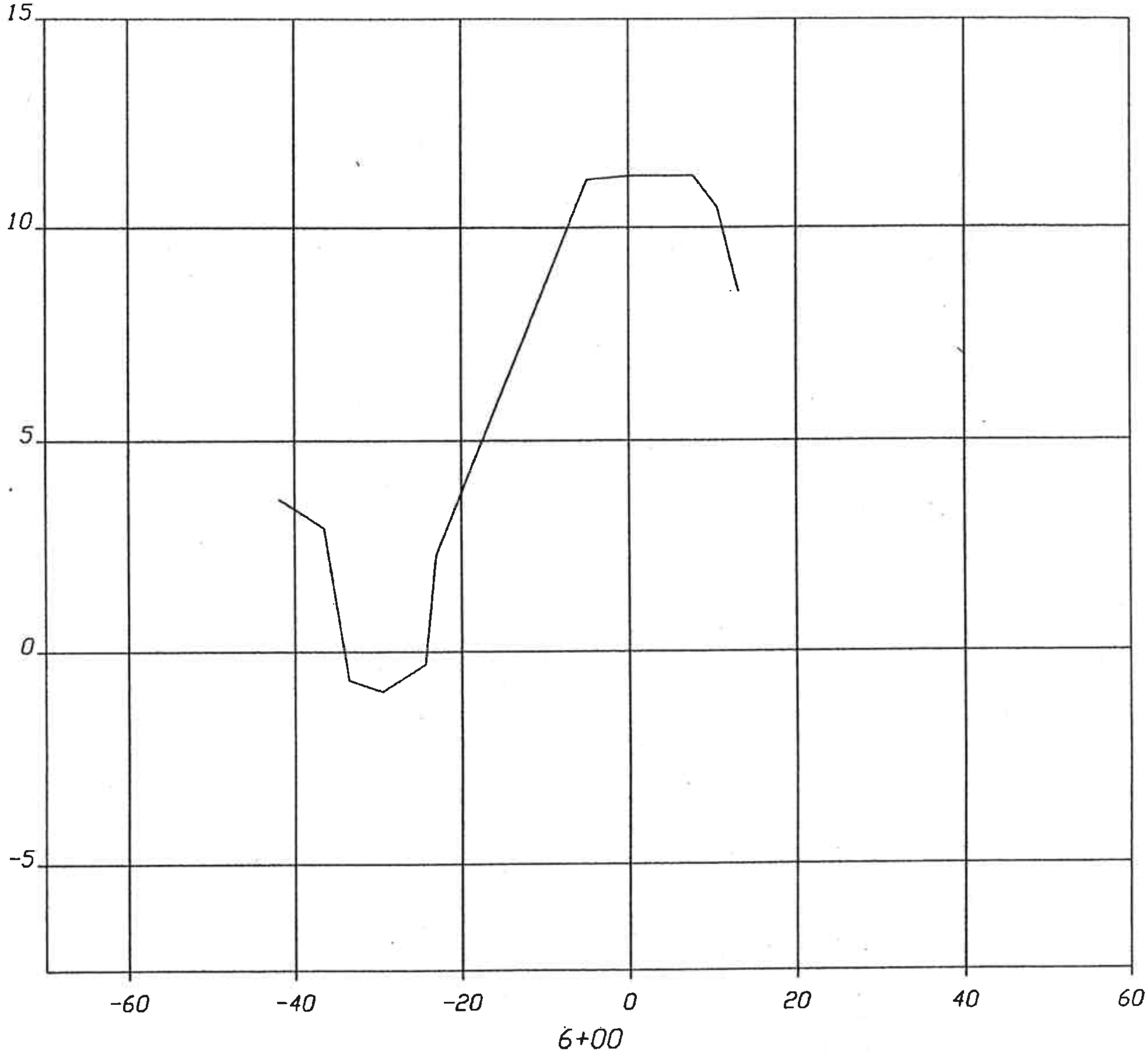
SURVEYOR: K. FOESTE, LS 849
DATE: JUNE & JULY 2002

CS – Figure 1



SCALE: HORIZ. 1" = 20' VERT. 1" = 4' BASIS OF ELEVATIONS: NATIONAL GEODETIC VERTICAL DATUM (NGVD) AS MEASURED FROM U. S. C. & G. S. BENCH MARK "NO. 2 1935" HAVING AN ELEVATION OF 8. 23 FEET N. G. V. D. (PUBLISHED ELEVATION OF 11. 83 FT. M. L. L. W.)	CROSS-SECTIONS OF OUTFALL DITCH FROM THE CITY OF WARRENTON SEWER LAGOON IN WARRENTON, OREGON FOR: CITY OF WARRENTON SHEET 4 OF 11 SURVEYOR: K. FOESTE, LS 849 DATE: JUNE & JULY 2002

CS – Figure 2



SCALE: HORIZ. 1" = 20'
VERT. 1" = 4'

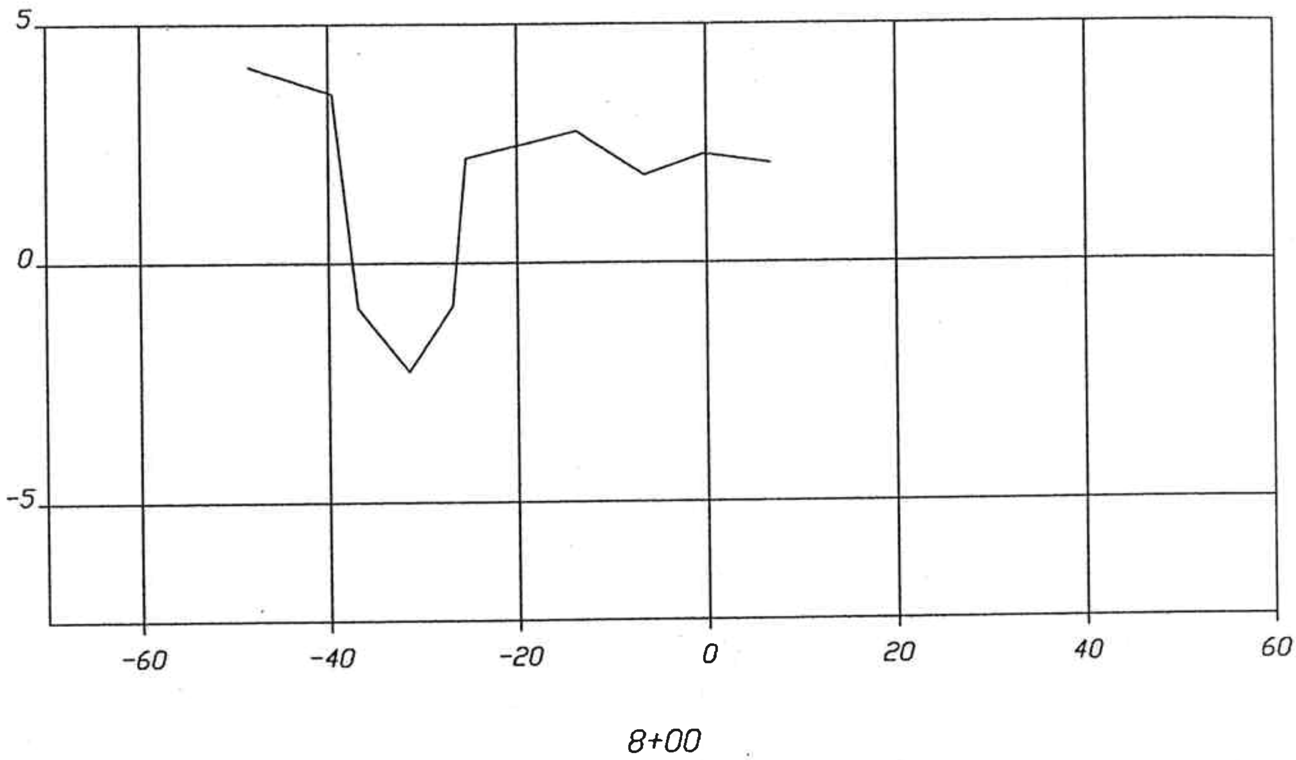
BASIS OF ELEVATIONS:
NATIONAL GEODETIC VERTICAL DATUM (NGVD) AS MEASURED FROM U.S.C. & G.S. BENCH MARK "NO. 2 1935" HAVING AN ELEVATION OF 8.23 FEET N.G.V.D. (PUBLISHED ELEVATION OF 11.83 FT. M.L.L.W.)

CROSS-SECTIONS OF OUTFALL DITCH
FROM THE CITY OF WARRENTON SEWER LAGOON
IN WARRENTON, OREGON

FOR: CITY OF WARRENTON
SHEET 5 OF 11

SURVEYOR: K. FOESTE, LS 849
DATE: JUNE & JULY 2002

CS – Figure 3



SCALE: HORIZ. 1" = 20' VERT. 1" = 4' BASIS OF ELEVATIONS: NATIONAL GEODETIC VERTICAL DATUM (NGVD) AS MEASURED FROM U. S. C. & G. S. BENCH MARK "NO. 2 1935" HAVING AN ELEVATION OF 8.23 FEET N. G. V. D. (PUBLISHED ELEVATION OF 11.83 FT. M. L. L. W.)	CROSS-SECTIONS OF OUTFALL DITCH FROM THE CITY OF WARRENTON SEWER LAGOON IN WARRENTON, OREGON FOR: CITY OF WARRENTON SHEET 6 OF 11 SURVEYOR: K. FOESTE, LS 849 DATE: JUNE & JULY 2002

CS – Figure 4

CREST

Columbia River Estuary Study Taskforce

750 Commercial Street, Room 205, Astoria, Oregon 97103
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September 4, 2002

To: Jeff Harrington PE
HLB & Associates, Inc.

From: Matthew Van Ess Matt V. C
CREST Director

Subject: City of Warrenton Wastewater Treatment NPDES Permit

At the request of the City of Warrenton, CREST (Columbia River Estuary Study Taskforce) has reviewed information regarding the NPDES discharge permit for the City's wastewater treatment facility.

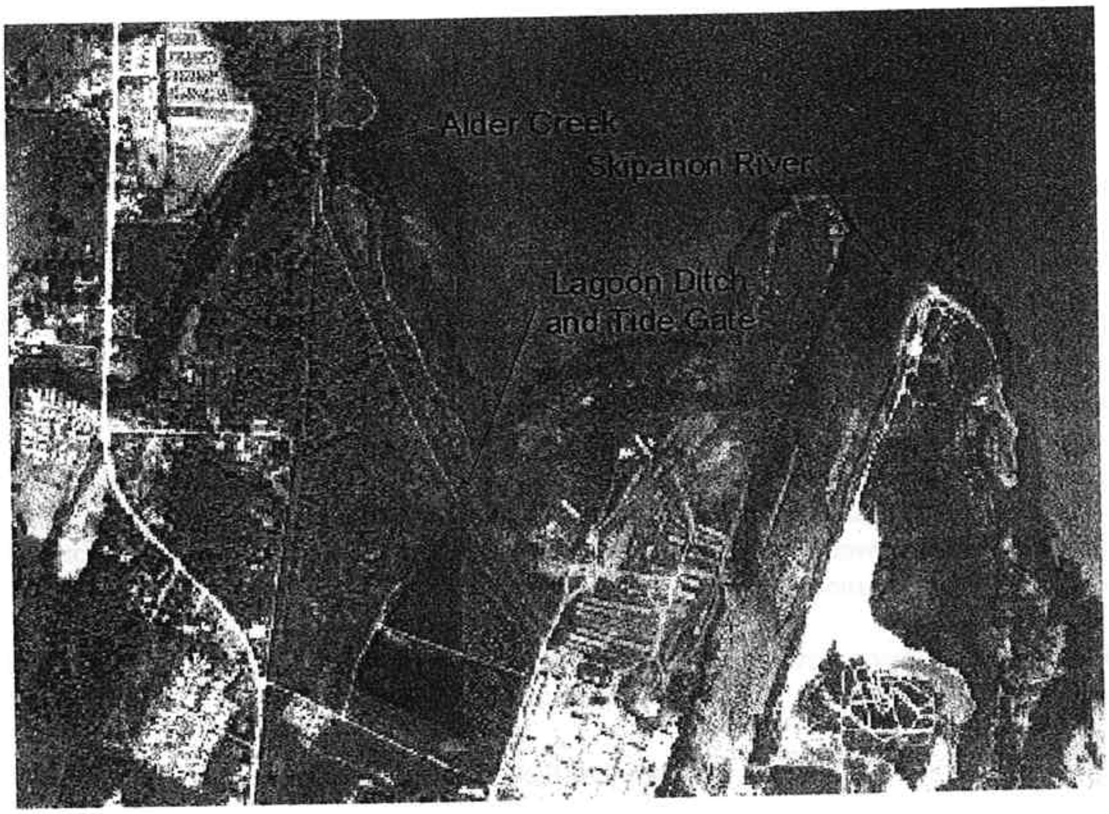
CREST has also made several site visits to the area to confirm and support findings presented here. Specifically, CREST reviewed the following:

- Whether it is likely that salmon use the City's wastewater outfall ditch; and
- Whether the outfall ditch has physical and biological characteristics that are different from a nearby stream.

In addition to site visits, the following sources were used to support the findings presented here:

- Skipanon Watershed Assessment (E&S Environmental Chemistry, 2000);
- Oregon Department of Fish and Wildlife Coho, Fall Chinook, and Winter Steelhead "Spawning, Rearing, and Migration Use" maps (ODFW, 2000); and
- City of Warrenton Local Wetlands Inventory (SRI Shapiro, 1993).

The graphic below shows the location of the Warrenton Wastewater Treatment facility and its proximity to nearby Alder Creek and the Skipanon River. The constructed wastewater outfall ditch flows out through a tidegate and into Alder Cove and the Columbia River Estuary.



Fish Use
The Skipanon Watershed Assessment and the ODFW Spawning, Rearing, and Migration Use maps do not show the wastewater treatment ditch or the adjacent wetlands as being utilized by salmonids or being salmonid habitat.

The Skipanon River is described in the Skipanon Watershed Assessment as habitat for Coho, Fall Chinook, and Winter Steelhead. Skipanon Watershed Council spawning surveys in the upper portions of the watershed demonstrate salmonid use in the Skipanon River.

Alder Creek is rearing habitat for juvenile Coho, Fall Chinook, and Winter Steelhead, but does not contain spawning habitat to support adult salmonids. This is supported by the Skipanon Watershed Assessment and field surveys conducted by the Skipanon Watershed

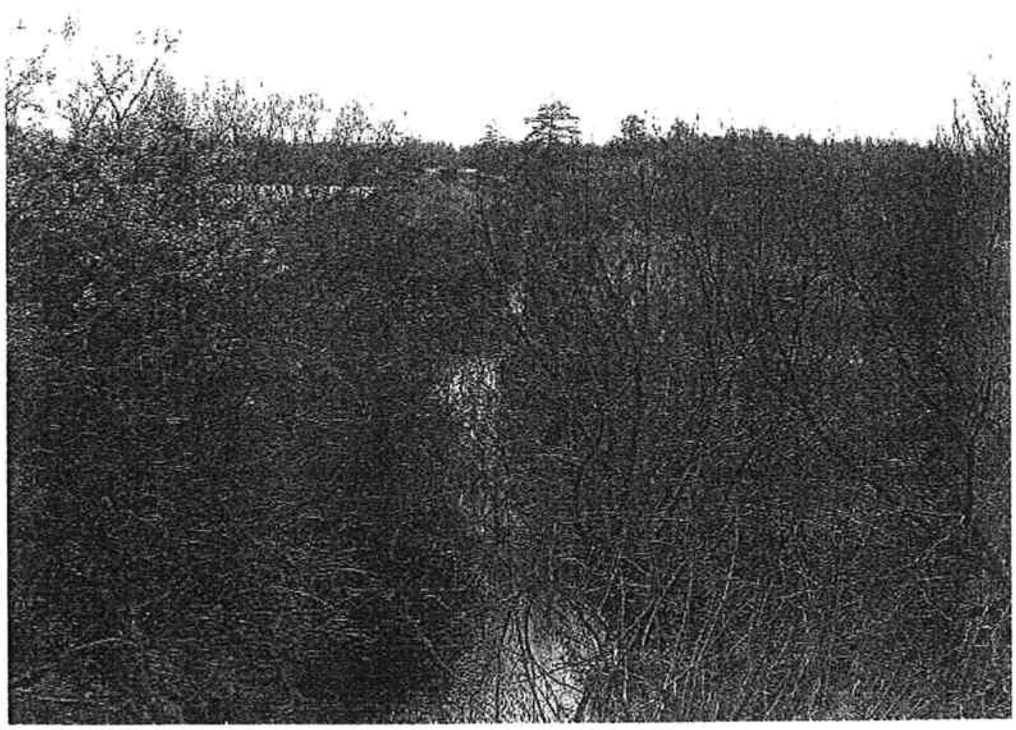
Council and Astoria High School. The mouth of the Alder Creek system is separated from the Columbia River Estuary by a "fish friendly" tidegate, which allows for juvenile salmon migration.

Field inspection and verification of the wastewater treatment ditch support the findings of ODFW and the Watershed Assessment. Although no actual fish surveys were physically taken, the CREST field inspections of the ditch noted that the water quality is visibly degraded (decreased water clarity and obvious odor) in comparison to nearby Skipanon River and Alder Creek and does not appear to support salmon. Additionally, the tidegate that separates the wastewater treatment ditch from Alder Cove is not designed or operated for fish passage. Therefore, CREST concludes that it is likely that salmon do not use this wastewater outfall ditch.

Physical and Biological Characteristics

Previous to diking, road construction and other development activities in the area the wetland areas adjacent to the wastewater treatment ditch and the tidegate were likely in the floodplain of the Columbia River and drained through Alder Creek or directly to Alder Cove. Although development activities have also affected the adjacent Skipanon River and Alder Creek, the basic stream channel structure is still intact.

The channel structure in the wastewater treatment ditch is very linear (lacking any sinuosity or meandering features likely to be present in streams in the Skipanon watershed) and appears to be a constructed drainage ditch used to drain the wastewater treatment facility and the adjacent wetlands, immediately to the west.



The photo above is of the wastewater treatment ditch taken looking south towards sewage lagoons. Photo demonstrates the linear structure of the ditch as well as its shallow depth in comparison to the Skipanon River or Alder Creek.

The wetland area that drains through the tidegate forms a triangle and is bordered by dikes to the west and north, by the treatment facility to the east, and by a road to the south. The wetland is described in the City of Warrenton Local Wetlands Inventory and attribute information for the wetland is included below (SRI Shapiro, 1993, Wetland Delineation Data Forms 5-16-1a, 5-16-1b, and 3-16-1c).

Field inspection and verification of the wastewater treatment outfall ditch indicates that through alterations in water quality and physical structure, the biological characteristics are remarkably different from the Skipanon River and Alder Creek. Specific biological differences include water quality (odor, water clarity) and physical structure (shallow straightened ditch).

If you have any questions regarding CREST's assessment of fish use or the physical and biological characteristics of the City of Warrenton's wastewater treatment facility outfall ditch, please do not hesitate to contact me at 503-325-0435.

Wetland Delineation Data Form

SRI Scientific Resources, Inc.

Routine Onsite Method

Applicant City of Warrenton	Project # 91002	Date 6-17-92
County and State Clatsop; Oregon	Legal Description Township 8N Range 10W Section 16	Sample Site # S-16-1a Investigator (s) JVS/DRS

Soils

Mapped Series and Phase Coquille Variant silt loam, 0-1 slopes		On Hydric Soils List [ ] No [X] Yes
Drainage Class poorly drained	Matrix Color 10YR 4/2	Mottles [ ] No [X] Yes Color 7.5YR 4/6
Other Indicators		
Comments		
		Hydric Soils Criteria [ ] Not Met [X] Met

Hydrology

Inundated [X] No [ ] Yes Depth (in.)	Saturated Soils [X] No [ ] Yes Depth (in.) >18"	Depth to Water Table >18"
Active Oxidized Rhizospheres Present [ ] No [X] Yes	Comments: strong ORs	
		Wetland Hydrology Criteria [ ] Not Met [X] Met

Vegetation

Dominant Species	FWS Indicator Status	% Cover Within Stratum	% Overall Cover of Stratum
Trees			
Saplings/Shrubs			
Herbs Juncus effusus	FACW+	25	100
Holcus lanatus	FAC	20	
Carex obnupta	OBL	35	
Woody Vines			

% of Dominant Species (those > 20% cover) that are OBL, FACW and/or FAC: 100%

Do Dominant OBL & FACW Exceed Dominant FACU & UPL? Y — N — NA

Comments:

Hydrophytic Vegetation Criteria [ ] Not Met [X] Met

Determination: [ ] Non-Wetland [X] Wetland

Comments:

WETLAND DELINEATION DATA FORM

SRI Scientific Resources, Inc.

Routine Onsite Method

Applicant: CITY OF WARRENTON
County: CLATSOP
Investigator: JVS/DRS

Project #: 91002-092 Date: 11/17/92
State: OR Township: 8N Range: 10W Section: 16
Sample Site: S-16-1B

Soils

Mapped Series and Phase: COQUILLE VARIANT SILT LOAM, 0-1% SLOPES
On Hydric Soils List: YES
Drainage Class: POORLY DRAINED
Mottles: YES

Matrix Color: 10YR 3/2
Mottle Color: 7.5YR 4/6
Hydric Soil Criteria met: YES

Comment:

Hydrology

Inundated: NO Depth: " Saturated Soils: YES Depth to Water Table:
Active Oxidized Rhizospheres Present: NO
Wetland Hydrology Criteria met: YES
Comment:

Vegetation

Type	Dominant Species	FWS Status	Stratum	Overall
Sapling/Shrub	*LONICERA INVOLUCRATA*	FAC	20%	
Sapling/Shrub	*RUBUS SPECTABILIS*	FAC	35%	
Sapling/Shrub	*SALIX SP.*	FAC	45%	70%
Herb	*CAREX OBNUPTA*	OBL	80%	
Herb	*RANUNCULUS REPENS*	FACW	20%	20%
Woody Vine	*RUBUS URSINUS*	NI	100%	10%

Percentage of dominant (>= 20%) species that are FAC, FACW or OBL: 83%
Hydrophytic Vegetation Criteria met: YES

Comment:

Determination: **Wetland**

Comment:

WETLAND DELINEATION DATA FORM

SRI Scientific Resources, Inc.

Routine Onsite Method

Applicant: CITY OF WARRENTON
County: CLATSOP
Investigator: JVS/DRS

State: OR

Project #: 91002-093 Date: 11/17/92
Township: 8N Range: 10W Section: 16
Sample Site: S-16-1C

Soils

Mapped Series and Phase: COQUILLE VARIANT SILT LOAM, 0-1% SLOPES
On Hydric Soils List: YES
Drainage Class: POORLY DRAINED
Mottles: NO

Matrix Color: 10YR 3/3-3/4

Hydric Soil Criteria met: NO

Comment:

Hydrology

Inundated: NO Depth: " Saturated Soils: NO Depth to Water Table: >18
Active Oxidized Rhizospheres Present: NO
Wetland Hydrology Criteria met: NO
Comment:

Vegetation

Type	Dominant Species	FWS Status	Stratum	Overall
Sapling/Shrub	*MALUS FUSCA*	FAC+	40%	
Sapling/Shrub	*RUBUS SPECTABILIS*	FAC	60%	35%
Herb	*CAREX OBNUPTA*	OBL	40%	
Herb	*POLYSTICHUM MUNITUM*	UPL	60%	20%
Woody Vine	*HEDERA HELIX*	UPL	100%	45%

Percentage of dominant (>= 20%) species that are FAC, FACW or OBL: 60%
Hydrophytic Vegetation Criteria met: YES

Comment:

Determination: **Non-Wetland**

Comment:

APPENDIX – E
(Water & Sewer Rate Study)

City of Warrenton
Water & Sewer Rate Study

Cost of Service and Rate Design Findings

February 6, 2002
City Commission Session #2

Ed Cebron, Vice-President
FCS Group, Inc.
8201 164th Ave NE, Suite 300
Redmond, WA 98052
(425) 867-1802

Agenda

- Recap of revenue needs
- Description of cost of service and rate design work
- Water cost of service findings
- Water rate structure alternatives
- Sewer cost of service findings
- Sewer rate structure alternatives

Revenue Needs

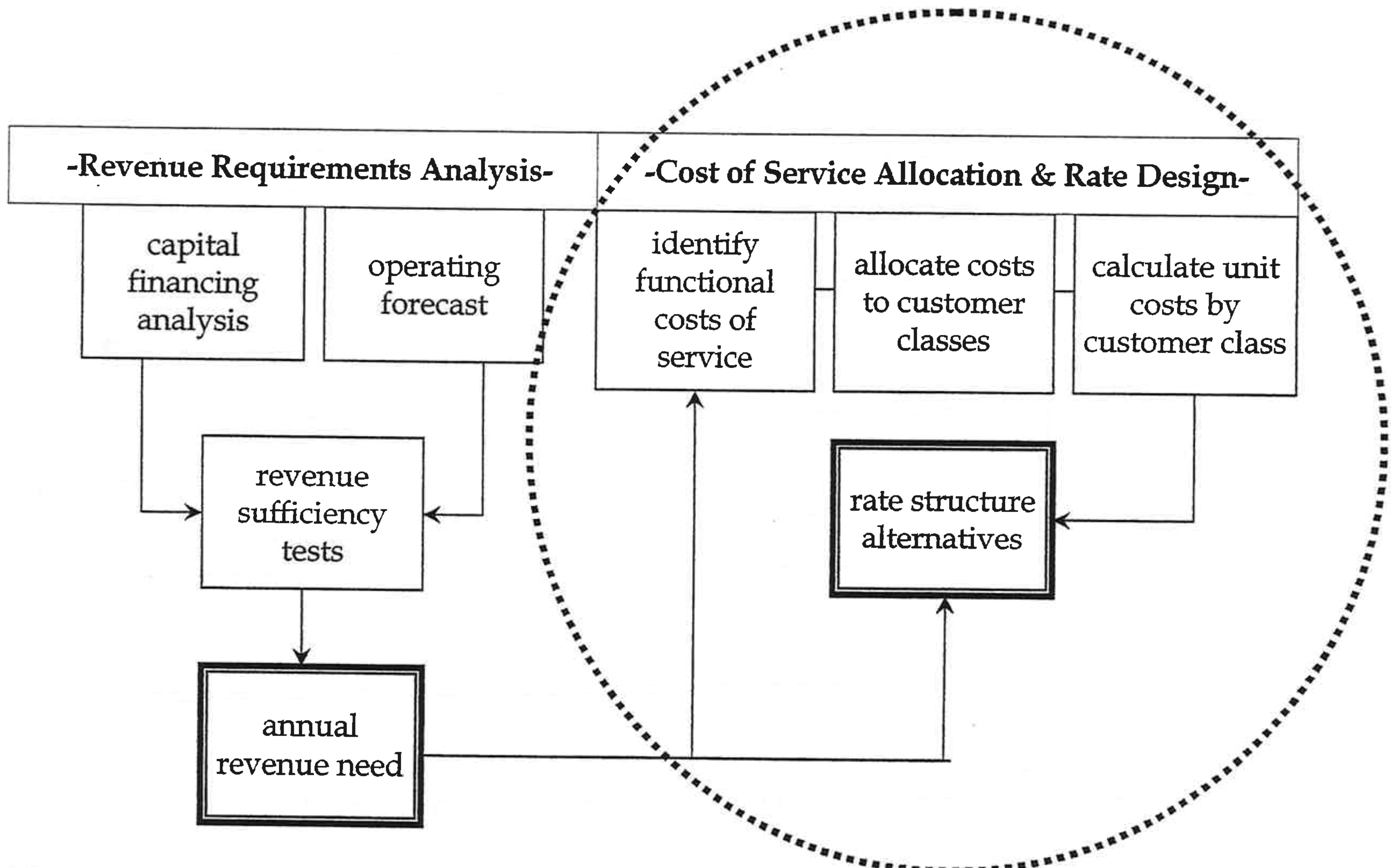
- Revenue in both utilities needs to be increased immediately to continue operations, repay debt, and comply with contractual obligations
  - Water: 50%
  - Sewer: over 130%
- Revenue increases assume April 2002 implementation and carry the utilities through June 2003
- Substantial annual increases are forecasted in both utilities through 2005, caused primarily by anticipated capital improvements

Forecasted Revenue Increases

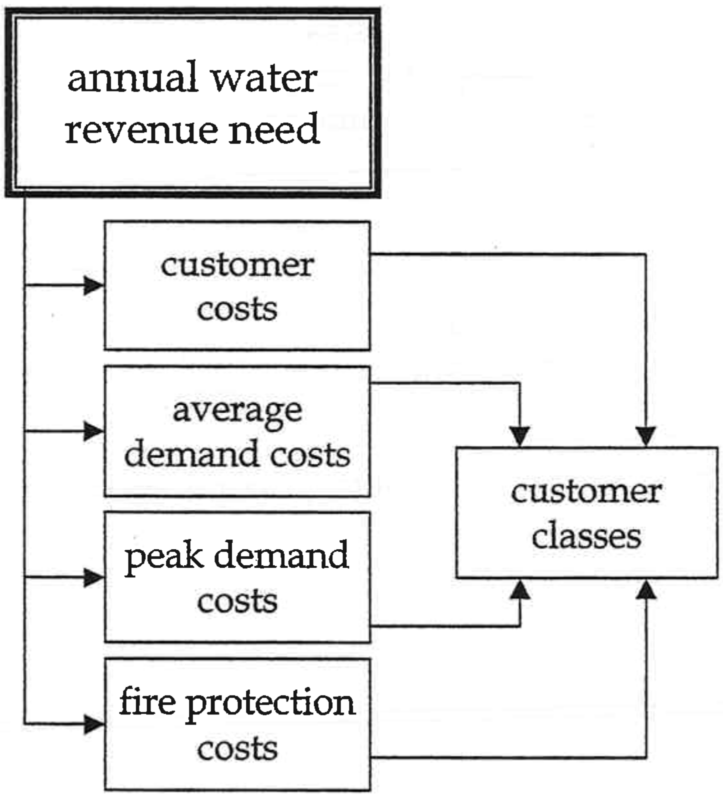
Implementation	Water Revenue Increase	Water Bill*	Sewer Revenue Increase	Sewer Bill*
Current		$16.00		$13.00
April 2002	50.00%	$24.00	130.77%	$30.00
July 2003	16.67%	$28.00	73.33%	$52.00
July 2004	17.85%	$33.00	5.77%	$55.00
July 2005	18.18%	$39.00	1.82%	$56.00
July 2006	0.00%	$39.00	0.00%	$56.00
July 2007	0.00%	$39.00	0.00%	$56.00
July 2008	0.00%	$39.00	0.00%	$56.00
July 2009	0.00%	$39.00	0.00%	$56.00
July 2010	0.00%	$39.00	0.00%	$56.00
July 2011	0.00%	$39.00	0.00%	$56.00

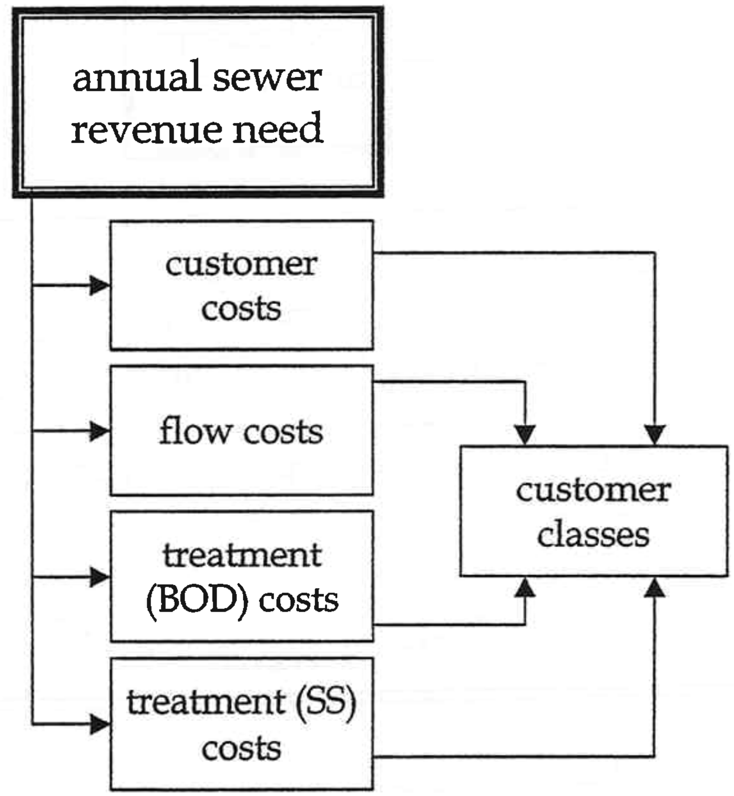
* In-City Single Family Residence per month under the current rate structures.

Cost of Service & Rate Design Steps

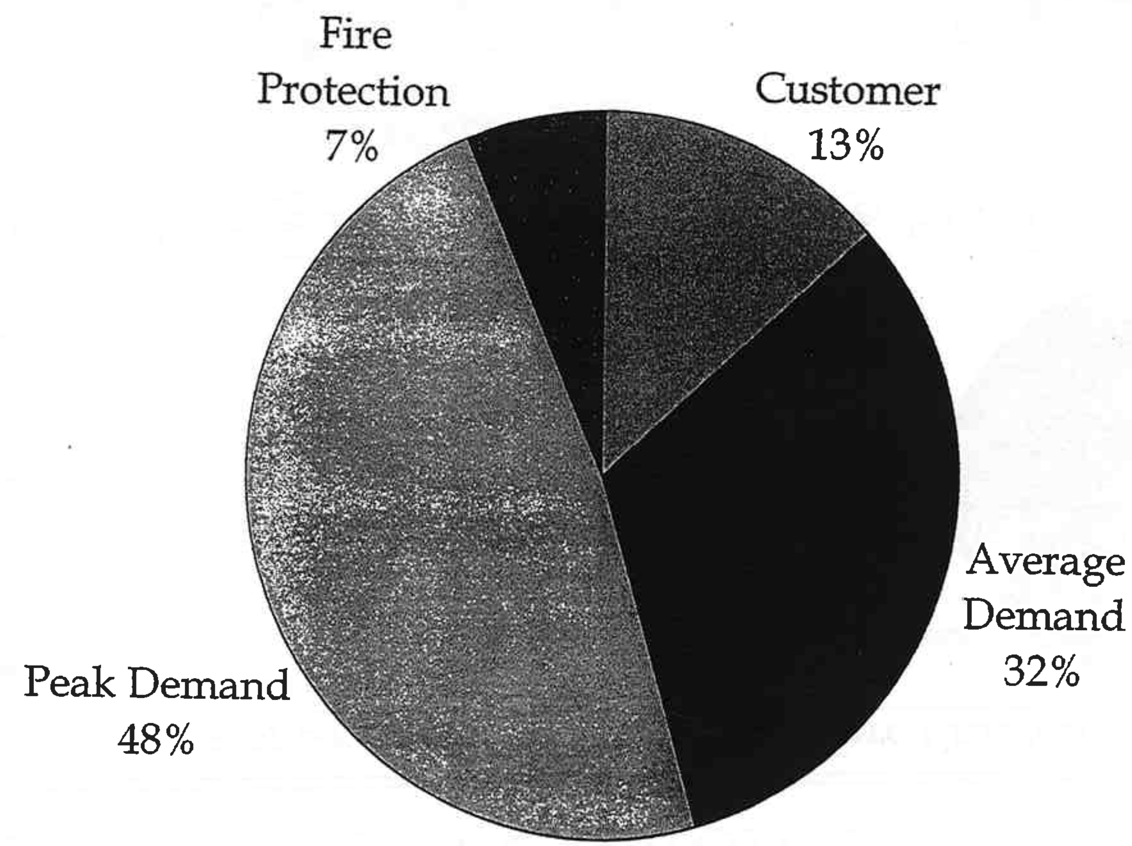


Cost of Service Allocations

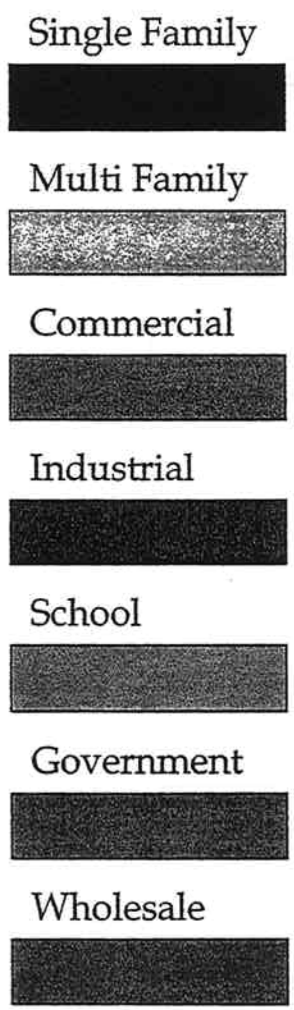




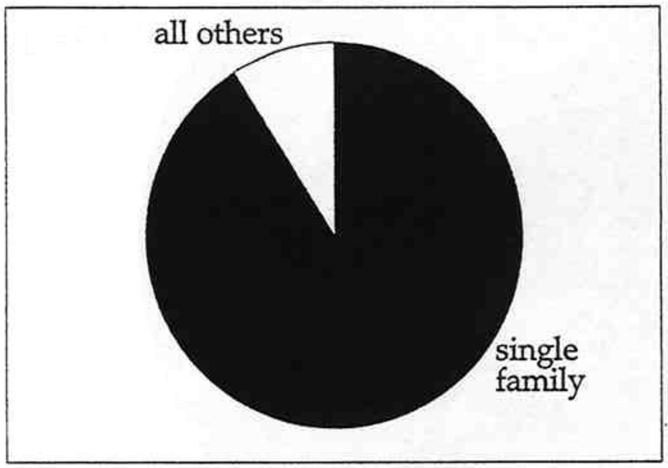
Water Functional Costs



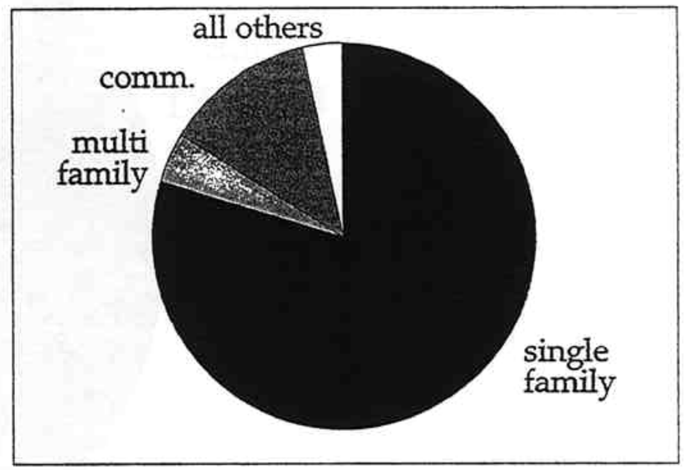
Functional Water Costs Allocated to Customer Classes



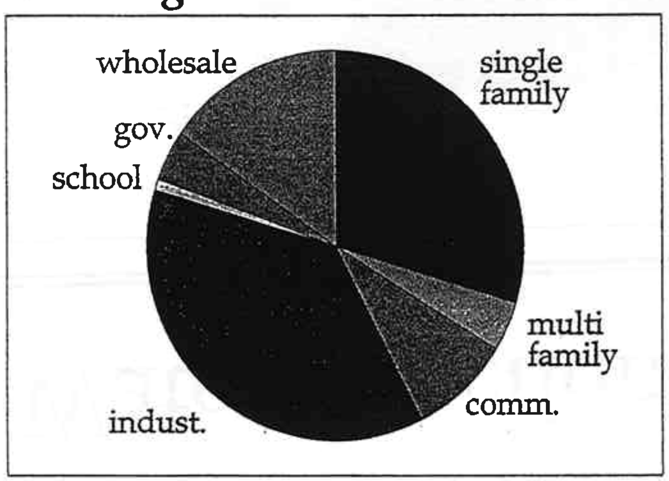
Customer Costs:



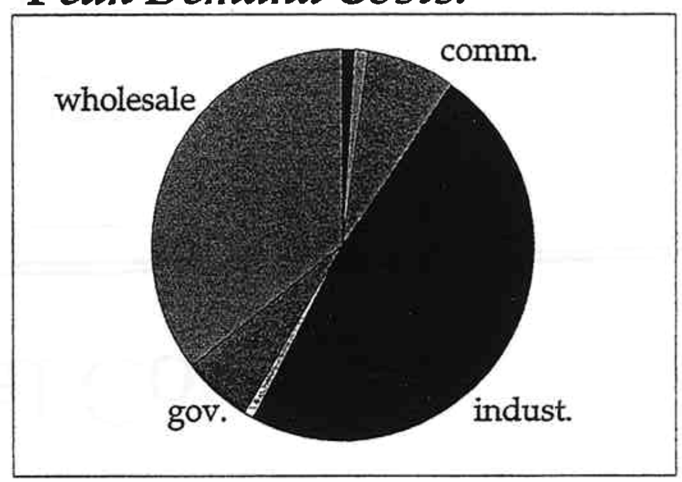
Fire Protection Costs:



Average Demand Costs:

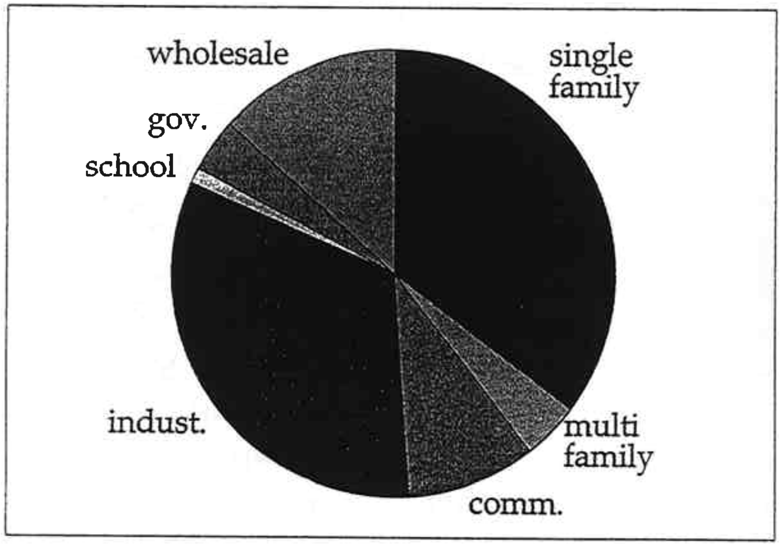


Peak Demand Costs:

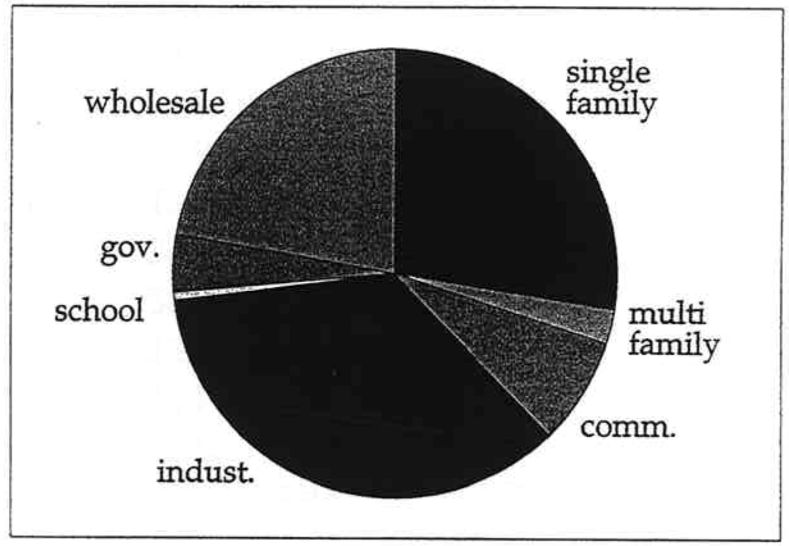


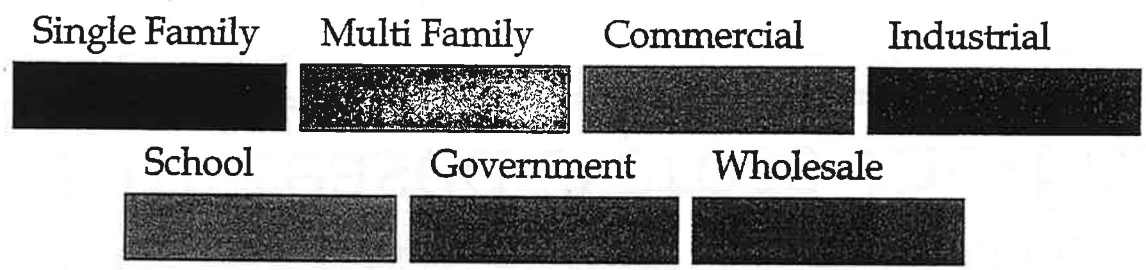
Water Cost Burden by Customer Class under Recommended Rates

Current Rates:



Recommended Rates:





Current Water Rate Structure and Rates Increased Across-the-Board

Current Rates with no Increase: *(1)*

Fixed Charge for All Classes:	
Unmetered:	$16.00
3/4″ Meter:	$5.80
1″ Meter:	$9.90
1.5″ Meter:	$19.10
2″ Meter:	$30.70
3″ Meter:	$58.00
4″ Meter:	$96.90
6″ Meter:	$193.10
8″ Meter:	$309.10
10″ Meter:	$444.90
Declining Volume Charges (2):	
Single Family:	$2.04, 1.79
Multi Family:	$2.15, 1.90
Commercial:	$2.21, 1.96
Industrial:	$2.26, 2.01
School:	$2.15, 1.90
Government:	$2.20, 1.95
Wholesale:	$2.20, 1.95

Current Rates Increased to Achieve Revenue Need: *(1)*

Fixed Charge for All Classes:	
Unmetered:	$24.00
3/4″ Meter:	$8.70
1″ Meter:	$14.85
1.5″ Meter:	$28.65
2″ Meter:	$46.05
3″ Meter:	$87.00
4″ Meter:	$145.35
6″ Meter:	$289.65
8″ Meter:	$463.65
10″ Meter:	$667.35
Declining Volume Charges (2):	
Single Family:	$3.06, 2.69
Multi Family:	$3.23, 2.85
Commercial:	$3.32, 2.94
Industrial:	$3.39, 3.02
School:	$3.23, 2.85
Government:	$3.30, 2.93
Wholesale:	$3.30, 2.93

(1) Outside-City customers pay 1.5 times these rates.

(2) 0-25,000 gallons; 25,000 and over

Water Rate Structure A

- Refines rates to reflect cost of service findings and the needed revenue increase
- Ties all customers' bills to volume used by applying a single rate charged per thousand gallons of consumption
- Continues the use of uniform fixed charges for administrative ease
- Outside-City customers continue paying 1.5 times these rates

Fixed Charge for All Classes:	
3/4" Meter:	$10.00
1" Meter:	$10.52
1.5" Meter:	$11.80
2" Meter:	$13.35
3" Meter:	$17.47
4" Meter:	$22.11
6" Meter:	$34.98
8" Meter:	$50.44
10" Meter:	$68.47
Volume Charge per thousand gallons:	
Single Family:	$1.69
Multi Family:	$1.73
Commercial:	$2.86
Industrial:	$3.30
School:	$2.83
Government:	$3.63
Wholesale:	$5.02

Water Rate Structure B
Recommended

- Refines rates to reflect cost of service findings and the needed revenue increase
- Incorporates a block of usage in every fixed charge (4,000 gallons)
- Volume rate is charged only on consumption over 4,000 gallons per month
- Outside-City customers continue paying 1.5 times these rates

Fixed Charge for All Classes:	
3/4″ Meter:	$18.00
1″ Meter:	$20.85
1.5″ Meter:	$27.92
2″ Meter:	$36.43
3″ Meter:	$59.17
4″ Meter:	$84.71
6″ Meter:	$155.64
8″ Meter:	$240.79
10″ Meter:	$340.16
Volume Charge per 1,000 gal. over 4:	
Single Family:	$1.15
Multi Family:	$1.49
Commercial:	$2.74
Industrial:	$3.27
School:	$2.24
Government:	$3.46
Wholesale:	$4.99

Water Rate Structure B-2

- Contains all attributes of the recommended rate structure (Alt. B)
- Allocates peak demand costs to the classes based on total consumption rather than their actual peaking characteristics (like Alt's. A and B)
  - Result: shifts some cost burden from industrial and wholesale classes to residential

Fixed Charge for All Classes:

3/4" Meter:	$24.00
1" Meter:	$30.87
1.5" Meter:	$47.90
2" Meter:	$68.41
3" Meter:	$123.19
4" Meter:	$184.73
6" Meter:	$355.62
8" Meter:	$560.77
10" Meter:	$800.18

Volume Charge per 1,000 gal. over 4:

Single Family:	$2.92
Multi Family:	$2.35
Commercial:	$2.46
Industrial:	$2.73
School:	$1.03
Government:	$2.23
Wholesale:	$2.72

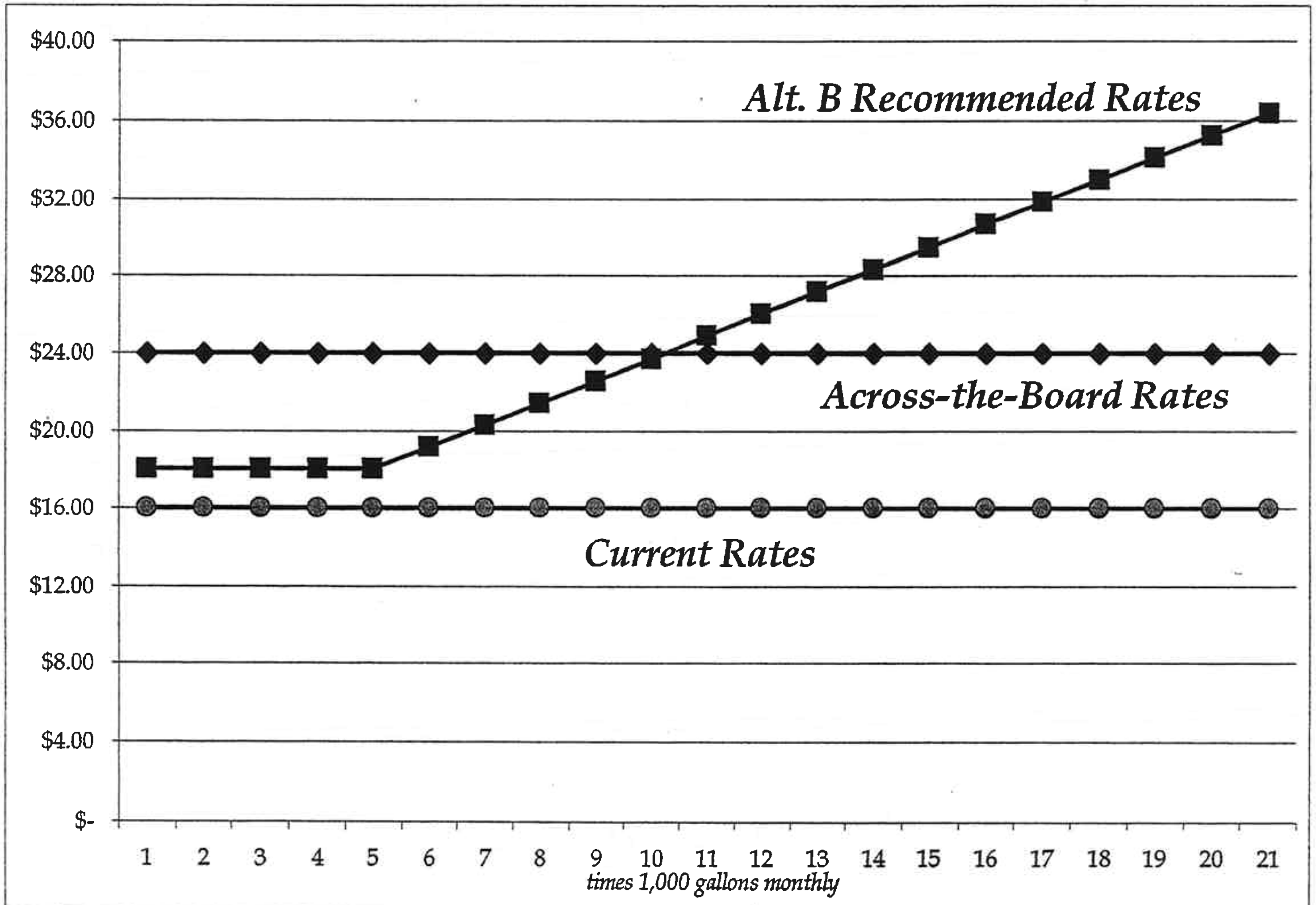
Alternative Peak Cost Shares

Class	Alt. B Rates	Alt. B-2 Rates
Single Family	1%	30%
Multi Family	1%	4%
Commercial	7%	9%
Industrial	48%	37%
School	1%	1%
Government	6%	4%
Wholesale	36%	15%

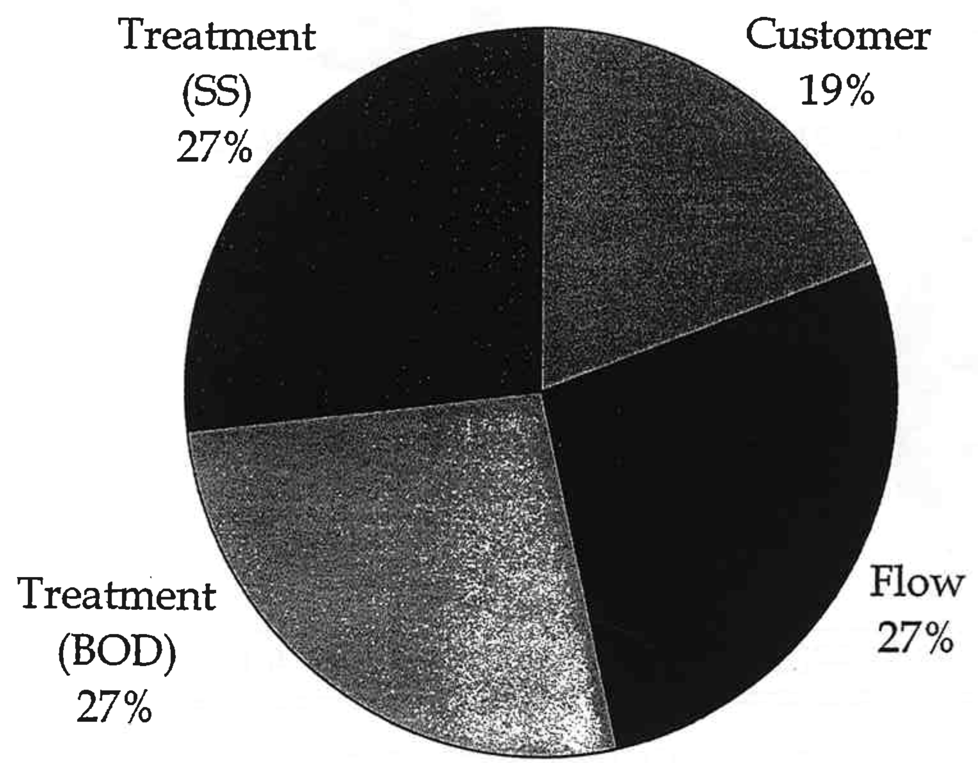
Sample Water Bills

				Recommended	
Customer Type	**Current**	**A.T.B.**	**Alt. A**	**Alt. B**	**Alt. B-2**
Single Family, In-City, 3/4," avg. usage of 6,000 gallons	$16.00	$24.00	$20.14	$20.30	$29.84
Single Family, Out-City, 3/4," avg. usage of 6,000 gal	$27.06	$40.59	$30.21	$30.45	$44.76
Multi-Family, In-City, 3/4," avg. usage of 34,000 gallons	$76.65	$114.98	$68.82	$62.70	$94.50
Commercial, In-City, 3/4," avg. usage of 33,000 gallons	$76.73	$115.10	$104.38	$97.46	$95.34
Industrial, In-City, 6," avg. usage of 3,200,000 gallons	$6,631.35	$9,947.03	$10,594.98	$10,606.56	$9,080.70
Wholesale, 8," avg. usage of 4,500,000 gallons	$9,090.35	$13,635.53	$22,658.47	$22,675.83	$13,029.30

Single Family Water Bill Comparison



Sewer Functional Costs



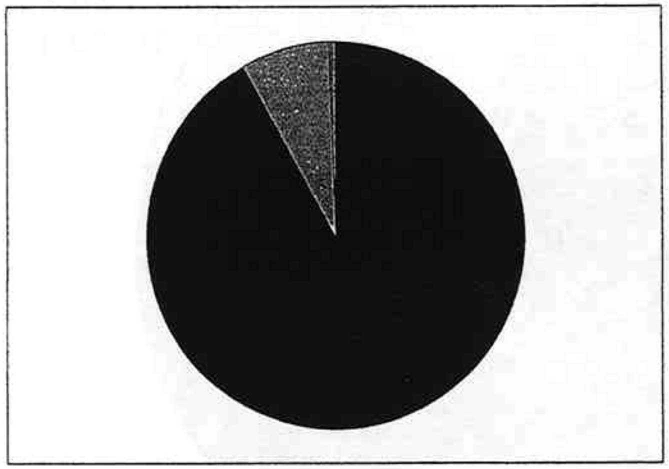
Functional Sewer Costs Allocated to Customer Classes

Single Unit

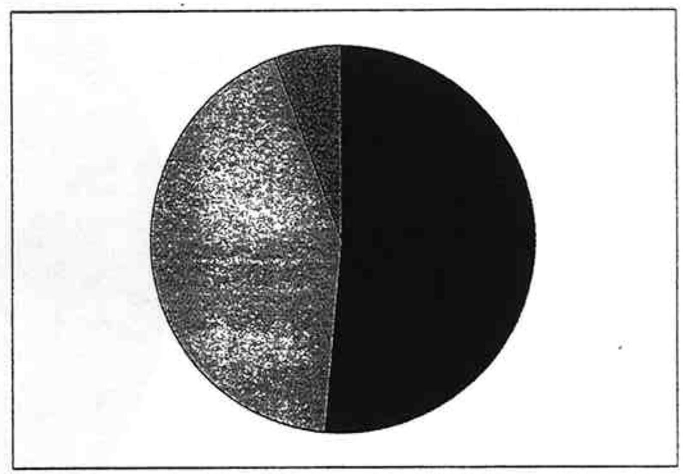
Metered

Other

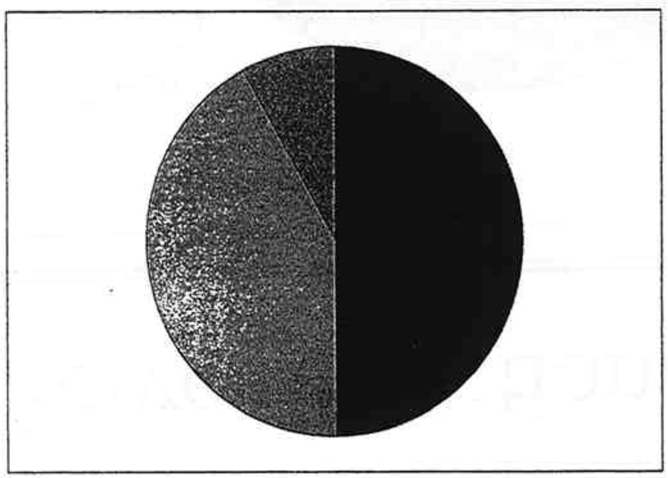
Customer Costs:



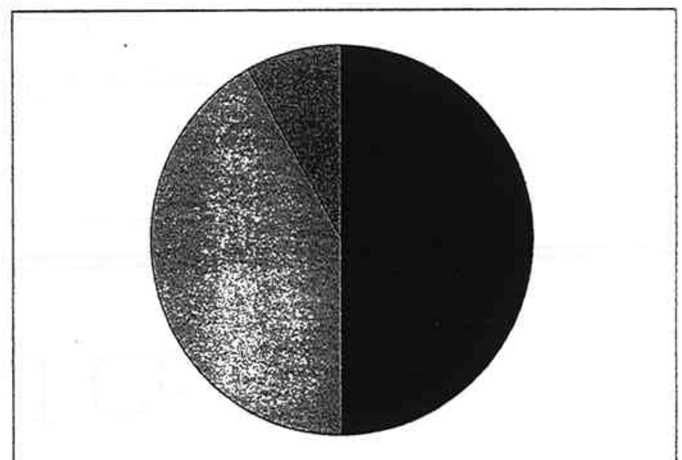
Flow Costs:



Treatment BOD Costs:

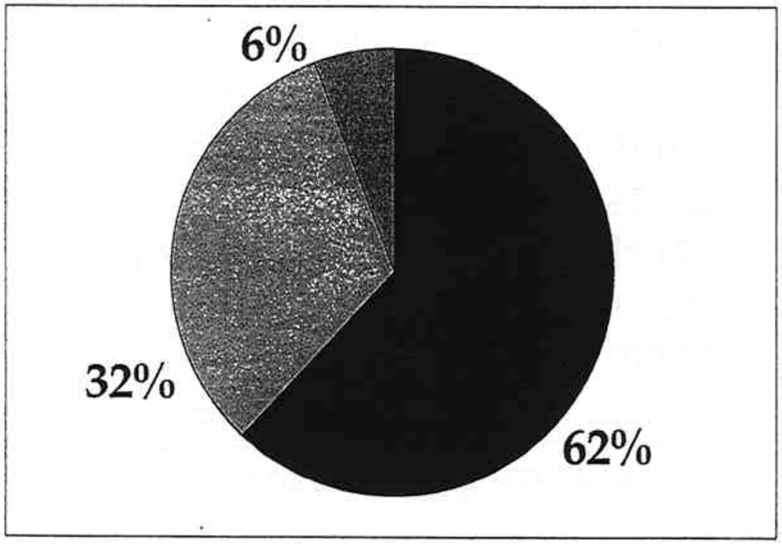


Treatment SS Costs:

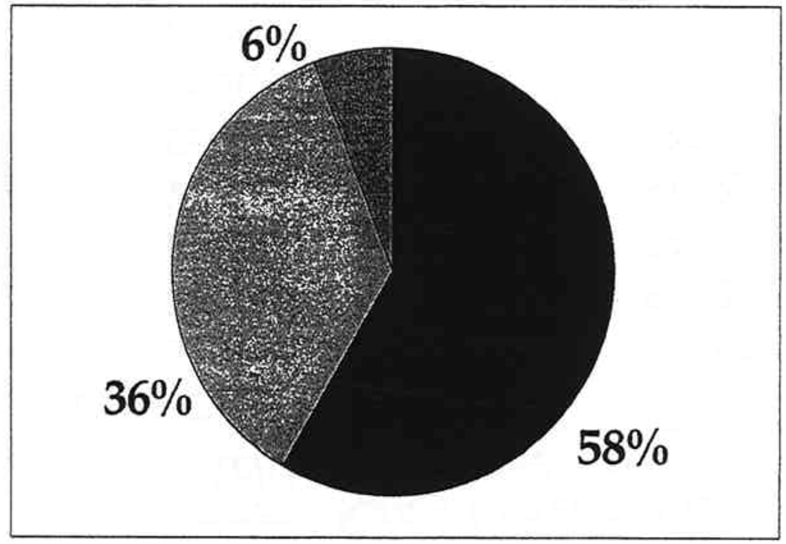


Sewer Cost Burden by Customer Class under Recommended Rates

Current Rates:



Recommended Rates:



Current Sewer Rate Structure and Rates Increased Across-the-Board

Current Rates with no Increase:

Fixed Charge for All Classes:	
Single Unit:	$13.00
Metered:	$5.75
Bioproducts:	$40.85
W. Deep Sea:	$18.75
Fort Stevens:	$1,023.75
Pacific Coast:	$85.05
Point Adams:	$23.30
W. Grade School:	$152.77
W. High School:	$152.77
W. Mobile Home:	$392.92
Volume Charge per thousand gallons:	
Metered Sewer:	$1.50

Current Rates Increased to Achieve Revenue Need:

Fixed Charge for All Classes:	
Single Unit:	$30.00
Metered:	$13.27
Bioproducts:	$94.27
W. Deep Sea:	$43.27
Fort Stevens:	$2,362.50
Pacific Coast:	$196.27
Point Adams:	$53.77
W. Grade School:	$352.55
W. High School:	$352.55
W. Mobile Home:	$906.74
Volume Charge per thousand gallons:	
Metered Sewer:	$3.46

Sewer Rate Structure A

- Refines rates to reflect cost of service findings and the needed revenue increase

Fixed Charge for All Classes:	
Single Unit:	$28.61
Metered:	$28.61
Bioproducts:	$82.77
W. Deep Sea:	$31.18
Fort Stevens:	$1,697.07
Pacific Coast:	$104.44
Point Adams:	$169.45
W. Grade School:	$152.94
W. High School:	$503.78
W. Mobile Home:	$772.07
Volume Charge per 1,000 gal. over 5,000:	
Metered Sewer:	$4.03

Sewer Rate Structure B
Recommended

- Refines rates to reflect cost of service findings and the needed revenue increase
- Introduces a strength differential for Fort Stevens to recognize higher demands placed on sewer treatment

Fixed Charge for All Classes:	
Single Unit:	$28.26
Metered:	$28.26
Bioproducts:	$81.49
W. Deep Sea:	$30.79
Fort Stevens:	$2,759.01
Pacific Coast:	$102.79
Point Adams:	$166.68
W. Grade School:	$150.46
W. High School:	$495.27
W. Mobile Home:	$758.95
Volume Charge per 1,000 gal. over 5,000:	
Metered Sewer:	$3.96

Sewer Rate Structure C

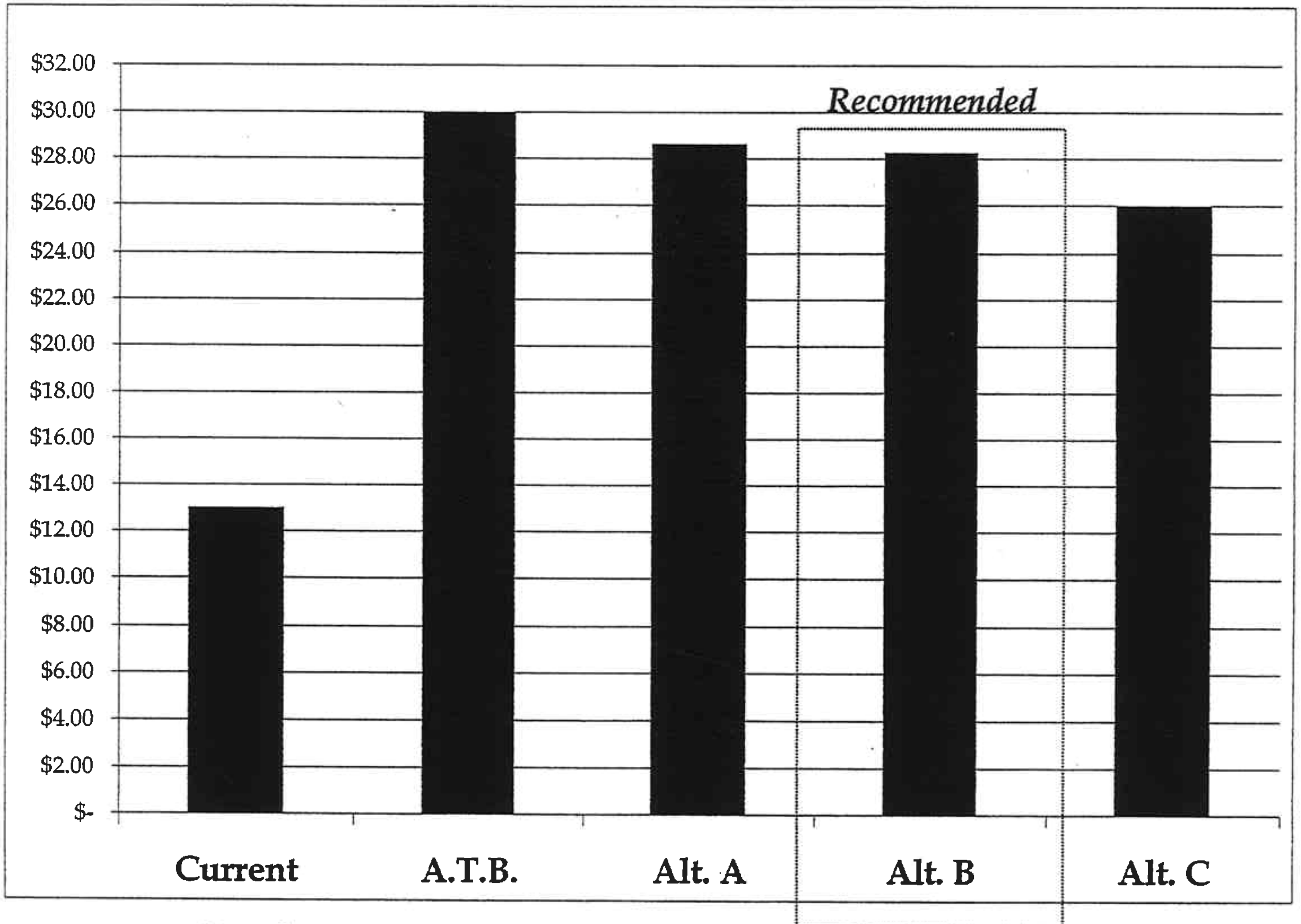
- Refines rates to reflect cost of service findings and the needed revenue increase
- Includes a strength differential for Fort Stevens
- Introduces a strength differential for Metered Commercial customers

Fixed Charge for All Classes:	
Single Unit:	$26.01
Metered Standard:	$26.01
Metered High Strength:	$36.76
Bioproducts:	$73.19
W. Deep Sea:	$28.25
Fort Stevens:	$2,381.38
Pacific Coast:	$92.06
Point Adams:	$148.68
W. Grade School:	$134.30
W. High School:	$439.89
W. Mobile Home:	$673.57
Volume Charge per 1,000 gal. over 5,000:	
Metered Standard:	$3.51
Metered High Strength:	$5.66

Sample Sewer Bills

				Recommended	
Customer Type	**Current**	**A.T.B.**	**Alt. A**	**Alt. B**	**Alt. C**
Single Unit	$13.00	$30.00	$28.61	$28.26	$26.01
Metered, average flow of 51,000 gallons, standard strength	$82.25	$189.73	$213.99	$210.42	$187.47
Metered, average flow of 51,000 gallons, high strength	$82.25	$189.73	$213.99	$210.42	$297.12
Fort Stevens	$1,023.50	$2,362.50	$1,697.07	$2,759.01	$2,381.38
Pacific Coast Seafoods	$85.05	$196.27	$104.44	$102.79	$92.06

Single Unit Sewer Bill Comparison



<u>City of Warrenton's Suggested Public Hearing Process</u>

OPENING STATEMENT - EXPLANATION OF HEARING PROCEDURE

***INSTRUCTIONS - DO NOT READ MATERIAL BETWEEN THE BRACKETS ( ) OUT LOUD**

Water & Sewer Rates

(-Mayor reads the following-)

" I will now open the Public Hearing"

"This is the time set for a public hearing concerning the proposed water and sewer rate increases for the purposes of paying related debt obligations, planning for future service demands and the operation of our community's facilities."

"The purpose of this hearing is for the City Commission to hear public testimony and receive relevant facts concerning consideration and adoption of a rate methodology that would effectively increase the water and sewer user rates over a period of ten years. To help insure that the hearing is conducted in a fair and orderly manner, I ask that you'll bear with me while I describe the rules and procedures we will be following this evening."

"First, members of the audience may note that this evening's proceeding is being tape recorded. This is to provide a full and accurate record of the hearing. I also want to assure you that everyone present will be given an opportunity to speak, but I ask that we all cooperate in observing the procedures that I'll now read."

"The public hearing will be conducted in the following order of events:

1. First, the City Commission will hear any staff reports, presented by the City Manager, and review any exhibits or other material that have been prepared and submitted by staff.

2. The hearing will then be opened to receive testimony or comments from the public. If you wish to address the City Commission please raise your hand and wait to be recognized. Once you have been recognized, please stand at the microphone and begin by giving your name and street address for the record, then proceed with whatever statement you wish to make. In the interest of time, each speaker is limited to 3 minutes."

3. Please do not begin to speak until you have been recognized, and please, let's only have one person speaking at a time. I also ask that you direct your statements to the City Commission. There shall be no direct exchanges between persons in the audience or with City staff unless authorized by the Commission."

"After everyone who wishes to speak has had an opportunity to do so, the public hearing will be closed and the City Commission will further deliberate on this issue."

"The City will now hear from citizens wishing to address the Commission on the proposed water and sewer rate increases. I will remind any one wanting to speak to please raise your hand and wait to be recognized. Once recognized, we will need you approach the microphone and clearly state your name and address for the record.)"

- The Public Addresses the Commission –

"If there is no further discussion, I'll close the public hearing at this time and open the matter for discussion by members of the City Commission."

(City Commission then deliberates and makes a decision as to the direction of the City on this matter.)

City of Warrenton Sewer Rate Study
Sewer Fund 030 Resources and Requirements

Forecast Includes All Costs & Phased Recommended Policy Assumptions, Increase Effective April 2002

Annual Rate Increase Required	130.77%	0.00%	73.33%	5.77%	1.82%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
In-City Single Family Bill: Current	$13.00	$13.00	$13.00	$13.00	$13.00	$13.00	$13.00	$13.00	$13.00	$13.00	$13.00
Monthly Bill after Rate Increase	$30.00	$30.00	$52.00	$55.00	$56.00	$56.00	$56.00	$56.00	$56.00	$56.00	$56.00

Resources	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
Beginning Fund Balance	$ 83,650	$ 111,916	$ 148,921	$ 221,560	$ 385,856	$ 463,765	$ 450,590	$ 433,044	$ 808,429	$ 1,232,076	$ 1,713,181
Bond & Loan Proceeds	50,000	275,000	8,000,000	300,000	-	-	-	-	-	-	-
Grant Proceeds	-	-	1,000,000	-	-	-	-	-	-	-	-
Connection Charges	25,000	25,750	26,523	27,318	28,138	28,982	29,851	30,747	31,669	32,619	33,598
Utilities (before increase)	398,000	410,736	423,880	437,444	451,442	465,888	480,796	496,182	512,060	528,446	545,356
Revenue from Rate Increase	127,725	537,116	1,271,639	1,413,280	1,493,231	1,541,014	1,590,327	1,641,217	1,693,736	1,747,936	1,803,870
Miscellaneous	140	144	149	153	158	162	167	172	177	183	188
Interest Earnings	4,183	5,596	7,446	11,078	19,293	23,188	22,530	21,652	40,421	61,604	85,659
Interest Tansy Point Dock Loan	350	-	-	-	-	-	-	-	-	-	-
Loan Repayment Tansy Point Dock	18,100	-	-	-	-	-	-	-	-	-	-
Total Resources	**$ 707,147**	**$ 1,366,258**	**$ 10,878,556**	**$ 2,410,832**	**$ 2,378,117**	**$ 2,522,999**	**$ 2,574,261**	**$ 2,623,014**	**$ 3,086,493**	**$ 3,602,864**	**$ 4,181,852**

Requirements	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
Personal Services											
Salaries	$ 185,610	$ 194,891	$ 204,635	$ 214,867	$ 225,610	$ 236,891	$ 248,735	$ 261,172	$ 274,231	$ 287,942	$ 302,339
Overtime	15,000	15,750	16,538	17,364	18,233	19,144	20,101	21,107	22,162	23,270	24,433
Part-Time Salaries	-	-	-	-	-	-	-	-	-	-	-
FICA	14,750	15,488	16,262	17,075	17,929	18,825	19,766	20,755	21,792	22,882	24,026
Workers Compensation	9,080	9,534	10,011	10,511	11,037	11,589	12,168	12,776	13,415	14,086	14,790
Unemployment	3,960	4,158	4,366	4,584	4,813	5,054	5,307	5,572	5,851	6,143	6,450
Retirement	31,750	33,338	35,004	36,755	38,592	40,522	42,548	44,675	46,909	49,255	51,717
Health Insurance	42,320	44,436	46,658	48,991	51,440	54,012	56,713	59,548	62,526	65,652	68,935
Life Insurance	780	819	860	903	948	995	1,045	1,098	1,152	1,210	1,271
Total Personal Services	**$ 303,250**	**$ 318,413**	**$ 334,333**	**$ 351,050**	**$ 368,602**	**$ 387,032**	**$ 406,384**	**$ 426,703**	**$ 448,038**	**$ 470,440**	**$ 493,962**

(continued on next page)

City of Warrenton Sewer Rate Study
Sewer Fund 030 Resources and Requirements

Requirements (continued)	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
Materials and Services											
Office Supplies	$ 1,000	$ 3,863	$ 3,978	$ 4,098	$ 4,221	$ 4,347	$ 4,478	$ 4,612	$ 4,750	$ 4,893	$ 5,040
Postage	3,000	3,090	3,183	3,278	3,377	3,478	3,582	3,690	3,800	3,914	4,032
General Supplies	3,250	7,725	7,957	8,195	8,441	8,695	8,955	9,224	9,501	9,786	10,079
Janitorial Supplies	300	592	610	628	647	667	687	707	728	750	773
Chemical Supplies	3,000	4,408	4,682	4,972	5,280	5,608	5,955	6,324	6,717	7,133	7,575
Uniforms	500	1,030	1,061	1,093	1,126	1,159	1,194	1,230	1,267	1,305	1,344
Printing/Advertising	500	1,236	1,273	1,311	1,351	1,391	1,433	1,476	1,520	1,566	1,613
Dues/Meetings/Training/Travel	4,240	4,635	4,774	4,917	5,065	5,217	5,373	5,534	5,700	5,871	6,048
Electricity	25,000	29,102	30,034	30,995	31,987	33,010	34,066	35,157	36,282	37,443	38,641
Communications	6,180	12,360	12,731	13,113	13,506	13,911	14,329	14,758	15,201	15,657	16,127
Insurance-Bonds and Fire	10,000	10,300	10,609	10,927	11,255	11,593	11,941	12,299	12,668	13,048	13,439
Gasoline/Oil Lubricants	5,000	6,903	7,248	7,611	7,991	8,391	8,810	9,251	9,713	10,199	10,709
Equipment Maintenance	37,000	45,114	46,467	47,861	49,297	50,776	52,299	53,868	55,485	57,149	58,864
Repair and Maintenance	28,000	30,900	31,827	32,782	33,765	34,778	35,822	36,896	38,003	39,143	40,317
Professional Services	27,870	23,690	24,401	25,133	25,887	26,663	27,463	28,287	29,136	30,010	30,910
Additional Costs from Deferrals & CIP	-	191,334	279,328	287,735	361,507	372,145	383,102	394,387	406,011	417,984	430,316
Total Materials and Services	**$ 154,840**	**$ 376,283**	**$ 470,163**	**$ 484,649**	**$ 564,702**	**$ 581,828**	**$ 599,489**	**$ 617,701**	**$ 636,482**	**$ 655,851**	**$ 675,826**
Capital Outlay											
Machinery and Equipment	$ 20,000	$ 20,600	$ 21,218	$ 21,855	$ 22,510	$ 23,185	$ 23,881	$ 24,597	$ 25,335	$ 26,095	$ 26,878
Improvements/Proj Mgr	7,130	7,344	7,564	7,791	8,025	8,266	8,514	8,769	9,032	9,303	9,582
Improvements	31,307	378,472	9,093,129	406,633	221,860	332,844	366,704	-	-	-	-
Total Capital Outlay	**$ 58,437**	**$ 406,416**	**$ 9,121,911**	**$ 436,278**	**$ 252,396**	**$ 364,296**	**$ 399,099**	**$ 33,366**	**$ 34,367**	**$ 35,398**	**$ 36,460**
Debt Service											
Existing Debt Repayment	$ 73,705	$ 89,935	$ 89,135	$ 88,322	$ 63,812	$ 74,244	$ 71,062	$ 71,452	$ 69,982	$ 62,256	$ 63,428
New Debt Repayment	-	21,141	636,150	659,213	659,213	659,213	659,213	659,213	659,213	659,213	659,213
Total Debt Service	**$ 73,705**	**$ 111,076**	**$ 725,285**	**$ 747,535**	**$ 723,025**	**$ 733,457**	**$ 730,275**	**$ 730,665**	**$ 729,195**	**$ 721,469**	**$ 722,641**
Transfer to Other Funds											
General Fund	5,000	5,150	5,305	5,464	5,628	5,796	5,970	6,149	6,334	6,524	6,720
	$ 5,000	**$ 5,150**	**$ 5,305**	**$ 5,464**	**$ 5,628**	**$ 5,796**	**$ 5,970**	**$ 6,149**	**$ 6,334**	**$ 6,524**	**$ 6,720**
Total Requirements Entered	**$ 595,232**	**$ 1,217,337**	**$ 10,656,997**	**$ 2,024,976**	**$ 1,914,352**	**$ 2,072,409**	**$ 2,141,217**	**$ 1,814,585**	**$ 1,854,417**	**$ 1,889,683**	**$ 1,935,609**
Ending Fund Balance	*$ 111,916*	*$ 148,921*	*$ 221,560*	*$ 385,856*	*$ 463,765*	*$ 450,590*	*$ 433,044*	*$ 808,429*	*$ 1,232,076*	*$ 1,713,181*	*$ 2,246,243*

City of Warrenton
Sewer Rate Study
Input of Data and Assumptions

Economic & Financial Factors	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
1 General Cost Inflation	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
2 Labor Cost Inflation	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
3 Customer Growth	3.20%	3.20%	3.20%	3.20%	3.20%	3.20%	3.20%	3.20%	3.20%	3.20%	3.20%
4 Construction Cost Inflation	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
5 Fund Earnings	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
6 General Cost Inflation and Growth	6.20%	6.20%	6.20%	6.20%	6.20%	6.20%	6.20%	6.20%	6.20%	6.20%	6.20%
	0	1	2	3	4	5	6	7	8	9	10
Customer Growth Index	1.03	1.03	1.07	1.10	1.13	1.17	1.21	1.25	1.29	1.33	1.37

Customer Growth	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
Sewer Accounts	1,810	1,868	1,928	1,989	2,053	2,119	2,187	2,257	2,329	2,403	2,480

Reserve Assumptions		FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
SEWER FUND 030												
Beginning Fund Balance	$	83,650										
Amount Allocable to Operating Reserves		0%										
Amount Allocable to Capital Reserves		100%										
Operating Reserve Portion:												
Beginning Fund Balance	$	-										
Minimum Working Capital		0%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Capital Reserve Portion:												
Beginning Balance	$	83,650										
Minimum Balance	$	-	-	-	-	-	-	-	-	-	-	-
Replacement Funding from Rates (a)	$	-	5,032	54,442	91,977	133,655	164,702	202,925	235,000	267,902	306,233	337,013
SDC FUND 036												
Beginning Balance	$	32,563										
BOND FUND 000												
Beginning Balance	$	-										
Minimum Balance	$	-										

(a) Annual depreciation expense less annual principal repayment, phased in at 10% per year beginning at 10% of the calculation.

City of Warrenton
Sewer Rate Study
Input of Data and Assumptions

Revenue Collection

		FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
July	$34,892	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
August	$33,178	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
September	$35,158	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
October	$33,459	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
November	$32,665	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
December	$33,744	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
January	$43,466	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
February	$33,456	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
March	$35,509	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
April	$33,886	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
May	$33,650	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
June	$35,079	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
	$418,142	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Capital Financing Assumptions

	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
GRANTS											
Proceeds Anticipated	$ -	$ -	$ 1,000,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
KNOWN DEBT PROCEEDS											
Proceeds Anticipated (a)	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
SDC REVENUES											
SDC Revenues	$ 1,000										
Current SDC	$ 50										
FUTURE REVENUE BONDS											
Term (years)	20	20	20	20	20	20	20	20	20	20	20
Interest Cost	4.50%	4.50%	5.25%	5.25%	5.25%	5.25%	5.25%	5.25%	5.25%	5.25%	5.25%
Issuance Cost	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
FUTURE STATE LOANS											
Term (years)	20	20	20	20	20	20	20	20	20	20	20
Interest Cost	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Issuance Cost	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

(a) Proceeds already awarded for which a repayment schedule is entered on the following page. These proceeds should be anticipated but not reflected in the beginning fund balance for the fiscal year.

City of Warrenton
Sewer Rate Study
Input of Data and Assumptions

Existing Revenue Bonds

		FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
Sewer System Revenue Refunding Bonds												
	Annual Interest Payment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Annual Principal Payment	-	-	-	-	-	-	-	-	-	-	-
	Total Annual Payment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Existing Loans

		FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
OEDD-L88010												
$151,313	Annual Interest Payment	$ 3,165	$ 2,716	$ 2,245	$ 1,750	$ 1,230	$ 685	$ 155	$ -	$ -	$ -	$ -
	Annual Principal Payment	8,977	9,426	9,897	10,392	10,912	10,599	3,093	-	-	-	-
	Total Annual Payment	$ 12,142	$ 12,142	$ 12,142	$ 12,142	$ 12,142	$ 11,284	$ 3,247	$ -	$ -	$ -	$ -
% to Sewer:	24%											
	Annual Interest Payment	$ 760	$ 652	$ 539	$ 420	$ 295	$ 164	$ 37	$ -	$ -	$ -	$ -
	Annual Principal Payment	2,154	2,262	2,375	2,494	2,619	2,544	742	-	-	-	-
	Total Annual Payment	$ 2,914	$ 2,914	$ 2,914	$ 2,914	$ 2,914	$ 2,708	$ 779	$ -	$ -	$ -	$ -
B97004A Industrial Park Improvements												
$933,600	Annual Interest Payment	$ 45,552	$ 45,552	$ 43,716	$ 41,851	$ 39,954	$ 38,025	$ 34,956	$ 31,795	$ 28,191	$ 24,557	$ 21,531
	Annual Principal Payment	-	41,733	41,936	42,149	42,370	66,008	66,521	72,068	72,672	60,539	65,956
	Total Annual Payment	$ 45,552	$ 87,285	$ 85,652	$ 84,000	$ 82,324	$ 104,033	$ 101,477	$ 103,863	$ 100,863	$ 85,096	$ 87,487
% to Sewer:	49%											
	Annual Interest Payment	$ 22,320	$ 22,320	$ 21,421	$ 20,507	$ 19,577	$ 18,632	$ 17,128	$ 15,580	$ 13,814	$ 12,033	$ 10,550
	Annual Principal Payment	-	20,449	20,549	20,653	20,761	32,344	32,595	35,313	35,609	29,664	32,318
	Total Annual Payment	$ 22,320	$ 42,770	$ 41,969	$ 41,160	$ 40,339	$ 50,976	$ 49,723	$ 50,893	$ 49,423	$ 41,697	$ 42,869
R94941												
$100,000	Annual Interest Payment	$ 2,187	$ 1,624	$ 1,046	$ 454	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Annual Principal Payment	21,505	22,068	22,646	23,235	-	-	-	-	-	-	-
	Total Annual Payment	$ 23,692	$ 23,692	$ 23,692	$ 23,689	$ -	$ -	$ -	$ -	$ -	$ -	$ -
% to Sewer:	100%											
	Annual Interest Payment	$ 2,187	$ 1,624	$ 1,046	$ 454	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Annual Principal Payment	21,505	22,068	22,646	23,235	-	-	-	-	-	-	-
	Total Annual Payment	$ 23,692	$ 23,692	$ 23,692	$ 23,689	$ -	$ -	$ -	$ -	$ -	$ -	$ -

City of Warrenton
Sewer Rate Study
Input of Data and Assumptions

Existing Loans (continued)		FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
R94940												
$203,861	Annual Interest Payment	$ 15,764	$ 7,466	$ 7,163	$ 6,850	$ 6,525	$ 6,186	$ 5,836	$ 5,472	$ 5,094	$ 4,702	$ 4,294
	Annual Principal Payment	3,859	7,938	8,241	8,554	8,879	9,218	9,568	9,932	10,310	10,702	11,110
	Total Annual Payment	$ 19,623	$ 15,404	$ 15,404	$ 15,404	$ 15,404	$ 15,404	$ 15,404	$ 15,404	$ 15,404	$ 15,404	$ 15,404
% to Sewer:	100%											
	Annual Interest Payment	$ 15,764	$ 7,466	$ 7,163	$ 6,850	$ 6,525	$ 6,186	$ 5,836	$ 5,472	$ 5,094	$ 4,702	$ 4,294
	Annual Principal Payment	3,859	7,938	8,241	8,554	8,879	9,218	9,568	9,932	10,310	10,702	11,110
	Total Annual Payment	$ 19,623	$ 15,404	$ 15,404	$ 15,404	$ 15,404	$ 15,404	$ 15,404	$ 15,404	$ 15,404	$ 15,404	$ 15,404
B97004B- North Coast Industrial Park												
$120,675	Annual Interest Payment	$ 6,835	$ 6,614	$ 6,379	$ 6,131	$ 5,868	$ 5,588	$ 5,292	$ 4,979	$ 4,646	$ 4,294	$ 3,920
	Annual Principal Payment	3,686	3,907	4,142	4,390	4,653	4,933	5,229	5,542	5,875	6,227	6,601
	Total Annual Payment	$ 10,521	$ 10,521	$ 10,521	$ 10,521	$ 10,521	$ 10,521	$ 10,521	$ 10,521	$ 10,521	$ 10,521	$ 10,521
% to Sewer:	49%											
	Annual Interest Payment	$ 3,349	$ 3,241	$ 3,126	$ 3,004	$ 2,875	$ 2,738	$ 2,593	$ 2,440	$ 2,277	$ 2,104	$ 1,921
	Annual Principal Payment	1,806	1,914	2,029	2,151	2,280	2,417	2,562	2,716	2,879	3,051	3,234
	Total Annual Payment	$ 5,155	$ 5,155	$ 5,155	$ 5,155	$ 5,155	$ 5,155	$ 5,155	$ 5,155	$ 5,155	$ 5,155	$ 5,155
Total Existing Debt Service												
	Annual Interest Payment	$ 44,380	$ 35,303	$ 33,294	$ 31,235	$ 29,273	$ 27,721	$ 25,595	$ 23,491	$ 21,184	$ 18,839	$ 16,765
	Annual Principal Payment	29,325	54,632	55,840	57,087	34,539	46,523	45,468	47,961	48,798	43,418	46,663
	Total Annual Payment	$ 73,705	$ 89,935	$ 89,135	$ 88,322	$ 63,812	$ 74,244	$ 71,062	$ 71,452	$ 69,982	$ 62,256	$ 63,428

City of Warrenton
Sewer Rate Study
Input of Data and Assumptions

Revenue	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
REVENUES											
Sewer Billing/Utilities	$ 398,000										
Connection Charges	25,000										
Miscellaneous	140										
Interest Tansy Point Dock Loan	350	-									
Loan repayment Tansy Point Dock	18,100	-									
Transfers from other funds											
State Street Tax	-										
Water	-										
Sewer SDC	-										
North Coast Industrial Park	-										
TOTAL REVENUES ENTERED	$ 441,590	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Expenditures	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
PERSONAL SERVICES											
Salaries	$ 185,610										
Part-Time Salaries	-										
Overtime	15,000										
FICA	14,750										
Workers Compensation	9,080										
Unemployment	3,960										
Retirement	31,750										
Health Insurance	42,320										
Life Insurance	780										
Total Personal Services	$ 303,250	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

City of Warrenton
Sewer Rate Study
Input of Data and Assumptions

Expenditures (continued)	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
MATERIALS AND SERVICES											
Office Supplies	$ 1,000	$ 3,863									
Postage	3,000	3,090									
General Supplies	3,250	7,725									
Janitorial Supplies	300	592									
Chemical Supplies	3,000	4,408									
Uniforms	500	1,030									
Printing/Advertising	500	1,236									
Dues/Meetings/Training/Travel	4,240	4,635									
Electricity	25,000	29,102									
Communications	6,180	12,360									
Insurance-Bonds and Fire	10,000	10,300									
Gasoline/Oil Lubricants	5,000	6,903									
Equipment Maintenance	37,000	45,114									
Repair and Maintenance	28,000	30,900									
Professional Services	27,870	23,690									
Refunds	-	-									
Total Materials and Services	$ 154,840	$ 184,949	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
CAPITAL OUTLAYS											
Machinery and Equipment	$ 20,000										
Improvements/Proj Mgr	$ 7,130										
Total Capital Outlay	$ 27,130	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TRANSFER TO OTHER FUNDS											
Interfund Loan Advances	$ -										
Sanitation	-										
General Fund	5,000										
Water	-										
Transfer to Bond Reserve	-										
Total Transfers to other Funds	$ 5,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
OTHER											
Depreciation (a)	$ 87,826										
TOTAL EXPENSES ENTERED	$ 578,046	$ 184,949	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

(a) Enter only the expense for the first year of the analysis; all subsequent years are calculated.

City of Warrenton
Sewer Rate Study
Input of Data and Assumptions

Improvement Projects (Upgrades and Expansions)

	NAME / DESCRIPTION	LIFE (YRS.)	DISTRIBUTION TO TYPE % UPGRADE	% EXPANSION	TOTAL COSTS	INPUT OF PROJECT COSTS $-YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Miscellaneous Improvements	40	100%		$ 63,870	2002	$ 63,870	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	Telemetry Upgrade	40	100%		70,000	2002	-	$ 70,000	-	-	-	-	-	-	-	-	-
3	Sewer Plant Upgrade	40	100%		6,330,000	2002	-	-	6,330,000	-	-	-	-	-	-	-	-
4	Core Conveyance	40	100%		1,594,000	2002	-	-	1,594,000	-	-	-	-	-	-	-	-
5	Upgrade Pump Stations	40	100%		275,000	2002	-	-	75,000	-	200,000	-	-	-	-	-	-
6	Inflow and Infiltration	40	100%		675,000	2002	-	225,000	225,000	225,000	-	-	-	-	-	-	-
7	Main Avenue Sewer	40	100%		290,000	2002	-	-	-	-	-	290,000	-	-	-	-	-
8	Dolphin Road Sewer	40	100%		310,000	2002	-	-	-	-	-	-	310,000	-	-	-	-
9		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
11		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
12		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
13		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
14		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
15		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
16		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
17		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
18		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
TOTAL IMPROVEMENT PROJECTS					$ 9,607,870		$ 63,870	$ 295,000	$ 8,224,000	$ 225,000	$ 200,000	$ 290,000	$ 310,000	$ -	$ -	$ -	$ -

Repair and Replacement Projects

	NAME / DESCRIPTION	LIFE (YRS.)	DISTRIBUTION TO TYPE % UPGRADE	% EXPANSION	TOTAL COSTS	INPUT OF PROJECT COSTS $-YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Public Works Facility	40	100%		$ 300,000	2002	$ -	$ -	$ 300,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	1992 Backhoe	5	100%		70,000	2002	-	-	-	70,000	-	-	-	-	-	-	-
3	1995 5 YD truck	5	100%		50,000	2002	-	-	50,000	-	-	-	-	-	-	-	-
4	1980 Vactor truck	5	100%		80,000	2002	-	-	-	80,000	-	-	-	-	-	-	-
5	1988 Mower	5	100%		25,000	2002	-	25,000	-	-	-	-	-	-	-	-	-
6	Compressor	5	100%		12,000	2002	-	12,000	-	-	-	-	-	-	-	-	-
7	Vehicle-Engineering	5	100%		8,000	2002	-	8,000	-	-	-	-	-	-	-	-	-
8	TV Inspection	40	100%		30,000	2002	-	30,000	-	-	-	-	-	-	-	-	-
9		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
10		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
11		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
12		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
13		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
14		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
15		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
16		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
17		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
18		40	100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
TOTAL REPAIR AND REPLACEMENT PROJECTS					$ 575,000		$ -	$ 75,000	$ 350,000	$ 150,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -

City of Warrenton
Sewer Rate Study
Input of Data and Assumptions

Incremental Operating Costs

	NAME / DESCRIPTION	DISTRIBUTION TO TYPE		TOTAL COSTS	INPUT OF PROJECT COSTS											
		% UPGRADE	% EXPANSION		$-YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Assistant Public Works Superintendent (.3 FTE)	100%		$ 172,440	2002	$ -	$ -	$ 19,160	$ 19,160	$ 19,160	$ 19,160	$ 19,160	$ 19,160	$ 19,160	$ 19,160	$ 19,160
2	Treatment Plant Operator (1 FTE)	100%		522,545	2002	-	-	58,061	58,061	58,061	58,061	58,061	58,061	58,061	58,061	58,061
3	Utility Worker (1FTE)	100%		580,605	2002	-	58,061	58,061	58,061	58,061	58,061	58,061	58,061	58,061	58,061	58,061
4	Utility Worker (1 FTE)	100%		406,424	2002	-	-	-	-	58,061	58,061	58,061	58,061	58,061	58,061	58,061
5	In-Lieu-of Property Tax [b]	100%		68,226	2002	-	6,176	6,692	6,920	6,920	6,920	6,920	6,920	6,920	6,920	6,920
6	Payroll Allocation	100%		1,217,050	2002	-	121,705	121,705	121,705	121,705	121,705	121,705	121,705	121,705	121,705	121,705
7		100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
8		100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
9		100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
10		100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
11		100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
12		100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
13		100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
14		100%		-	2002	-	-	-	-	-	-	-	-	-	-	-
	TOTAL INCREMENTAL OPERATING COSTS			$ 2,967,288		$ -	$ 185,941	$ 263,678	$ 263,906	$ 321,966	$ 321,966	$ 321,966	$ 321,966	$ 321,966	$ 321,966	$ 321,966

[a] This estimate is calculated by dividing the 2001-2002 sewer personal services cost ($303,250) by the number of estimated sewer FTEs (5.223) times the number of FTEs being added.

[b] $1.39/1000 fixed assets (represents local share property tax).

City of Warrenton
Water Rate Study
Input of Data and Assumptions

Improvement Projects (Upgrades and Expansions)

	NAME / DESCRIPTION	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
		TOTAL FORECASTED PROJECT COSTS										
1	Miscellaneous Improvements	$ 63,870	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	Telemetry Upgrade	-	72,100	-	-	-	-	-	-	-	-	-
3	Sewer Plant Upgrade	-	-	6,715,497	-	-	-	-	-	-	-	-
4	Core Conveyance	-	-	1,691,075	-	-	-	-	-	-	-	-
5	Upgrade Pump Stations	-	-	79,568	-	225,102	-	-	-	-	-	-
6	Inflow and Infiltration	-	231,750	238,703	245,864	-	-	-	-	-	-	-
7	Main Avenue Sewer	-	-	-	-	-	336,189	-	-	-	-	-
8	Dolphin Road Sewer	-	-	-	-	-	-	370,156	-	-	-	-
9	0	-	-	-	-	-	-	-	-	-	-	-
11	0	-	-	-	-	-	-	-	-	-	-	-
12	0	-	-	-	-	-	-	-	-	-	-	-
13	0	-	-	-	-	-	-	-	-	-	-	-
14	0	-	-	-	-	-	-	-	-	-	-	-
15	0	-	-	-	-	-	-	-	-	-	-	-
16	0	-	-	-	-	-	-	-	-	-	-	-
17	0	-	-	-	-	-	-	-	-	-	-	-
18	0	-	-	-	-	-	-	-	-	-	-	-
TOTAL IMPROVEMENT PROJECTS		$ 63,870	$ 303,850	$ 8,724,842	$ 245,864	$ 225,102	$ 336,189	$ 370,156	$ -	$ -	$ -	$ -

Repair and Replacement Projects

	NAME / DESCRIPTION	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
		TOTAL FORECASTED PROJECT COSTS										
1	Public Works Facility	$ -	$ -	$ 318,270	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	1992 Backhoe	-	-	-	76,491	-	-	-	-	-	-	-
3	1995 5 YD truck	-	-	53,045	-	-	-	-	-	-	-	-
4	1980 Vactor truck	-	-	-	87,418	-	-	-	-	-	-	-
5	1988 Mower	-	25,750	-	-	-	-	-	-	-	-	-
6	Compressor	-	12,360	-	-	-	-	-	-	-	-	-
7	Vehicle-Engineering	-	8,240	-	-	-	-	-	-	-	-	-
8	TV Inspection	-	30,900	-	-	-	-	-	-	-	-	-
9	0	-	-	-	-	-	-	-	-	-	-	-
10	0	-	-	-	-	-	-	-	-	-	-	-
11	0	-	-	-	-	-	-	-	-	-	-	-
12	0	-	-	-	-	-	-	-	-	-	-	-
13	0	-	-	-	-	-	-	-	-	-	-	-
14	0	-	-	-	-	-	-	-	-	-	-	-
15	0	-	-	-	-	-	-	-	-	-	-	-
16	0	-	-	-	-	-	-	-	-	-	-	-
17	0	-	-	-	-	-	-	-	-	-	-	-
18	0	-	-	-	-	-	-	-	-	-	-	-
TOTAL REPAIR AND REPLACEMENT PROJECTS		$ -	$ 77,250	$ 371,315	$ 163,909	$ -	$ -	$ -	$ -	$ -	$ -	$ -

City of Warrenton
Water Rate Study
Input of Data and Assumptions

Incremental Operating Costs from the CIP

	NAME / DESCRIPTION	TOTAL FORECASTED PROJECT COSTS										
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Assistant Public Works Superintendent (.3 FTE)	$ -	$ -	$ 20,327	$ 20,937	$ 21,565	$ 22,212	$ 22,878	$ 23,564	$ 24,271	$ 24,999	$ 25,749
2	Treatment Plant Operator (1 FTE)	-	-	61,596	63,444	65,348	67,308	69,327	71,407	73,549	75,756	78,028
3	Utility Worker (1FTE)	-	59,802	61,596	63,444	65,348	67,308	69,327	71,407	73,549	75,756	78,028
4	Utility Worker (1 FTE)	-	-	-	-	65,348	67,308	69,327	71,407	73,549	75,756	78,028
5	In-Lieu-of Property Tax [b]	-	6,176	6,692	6,920	6,920	6,920	6,920	6,920	6,920	6,920	6,920
6	Payroll Allocation	-	125,356	129,117	132,990	136,980	141,089	145,322	149,682	154,172	158,797	163,561
7	0	-	-	-	-	-	-	-	-	-	-	-
8	0	-	-	-	-	-	-	-	-	-	-	-
9	0	-	-	-	-	-	-	-	-	-	-	-
10	0	-	-	-	-	-	-	-	-	-	-	-
11	0	-	-	-	-	-	-	-	-	-	-	-
12	0	-	-	-	-	-	-	-	-	-	-	-
13	0	-	-	-	-	-	-	-	-	-	-	-
14	0	-	-	-	-	-	-	-	-	-	-	-
TOTAL INCREMENTAL OPERATING COSTS		$ -	$ 191,334	$ 279,328	$ 287,735	$ 361,507	$ 372,145	$ 383,102	$ 394,387	$ 406,011	$ 417,984	$ 430,316

City of Warrenton
Sewer Rate Study
Capital Funding Analysis

Summary of Expenditures	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
CAPITAL PROJECTS											
Improvement Upgrades	$ 63,870	$ 303,850	$ 8,724,842	$ 245,864	$ 225,102	$ 336,189	$ 370,156	$ -	$ -	$ -	$ -
Expansions	-	-	-	-	-	-	-	-	-	-	-
Repairs and Replacements	-	77,250	371,315	163,909	-	-	-	-	-	-	-
TOTAL CAPITAL PROJECTS	$ 63,870	$ 381,100	$ 9,096,157	$ 409,773	$ 225,102	$ 336,189	$ 370,156	$ -	$ -	$ -	$ -

Capital Financing Plan	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
CAPITAL FUNDING SOURCES											
System Development Charge Fund (036)	32,563	2,628	3,027	3,140	3,241	3,345	3,452	-	-	-	-
Grants	-	-	1,000,000	-	-	-	-	-	-	-	-
Other Debt Proceeds (see Note A)	-	275,000	8,000,000	300,000	-	-	-	-	-	-	-
Capital Reserve Balance (030)	31,307	103,472	39,753	95,772	221,860	318,345	299,674	-	-	-	-
Rates (030)	-	-	53,377	10,860	-	14,500	67,030	-	-	-	-
TOTAL CAPITAL RESOURCES	**$ 63,870**	**$ 381,100**	**$ 9,096,157**	**$ 409,773**	**$ 225,102**	**$ 336,189**	**$ 370,156**	**$ -**	**$ -**	**$ -**	**$ -**
Unfunded Capital Expenditures	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

NOTE A: OTHER DEBT OPTION

Specify debt instrument:	State Loans	State Loans	State Loans	State Loans	State Loans	State Loans	State Loans	State Loans	State Loans	State Loans	State Loans
Enter amount needed for projects:	$ -	$ 275,000	$ 8,000,000	$ 300,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -

City of Warrenton
Sewer Rate Study
Capital Funding Analysis

New Debt Computations	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
REVENUE BONDS											
Amount to Fund	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Issuance Costs	-	-	-	-	-	-	-	-	-	-	-
Reserve Required	-	-	-	-	-	-	-	-	-	-	-
Amount of Debt Issue	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
STATE LOAN											
Amount to Fund	$ -	$ 275,000	$ 8,000,000	$ 300,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Issuance Costs	-	-	-	-	-	-	-	-	-	-	-
Amount of Debt Issue	$ -	$ 275,000	$ 8,000,000	$ 300,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Debt Service Summary	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
EXISTING DEBT SERVICE											
Annual Interest Payments	$ 44,380	$ 35,303	$ 33,294	$ 31,235	$ 29,273	$ 27,721	$ 25,595	$ 23,491	$ 21,184	$ 18,839	$ 16,765
Annual Principal Payments	29,325	54,632	55,840	57,087	34,539	46,523	45,468	47,961	48,798	43,418	46,663
Total Debt Service Payments	$ 73,705	$ 89,935	$ 89,135	$ 88,322	$ 63,812	$ 74,244	$ 71,062	$ 71,452	$ 69,982	$ 62,256	$ 63,428
Revenue Bonds Payments Only	-	-	-	-	-	-	-	-	-	-	-
NEW DEBT SERVICE											
Annual Interest Payments	$ -	$ 12,375	$ 371,981	$ 373,593	$ 360,740	$ 347,309	$ 333,273	$ 318,606	$ 303,278	$ 287,261	$ 270,524
Annual Principal Payments	-	8,766	264,170	285,620	298,473	311,904	325,940	340,607	355,935	371,952	388,689
Total Debt Service Payments	$ -	$ 21,141	$ 636,150	$ 659,213	$ 659,213	$ 659,213	$ 659,213	$ 659,213	$ 659,213	$ 659,213	$ 659,213
TOTAL DEBT SERVICE PAYMENTS	**$ 73,705**	**$ 111,076**	**$ 725,285**	**$ 747,535**	**$ 723,025**	**$ 733,457**	**$ 730,275**	**$ 730,665**	**$ 729,195**	**$ 721,469**	**$ 722,641**
Total Interest Payments	44,380	47,678	405,275	404,828	390,013	375,030	358,868	342,097	324,463	306,100	287,289
Total Principal Payments	29,325	63,398	320,010	342,707	333,012	358,427	371,407	388,568	404,732	415,369	435,352
Total Revenue Bond Payments Only	-	-	-	-	-	-	-	-	-	-	-

City of Warrenton
Sewer Rate Study
Operating Revenue and Expenditure Forecast

Revenues	FORECAST BASIS	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
REVENUES												
Sewer Billing/Utilities	Customer Growth	$ 398,000	$ 410,736	$ 423,880	$ 437,444	$ 451,442	$ 465,888	$ 480,796	$ 496,182	$ 512,060	$ 528,446	$ 545,356
Connection Charges	General Cost Inflation	25,000	25,750	26,523	27,318	28,138	28,982	29,851	30,747	31,669	32,619	33,598
Miscellaneous	General Cost Inflation	140	144	149	153	158	162	167	172	177	183	188
Interest Tansy Point Dock Loan	General Cost Inflation	350	-	-	-	-	-	-	-	-	-	-
Loan repayment Tansy Point Dock	General Cost Inflation	18,100	-	-	-	-	-	-	-	-	-	-
Transfers from other funds	General Cost Inflation	-	-	-	-	-	-	-	-	-	-	-
State Street Tax	General Cost Inflation	-	-	-	-	-	-	-	-	-	-	-
Water	General Cost Inflation	-	-	-	-	-	-	-	-	-	-	-
Sewer SDC	General Cost Inflation	-	-	-	-	-	-	-	-	-	-	-
North Coast Industrial Park	General Cost Inflation	-	-	-	-	-	-	-	-	-	-	-
TOTAL REVENUE		**$ 441,590**	**$ 436,630**	**$ 450,551**	**$ 464,915**	**$ 479,737**	**$ 495,032**	**$ 510,815**	**$ 527,101**	**$ 543,906**	**$ 561,248**	**$ 579,142**

Expenditures	FORECAST BASIS	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
PERSONAL SERVICES												
Salaries	Labor Cost Inflation	$ 185,610	$ 194,891	$ 204,635	$ 214,867	$ 225,610	$ 236,891	$ 248,735	$ 261,172	$ 274,231	$ 287,942	$ 302,339
Part-Time Salaries	Labor Cost Inflation	-	-	-	-	-	-	-	-	-	-	-
Overtime	Labor Cost Inflation	15,000	15,750	16,538	17,364	18,233	19,144	20,101	21,107	22,162	23,270	24,433
FICA	Labor Cost Inflation	14,750	15,488	16,262	17,075	17,929	18,825	19,766	20,755	21,792	22,882	24,026
Workers Compensation	Labor Cost Inflation	9,080	9,534	10,011	10,511	11,037	11,589	12,168	12,776	13,415	14,086	14,790
Unemployment	Labor Cost Inflation	3,960	4,158	4,366	4,584	4,813	5,054	5,307	5,572	5,851	6,143	6,450
Retirement	Labor Cost Inflation	31,750	33,338	35,004	36,755	38,592	40,522	42,548	44,675	46,909	49,255	51,717
Health Insurance	Labor Cost Inflation	42,320	44,436	46,658	48,991	51,440	54,012	56,713	59,548	62,526	65,652	68,935
Life Insurance	Labor Cost Inflation	780	819	860	903	948	995	1,045	1,098	1,152	1,210	1,271
Total Personal Services		$ 303,250	$ 318,413	$ 334,333	$ 351,050	$ 368,602	$ 387,032	$ 406,384	$ 426,703	$ 448,038	$ 470,440	$ 493,962
MATERIALS AND SERVICES												
Office Supplies	General Cost Inflation	$ 1,000	$ 3,863	$ 3,978	$ 4,098	$ 4,221	$ 4,347	$ 4,478	$ 4,612	$ 4,750	$ 4,893	$ 5,040
Postage	General Cost Inflation	3,000	3,090	3,183	3,278	3,377	3,478	3,582	3,690	3,800	3,914	4,032
General Supplies	General Cost Inflation	3,250	7,725	7,957	8,195	8,441	8,695	8,955	9,224	9,501	9,786	10,079
Janitorial Supplies	General Cost Inflation	300	592	610	628	647	667	687	707	728	750	773
Chemical Supplies	General Cost Inflation and Grow	3,000	4,408	4,682	4,972	5,280	5,608	5,955	6,324	6,717	7,133	7,575
Uniforms	General Cost Inflation	500	1,030	1,061	1,093	1,126	1,159	1,194	1,230	1,267	1,305	1,344
Printing/Advertising	General Cost Inflation	500	1,236	1,273	1,311	1,351	1,391	1,433	1,476	1,520	1,566	1,613
Dues/Meetings/Training/Travel	General Cost Inflation	4,240	4,635	4,774	4,917	5,065	5,217	5,373	5,534	5,700	5,871	6,048

City of Warrenton
Sewer Rate Study
Operating Revenue and Expenditure Forecast

Expenditures continued	FORECAST BASIS	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
MATERIALS AND SERVICES continued												
Electricity	Customer Growth	25,000	29,102	30,034	30,995	31,987	33,010	34,066	35,157	36,282	37,443	38,641
Communications	General Cost Inflation	6,180	12,360	12,731	13,113	13,506	13,911	14,329	14,758	15,201	15,657	16,127
Insurance-Bonds and Fire	General Cost Inflation	10,000	10,300	10,609	10,927	11,255	11,593	11,941	12,299	12,668	13,048	13,439
Gasoline/Oil Lubricants	Fund Earnings	5,000	6,903	7,248	7,611	7,991	8,391	8,810	9,251	9,713	10,199	10,709
Equipment Maintenance	General Cost Inflation	37,000	45,114	46,467	47,861	49,297	50,776	52,299	53,868	55,485	57,149	58,864
Repair and Maintenance	General Cost Inflation	28,000	30,900	31,827	32,782	33,765	34,778	35,822	36,896	38,003	39,143	40,317
Professional Services	General Cost Inflation	27,870	23,690	24,401	25,133	25,887	26,663	27,463	28,287	29,136	30,010	30,910
Refunds	General Cost Inflation	-	-	-	-	-	-	-	-	-	-	-
Total Materials and Services		$ 154,840	$ 184,949	$ 190,834	$ 196,914	$ 203,195	$ 209,684	$ 216,387	$ 223,314	$ 230,471	$ 237,867	$ 245,510
CAPITAL OUTLAYS												
Machinery and Equipment	Construction Cost Inflation	$ 20,000	$ 20,600	$ 21,218	$ 21,855	$ 22,510	$ 23,185	$ 23,881	$ 24,597	$ 25,335	$ 26,095	$ 26,878
Improvements/Proj Mgr	Construction Cost Inflation	7,130	7,344	7,564	7,791	8,025	8,266	8,514	8,769	9,032	9,303	9,582
Total Capital Outlay		$ 27,130	$ 27,944	$ 28,782	$ 29,646	$ 30,535	$ 31,451	$ 32,395	$ 33,366	$ 34,367	$ 35,398	$ 36,460
TRANSFER TO OTHER FUNDS												
Interfund Loan Advances	General Cost Inflation	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Sanitation	General Cost Inflation	-	-	-	-	-	-	-	-	-	-	-
General Fund	General Cost Inflation	5,000	5,150	5,305	5,464	5,628	5,796	5,970	6,149	6,334	6,524	6,720
Water	General Cost Inflation	-	-	-	-	-	-	-	-	-	-	-
Total Transfers to other Funds		$ 5,000	$ 5,150	$ 5,305	$ 5,464	$ 5,628	$ 5,796	$ 5,970	$ 6,149	$ 6,334	$ 6,524	$ 6,720
OTHER												
Depreciation (a)		$ 87,826	$ 104,951	$ 328,051	$ 363,676	$ 368,676	$ 375,926	$ 383,676	$ 383,676	$ 383,676	$ 383,676	$ 383,676
Additional Costs from CIP		-	191,334	279,328	287,735	361,507	372,145	383,102	394,387	406,011	417,984	430,316
TOTAL EXPENSES		**$ 578,046**	**$ 832,740**	**$ 1,166,633**	**$ 1,234,485**	**$ 1,338,143**	**$ 1,382,034**	**$ 1,427,914**	**$ 1,467,596**	**$ 1,508,898**	**$ 1,551,889**	**$ 1,596,644**
Cash Operating Expenses		*$ 490,220*	*$ 727,789*	*$ 838,582*	*$ 870,809*	*$ 969,467*	*$ 1,006,108*	*$ 1,044,238*	*$ 1,083,920*	*$ 1,125,222*	*$ 1,168,213*	*$ 1,212,968*

(a) Calculated using prior year's expense plus incremental additions for new capital.

City of Warrenton
Sewer Rate Study
Revenue Requirements Analysis

Cash Flow Sufficiency Test

Cash Flow Sufficiency Test	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
	1	2	3	4	5	6	7	8	9	10	11
EXPENSES											
Cash Operating Expenses	$ 490,220	$ 727,789	$ 838,582	$ 870,809	$ 969,467	$ 1,006,108	$ 1,044,238	$ 1,083,920	$ 1,125,222	$ 1,168,213	$ 1,212,968
Existing Debt Service	73,705	89,935	89,135	88,322	63,812	74,244	71,062	71,452	69,982	62,256	63,428
New Debt Service	-	21,141	636,150	659,213	659,213	659,213	659,213	659,213	659,213	659,213	659,213
Rate-Funded Capital Improvement Program	-	-	53,377	10,860	-	14,500	67,030	-	-	-	-
Capital Reserve Funding	-	5,032	54,442	91,977	133,655	164,702	202,925	235,000	267,902	306,233	337,013
Additions Required to Meet Minimum Working Capital	-	109,168	16,619	4,834	14,799	5,496	5,719	5,952	6,195	6,449	6,713
Total Expenses	$ 563,925	$ 953,065	$ 1,688,305	$ 1,726,014	$ 1,840,945	$ 1,924,263	$ 2,050,188	$ 2,055,538	$ 2,128,515	$ 2,202,364	$ 2,279,335
REVENUES											
Sewer Billing/ Utilities	$ 398,000	$ 410,736	$ 423,880	$ 437,444	$ 451,442	$ 465,888	$ 480,796	$ 496,182	$ 512,060	$ 528,446	$ 545,356
Other Revenue	43,590	25,894	26,671	27,471	28,295	29,144	30,018	30,919	31,847	32,802	33,786
Operating Fund Interest Earnings	-	-	5,458	6,289	6,531	7,271	7,546	7,832	8,129	8,439	8,762
Total Revenue	$ 441,590	$ 436,630	$ 456,009	$ 471,204	$ 486,268	$ 502,303	$ 518,361	$ 534,933	$ 552,036	$ 569,687	$ 587,904
CASH TEST REVENUE DEFICIENCY (SURPLUS)	**$ 122,335**	**$ 516,435**	**$ 1,232,296**	**$ 1,254,810**	**$ 1,354,677**	**$ 1,421,959**	**$ 1,531,827**	**$ 1,520,605**	**$ 1,576,479**	**$ 1,632,677**	**$ 1,691,432**

Coverage Sufficiency Test

Coverage Sufficiency Test		FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
EXPENSES												
Cash Operating Expenses		$ 490,220	$ 727,789	$ 838,582	$ 870,809	$ 969,467	$ 1,006,108	$ 1,044,238	$ 1,083,920	$ 1,125,222	$ 1,168,213	$ 1,212,968
Revenue Bond Debt Service		-	-	-	-	-	-	-	-	-	-	-
Revenue Bond Coverage Requirement	1.25	-	-	-	-	-	-	-	-	-	-	-
Other Debt Service and Loan Repayment		73,705	111,076	725,285	747,535	723,025	733,457	730,275	730,665	729,195	721,469	722,641
Total Expenses		$ 563,925	$ 838,865	$ 1,563,867	$ 1,618,344	$ 1,692,492	$ 1,739,565	$ 1,774,513	$ 1,814,585	$ 1,854,417	$ 1,889,683	$ 1,935,609
ALLOWABLE REVENUES												
Sewer Billing/ Utilities		$ 398,000	$ 410,736	$ 423,880	$ 437,444	$ 451,442	$ 465,888	$ 480,796	$ 496,182	$ 512,060	$ 528,446	$ 545,356
Other Revenue		43,590	25,894	26,671	27,471	28,295	29,144	30,018	30,919	31,847	32,802	33,786
Operating and Bond Reserve Interest Earnings		-	-	5,458	6,289	6,531	7,271	7,546	7,832	8,129	8,439	8,762
Total Revenue		$ 441,590	$ 436,630	$ 456,009	$ 471,204	$ 486,268	$ 502,303	$ 518,361	$ 534,933	$ 552,036	$ 569,687	$ 587,904
COVERAGE TEST REVENUE DEFICIENCY (SURPLUS)		**$ 122,335**	**$ 402,235**	**$ 1,107,858**	**$ 1,147,139**	**$ 1,206,224**	**$ 1,237,262**	**$ 1,256,152**	**$ 1,279,652**	**$ 1,302,381**	**$ 1,319,996**	**$ 1,347,705**

City of Warrenton
Sewer Rate Study
Revenue Requirements Analysis

Rate Increase Required	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
Maximum Revenue Deficiency	$ 122,335	$ 516,435	$ 1,232,296	$ 1,254,810	$ 1,354,677	$ 1,421,959	$ 1,531,827	$ 1,520,605	$ 1,576,479	$ 1,632,677	$ 1,691,432
plus: Adjustment to Levelize	5,390	-	39,343	158,470	138,554	-	-	-	-	-	-
Total Additional Revenue Needed	$ 127,725	$ 516,435	$ 1,271,639	$ 1,413,280	$ 1,493,231	$ 1,421,959	$ 1,531,827	$ 1,520,605	$ 1,576,479	$ 1,632,677	$ 1,691,432
Total Revenue Requirement from Rates	$ 525,725	$ 927,171	$ 1,695,518	$ 1,850,723	$ 1,944,673	$ 1,887,847	$ 2,012,623	$ 2,016,787	$ 2,088,539	$ 2,161,123	$ 2,236,788
Use Calculated Rate Increases	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Month of Implementation	April	July	July	July	July	July	July	July	July	July	July
Percent of Revenue Impacted	24.54%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	30.00	30.00	52.00	55.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00
INCREASE OVER EXISTING RATE REVENUE	130.77%	130.77%	300.00%	323.08%	330.77%	330.77%	330.77%	330.77%	330.77%	330.77%	330.77%
ANNUAL RATE INCREASE REQUIRED	130.77%	0.00%	73.33%	5.77%	1.82%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	1	2	3	4	5	6	7	8	9	10	11
Annual Rate Revenue after Increase	$ 525,725	$ 947,852	$ 1,695,518	$ 1,850,723	$ 1,944,673	$ 2,006,902	$ 2,071,123	$ 2,137,399	$ 2,205,796	$ 2,276,381	$ 2,349,226
Net Cash Flow after Rate Increase	$ 5,390	$ 129,850	$ 55,962	$ 163,303	$ 153,353	$ 124,551	$ 64,219	$ 126,564	$ 123,453	$ 121,707	$ 119,151

Fund Activity	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
SEWER FUND (030) Operating Reserve Portion											
Beginning Balance	$ -	$ -	$ 109,168	$ 125,787	$ 130,621	$ 145,420	$ 150,916	$ 156,636	$ 162,588	$ 168,783	$ 175,232
plus: Net Cash Flow after Rate Increase	5,390	129,850	109,338	174,164	153,353	139,051	131,249	126,564	123,453	121,707	119,151
less: Rate-Funded Capital	-	-	53,377	10,860	-	14,500	67,030	-	-	-	-
less: Transfer of Surplus to Construction Portion	5,390	20,681	39,343	158,470	138,554	119,055	58,500	120,612	117,257	115,258	112,438
Ending Balance	$ -	$ 109,168	$ 125,787	$ 130,621	$ 145,420	$ 150,916	$ 156,636	$ 162,588	$ 168,783	$ 175,232	$ 181,945
Minimum Working Capital	*$ -*	*$ 109,168*	*$ 125,787*	*$ 130,621*	*$ 145,420*	*$ 150,916*	*$ 156,636*	*$ 162,588*	*$ 168,783*	*$ 175,232*	*$ 181,945*
SEWER FUND (030) Capital Reserve Portion											
Beginning Balance	$ 83,650	$ 111,916	$ 39,753	$ 95,772	$ 255,235	$ 318,345	$ 299,674	$ 276,408	$ 645,841	$ 1,063,293	$ 1,537,949
plus: Existing Debt Proceeds	50,000	-	-	-	-	-	-	-	-	-	-
plus: Replacement Funding from Rates	-	5,032	54,442	91,977	133,655	164,702	202,925	235,000	267,902	306,233	337,013
plus: Grant Proceeds	-	-	1,000,000	-	-	-	-	-	-	-	-
plus: Net Debt Proceeds	-	275,000	8,000,000	300,000	-	-	-	-	-	-	-
plus: Transfer from Operating Fund	5,390	20,681	39,343	158,470	138,554	119,055	58,500	120,612	117,257	115,258	112,438
plus: Interest Earnings	4,183	5,596	1,988	4,789	12,762	15,917	14,984	13,820	32,292	53,165	76,897
less: Capital Expenditures	31,307	378,472	9,039,753	395,772	221,860	318,345	299,674	-	-	-	-
Ending Balance	$ 111,916	$ 39,753	$ 95,772	$ 255,235	$ 318,345	$ 299,674	$ 276,408	$ 645,841	$ 1,063,293	$ 1,537,949	$ 2,064,297

City of Warrenton
Sewer Rate Study
Revenue Requirements Analysis

Fund Activity (continued)	FY 2001 2002	FY 2002 2003	FY 2003 2004	FY 2004 2005	FY 2005 2006	FY 2006 2007	FY 2007 2008	FY 2008 2009	FY 2009 2010	FY 2010 2011	FY 2011 2012
SDC FUND (036)											
Beginning Balance	$ 32,563	$ 2,628	$ 3,027	$ 3,140	$ 3,241	$ 3,345	$ 3,452	$ 3,563	$ 7,239	$ 11,212	$ 15,498
plus: System Development Charges	1,000	2,896	2,989	3,084	3,183	3,285	3,390	3,498	3,610	3,726	3,845
plus: Interest Earnings	1,628	131	151	157	162	167	173	178	362	561	775
less: SDC-Eligible Improvements	32,563	2,628	3,027	3,140	3,241	3,345	3,452	-	-	-	-
Ending Balance	$ 2,628	$ 3,027	$ 3,140	$ 3,241	$ 3,345	$ 3,452	$ 3,563	$ 7,239	$ 11,212	$ 15,498	$ 20,118

City of Warrenton
Sewer Rate Study
Cost of Service Allocation

Rate Requirement Based on Fiscal Year Ending:	2007
Customer Data Based on Fiscal Year Ending:	2001

Allocation of CIP	FY 2006/2007	Functions of Sewer Service				Allocation Basis
		CUSTOMER	FLOW	TREATMENT BOD	TREATMENT SS	
Miscellaneous Improvements	$ 63,870	100%	0%	0%	0%	per CIP description
Telemetry Upgrade	70,000	0%	100%	0%	0%	per CIP description
Sewer Plant Upgrade	6,330,000	0%	40%	30%	30%	per SWRCB guidelines
Core Conveyance	1,594,000	0%	100%	0%	0%	per CIP description
Upgrade Pump Stations	275,000	0%	100%	0%	0%	per CIP description
Inflow and Infiltration	675,000	0%	100%	0%	0%	per CIP description
Main Avenue Sewer	290,000	0%	100%	0%	0%	per CIP description
Dolphin Road Sewer	310,000	0%	100%	0%	0%	per CIP description
Public Works Facility	300,000	100%	0%	0%	0%	per CIP description
1992 Backhoe	70,000	100%	0%	0%	0%	per CIP description
1995 5 YD truck	50,000	100%	0%	0%	0%	per CIP description
1980 Vactor truck	80,000	100%	0%	0%	0%	per CIP description
1988 Mower	25,000	100%	0%	0%	0%	per CIP description
Compressor	12,000	100%	0%	0%	0%	per CIP description
Vehicle-Engineering	8,000	100%	0%	0%	0%	per CIP description
TV Inspection	30,000	100%	0%	0%	0%	per CIP description
Total CIP	$ 10,182,870	**6%**	**56%**	**19%**	**19%**	calculated CIP allocation factors

Allocation of the Capital Revenue Requirement	FY 2006/2007	Functions of Sewer Service				Allocation Basis
		CUSTOMER	FLOW	TREATMENT BOD	TREATMENT SS	
Existing Debt Service	$ 74,244	6.27%	56.43%	18.65%	18.65%	CIP factor
New Debt Service	$ 659,213	6.27%	56.43%	18.65%	18.65%	CIP factor
Rate-Funded Capital Improvement Program	$ 14,500	6.27%	56.43%	18.65%	18.65%	CIP factor
Capital Reserve Funding	$ 164,702	6.27%	56.43%	18.65%	18.65%	CIP factor
Total Capital Expenditures	**$ 912,658**	**6.27%**	**56.43%**	**18.65%**	**18.65%**	total capital requirement

City of Warrenton
Sewer Rate Study
Cost of Service Allocation

Rate Requirement Based on Fiscal Year Ending:	2007
Customer Data Based on Fiscal Year Ending:	2001

Allocation of the Operating Revenue Requirement	FY 2006/2007	Functions of Sewer Service				Allocation Basis
		CUSTOMER	FLOW	TREATMENT BOD	TREATMENT SS	
PERSONAL SERVICES						
Admin	$ 92,653	30.56%	41.80%	13.82%	13.82%	FTE factor
Public Works	$ 167,714	6.27%	56.43%	18.65%	18.65%	FTE factor
Utillity Billing/Finance	$ 126,665	100.00%	0.00%	0.00%	0.00%	FTE factor
MATERIALS AND SERVICES						
Office Supplies	$ 4,347	100.00%	0.00%	0.00%	0.00%	customer cost
Postage	$ 3,478	100.00%	0.00%	0.00%	0.00%	customer cost
General Supplies	$ 8,695	6.27%	56.43%	18.65%	18.65%	CIP factor
Janitorial Supplies	$ 667	6.27%	56.43%	18.65%	18.65%	CIP factor
Chemical Supplies	$ 5,608	6.27%	56.43%	18.65%	18.65%	CIP factor
Uniforms	$ 1,159	6.27%	56.43%	18.65%	18.65%	CIP factor
Printing/Advertising	$ 1,391	6.27%	56.43%	18.65%	18.65%	CIP factor
Dues/Meetings/Training/Travel	$ 5,217	6.27%	56.43%	18.65%	18.65%	CIP factor
Electricity	$ 33,010	6.27%	56.43%	18.65%	18.65%	CIP factor
Communications	$ 13,911	6.27%	56.43%	18.65%	18.65%	CIP factor
Insurance-Bonds and Fire	$ 11,593	6.27%	56.43%	18.65%	18.65%	CIP factor
Gasoline/Oil Lubricants	$ 8,391	6.27%	56.43%	18.65%	18.65%	CIP factor
Equipment Maintenance	$ 50,776	6.27%	56.43%	18.65%	18.65%	CIP factor
Repair and Maintenance	$ 34,778	6.27%	56.43%	18.65%	18.65%	CIP factor
Professional Services	$ 26,663	6.27%	56.43%	18.65%	18.65%	CIP factor
Refunds	$ -	6.27%	56.43%	18.65%	18.65%	CIP factor
CAPITAL OUTLAYS						
Machinery and Equipment	$ 23,185	6.27%	56.43%	18.65%	18.65%	CIP factor
Improvements/Proj Mgr	$ 8,266	6.27%	56.43%	18.65%	18.65%	CIP factor
TRANSFER TO OTHER FUNDS						

City of Warrenton
Sewer Rate Study
Cost of Service Allocation

Rate Requirement Based on Fiscal Year Ending:	2007
Customer Data Based on Fiscal Year Ending:	2001

Interfund Loan Advances	$	-	100.00%	0.00%	0.00%	0.00%	customer cost
Sanitation	$	-	100.00%	0.00%	0.00%	0.00%	customer cost
General Fund	$	5,796	100.00%	0.00%	0.00%	0.00%	customer cost
Water	$	-	100.00%	0.00%	0.00%	0.00%	customer cost
Additional Costs from CIP	$	372,145	30.56%	41.80%	13.82%	13.82%	CIP factor
Total Operating Expenditures	**$**	**1,006,108**	**30.56%**	**41.80%**	**13.82%**	**13.82%**	total operating requirement

City of Warrenton
Sewer Rate Study
Cost of Service Allocation

Rate Requirement Based on Fiscal Year Ending:	2007
Customer Data Based on Fiscal Year Ending:	2001

Functional Allocation of Total Revenue Requirement	FY 2006/2007	Functions of Sewer Service				Allocation Basis
		CUSTOMER	FLOW	TREATMENT BOD	TREATMENT SS	
Capital Requirement	$ 912,658	$ 57,260	$ 514,996	$ 170,201	$ 170,201	as total operating requirement
Operating Requirement	1,006,108	307,508	420,595	139,003	139,003	as total capital requirement
Gross Revenue Requirement	$ 1,918,766	$ 364,768	$ 935,590	$ 309,204	$ 309,204	gross requirement
Other Revenue	$ (29,144)	(5,540)	(14,211)	(4,697)	(4,697)	allocated per gross requirement
Operating Fund Interest Earnings	$ (7,271)	(1,382)	(3,545)	(1,172)	(1,172)	
Additional Cash to Meet Working Capital	$ 5,496	1,680	2,298	759	759	allocated per total operating req't
Cash Surplus Generated by Rates	119,055	22,633	58,051	19,185	19,185	allocated per gross requirement
Net Rate Revenue Requirement	**$ 2,006,902**	**$ 382,158**	**$ 978,183**	**$ 323,280**	**$ 323,280**	rate revenue requirement
Distribution	100%	19%	49%	16%	16%	
Check: Revenue After Rate Increase	*$ 2,006,902*					

$ -

Select Revenue Requirement to Use in Rate Desigr	Calculated				
[a] Amount of Rate Revenue to Generate:	$ -	$ -	$ -	$ -	$ -
(Distributed to functions as total requirement.)					

City of Warrenton
Sewer Rate Study
Customer Class Data and Allocations

Rate Requirement Based on Fiscal Year Ending:	2002
Customer Data Based on Fiscal Year Ending:	2001

Grouping of Customer Classes	Customer Class									
	BASIC SINGLE UNIT	BIOPRODUCTS	W. DEEP SEA	FORT STEVENS	METERED SEWER	PAC COAST SEAFOODS	POINT ADAMS PACKING	W. GRADE SCHOOL	W. HIGH SCHOOL	W. MOBILE HOME ESTATES
Select Group to Combine Customer Data	Do Not Group	Do Not Group	Do Not Group	Do Not Group	Do Not Group	Do Not Group	Do Not Group	Do Not Group	Do Not Group	Do Not Group

Billing Cycle	Customer Class									
	BASIC SINGLE UNIT	BIOPRODUCTS	W. DEEP SEA	FORT STEVENS	METERED SEWER	PAC COAST SEAFOODS	POINT ADAMS PACKING	W. GRADE SCHOOL	W. HIGH SCHOOL	W. MOBILE HOME ESTATES
Number of Months per Billing Cycle	1	1	1	1	1	1	1	1	1	1

Annual Bills	Total Utility	Customer Class									
		BASIC SINGLE UNIT	BIOPRODUCTS	W. DEEP SEA	FORT STEVENS	METERED SEWER	PAC COAST SEAFOODS	POINT ADAMS PACKING	W. GRADE SCHOOL	W. HIGH SCHOOL	W. MOBILE HOME ESTATES
Total Annual Bills	20,638	18,986	12	23	12	1,535	23	12	12	12	12
Grand Total	**20,638**	**18,986**	**12**	**23**	**12**	**1,535**	**23**	**12**	**12**	**12**	**12**
Informational: Number of Accounts	*1,720*	*1,582*	*1*	*2*	*1*	*128*	*2*	*1*	*1*	*1*	*1*

Total Consumption	Total Utility	Customer Class									
		BASIC SINGLE UNIT	BIOPRODUCTS	W. DEEP SEA	FORT STEVENS	METERED SEWER	PAC COAST SEAFOODS	POINT ADAMS PACKING	W. GRADE SCHOOL	W. HIGH SCHOOL	W. MOBILE HOME ESTATES
Total Annual Consumption (kgal)	79,341	-	-	-	-	79,341	-	-	-	-	-
Grand Total	**79,341**	-	-	-	-	**79,341**	-	-	-	-	-

City of Warrenton
Sewer Rate Study
Customer Class Data and Allocations

Estimated ERUs	Total Utility	Customer Class									
		BASIC SINGLE UNIT	BIOPRODUCTS	W. DEEP SEA	FORT STEVENS	METERED SEWER	PAC COAST SEAFOODS	POINT ADAMS PACKING	W. GRADE SCHOOL	W. HIGH SCHOOL	W. MOBILE HOME ESTATES
Total Estimated Annual Flow (gal)		-	216,000	132,000	4,909,250	79,340,606	558,000	468,000	420,000	1,440,000	2,220,000
Flow per unit factor (kgal/day)			25	25	25	-	25	25	10	20	164
Number of Units			36	22	538		93	78	175	300	37
Days of Use/Month			20	20	30		20	20	20	20	30
Basis for flow calculation			per employee	per employee	per campsite		per employee	per employee	per student and staff	per student and staff	per mobile home unit
ERU basis (gallons)			5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
TOTAL ESTIMATED ERUs	3,077	1,582	4	2	82	1,322	9	8	7	24	37
Grand Total	**3,077**	**1,582**	**4**	**2**	**82**	**1,322**	**9**	**8**	**7**	**24**	**37**

Weighted ERUs (BOD Treatment)	Total Utility	Customer Class									
		BASIC SINGLE UNIT	BIOPRODUCTS	W. DEEP SEA	FORT STEVENS	METERED SEWER	PAC COAST SEAFOODS	POINT ADAMS PACKING	W. GRADE SCHOOL	W. HIGH SCHOOL	W. MOBILE HOME ESTATES
Ratio of BOD Strength to be Treated		1.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Grand Total	**3,159**	**1,582**	**3.60**	**2**	**164**	**1,322**	**9**	**8**	**7**	**24**	**37**

Allocation of BOD Costs	Total Utility	BASIC SINGLE UNIT	BIOPRODUCTS	W. DEEP SEA	FORT STEVENS	METERED SEWER	PAC COAST SEAFOODS	POINT ADAMS PACKING	W. GRADE SCHOOL	W. HIGH SCHOOL	W. MOBILE HOME ESTATES
Grand Total	**$ 323,280**	**$ 161,911**	**$ 368**	**$ 225**	**$ 16,746**	**$ 135,321**	**$ 952**	**$ 798**	**$ 716**	**$ 2,456**	**$ 3,786**

City of Warrenton
Sewer Rate Study
Customer Class Data and Allocations

Weighted Flow (SS Treatment)	Total Utility	Customer Class BASIC SINGLE UNIT	BIOPRODUCTS	W. DEEP SEA	FORT STEVENS	METERED SEWER	PAC COAST SEAFOODS	POINT ADAMS PACKING	W. GRADE SCHOOL	W. HIGH SCHOOL	W. MOBILE HOME ESTATES
Ratio of SS Strength to be Treated		1.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Grand Total	3,159	1,582	4	2	164	1,322	9	8	7	24	37

Allocation of SS Costs	Total Utility	BASIC SINGLE UNIT	BIOPRODUCTS	W. DEEP SEA	FORT STEVENS	METERED SEWER	PAC COAST SEAFOODS	POINT ADAMS PACKING	W. GRADE SCHOOL	W. HIGH SCHOOL	W. MOBILE HOME ESTATES
Grand Total	$ 323,280	$ 161,911	$ 368	$ 225	$ 16,746	$ 135,321	$ 952	$ 798	$ 716	$ 2,456	$ 3,786

FUNCTIONAL COSTS	ALLOC. BASIS	BASIC SINGLE UNIT	BIOPRODUCTS	W. DEEP SEA	FORT STEVENS	METERED SEWER	PAC COAST SEAFOODS	POINT ADAMS PACKING	W. GRADE SCHOOL	W. HIGH SCHOOL	W. MOBILE HOME ESTATES
Customer	accounts	1,582	1	2	1	128	2	1	1	1	1
Flow	eru's	1,582	4	2	82	1,322	9	8	7	24	37
Treatment BOD	eru's	1,582	4	2	164	1,322	9	8	7	24	37
Treatment SS	eru's	1,582	4	2	164	1,322	9	8	7	24	37

FUNCTIONAL COSTS	TOTAL ALLOC'S	BASIC SINGLE UNIT	BIOPRODUCTS	W. DEEP SEA	FORT STEVENS	METERED SEWER	PAC COAST SEAFOODS	POINT ADAMS PACKING	W. GRADE SCHOOL	W. HIGH SCHOOL	W. MOBILE HOME ESTATES
Customer	1,720	92%	0%	0%	0%	7%	0%	0%	0%	0%	0%
Flow	3,077	51%	0%	0%	3%	43%	0%	0%	0%	1%	1%
Treatment BOD	3,159	50%	0%	0%	5%	42%	0%	0%	0%	1%	1%
Treatment SS	3,159	50%	0%	0%	5%	42%	0%	0%	0%	1%	1%

FUNCTIONAL COSTS	TOTAL COSTS	BASIC SINGLE UNIT	BIOPRODUCTS	W. DEEP SEA	FORT STEVENS	METERED SEWER	PAC COAST SEAFOODS	POINT ADAMS PACKING	W. GRADE SCHOOL	W. HIGH SCHOOL	W. MOBILE HOME ESTATES
Customer	$382,158	$351,570	$217	$434	$217	$28,420	$434	$217	$217	$217	$217
Flow	$978,183	$502,936	$1,144	$699	$26,009	$420,343	$2,958	$2,479	$2,225	$7,629	$11,761
Treatment BOD	$323,280	$161,911	$368	$225	$16,746	$135,321	$952	$798	$716	$2,456	$3,786
Treatment SS	$323,280	$161,911	$368	$225	$16,746	$135,321	$952	$798	$716	$2,456	$3,786
Grand Total	$2,006,902	$1,178,328	$2,098	$1,583	$59,718	$719,406	$5,293	$4,293	$3,875	$12,758	$19,551

City of Warrenton
Sewer Rate Study
Unit Cost Development

Alloc Yr (1st yr of FY)
2006
Annual Escalator
117.1%

Basic Single Unit						
Allocated Costs		**Unit Cost Basis**		**Unit Cost**	**Recovery Policy**	**Rate Component**
FUNCTION	AMOUNT	FACTOR	AMOUNT			
Customer	$ 382,158	Utility Annual Bills	2,013	$15.82	100%	$15.82
Flow	$ 978,183	Utility Estimated Flow	3,602	$22.63	0%	$0.00
Flow	$ 978,183	Utility Estimated ERUs	3,602	$22.63	100%	$22.63
Treatment BOD	$ 161,911	Group Estimated Flow ERUs	1,852	$7.29	100%	$7.29
Treatment BOD	$ 161,911	Group Estimated Strength ERUs	1,852	$87.42	0%	$0.00
SS	$ 161,911	Group Estimated Flow ERUs	1,852	$7.29	100%	$7.29
SS	$ 161,911	Group Estimated Strength ERUs	1,852	$87.42	0%	$0.00

Bioproducts						
Allocated Costs		**Unit Cost Basis**		**Unit Cost**	**Recovery Policy**	**Rate Component**
FUNCTION	AMOUNT	FACTOR	AMOUNT			
Customer	$ 382,158	Utility Estimated ERUs	3,602	$8.84	100%	$8.84
Flow	$ 978,183	Utility Estimated Flow	3,602	$22.63	0%	$0.00
Flow	$ 978,183	Utility Estimated ERUs	3,602	$22.63	100%	$22.63
Treatment BOD	$ 368	Group Estimated Flow ERUs	4	$7.29	100%	$7.29
Treatment BOD	$ 368	Group Estimated Strength ERUs	4	$87.42	0%	$0.00
SS	$ 368	Group Estimated Flow ERUs	4	$7.29	100%	$7.29
SS	$ 368	Group Estimated Strength ERUs	4	$87.42	0%	$0.00

City of Warrenton
Sewer Rate Study
Unit Cost Development

Warrenton Deep Sea							
Allocated Costs		Unit Cost Basis		Unit Cost	Recovery Policy	Rate Component
FUNCTION	AMOUNT		FACTOR	AMOUNT			
Customer	$	382,158	Utility Estimated ERUs	3,602	$8.84	100%	$8.84
Flow	$	978,183	Utility Estimated Flow	3,602	$22.63	0%	$0.00
Flow	$	978,183	Utility Estimated ERUs	3,602	$22.63	100%	$22.63
Treatment BOD	$	225	Group Estimated Flow ERUs	3	$7.29	100%	$7.29
Treatment BOD	$	225	Group Estimated Strength ERUs	3	$87.42	0%	$0.00
SS	$	225	Group Estimated Flow ERUs	3	$7.29	100%	$7.29
SS	$	225	Group Estimated Strength ERUs	3	$87.42	0%	$0.00

Fort Stevens							
Allocated Costs			Unit Cost Basis		Unit Cost	Recovery Policy	Rate Component
FUNCTION	AMOUNT		FACTOR	AMOUNT			
Customer	$	382,158	Utility Estimated ERUs	3,602	$8.84	100%	$8.84
Flow	$	978,183	Utility Estimated Flow	3,602	$22.63	0%	$0.00
Flow	$	978,183	Utility Estimated ERUs	3,602	$22.63	100%	$22.63
Treatment BOD	$	16,746	Group Estimated Flow ERUs	96	$14.57	100%	$14.57
Treatment BOD	$	16,746	Group Estimated Strength ERUs	192	$87.42	0%	$0.00
SS	$	16,746	Group Estimated Flow ERUs	96	$14.57	100%	$14.57
SS	$	16,746	Group Estimated Strength ERUs	192	$87.42	0%	$0.00

City of Warrenton
Sewer Rate Study
Unit Cost Development

Metered Sewer

Allocated Costs		Unit Cost Basis		Unit Cost	Recovery Policy	Rate Component
FUNCTION	AMOUNT	FACTOR	AMOUNT			
Customer	$ 382,158	Utility Estimated ERUs	3,602	$8.84	100%	$8.84
Flow	$ 978,183	Utility Estimated Flow	3,602	$22.63	0%	$0.00
Flow	$ 978,183	Utility Estimated ERUs	3,602	$22.63	100%	$22.63
Treatment BOD	$ 135,321	Group Estimated Flow ERUs	1,548	$7.29	100%	$7.29
Treatment BOD	$ 135,321	Group Estimated Strength ERUs	1,548	$87.42	0%	$0.00
SS	$ 135,321	Group Estimated Flow ERUs	1,548	$7.29	100%	$7.29
SS	$ 135,321	Group Estimated Strength ERUs	1,548	$87.42	0%	$0.00

Pacific Coast Seafoods

Allocated Costs		Unit Cost Basis		Unit Cost	Recovery Policy	Rate Component
FUNCTION	AMOUNT	FACTOR	AMOUNT			
Customer	$ 382,158	Utility Estimated ERUs	3,602	$8.84	100%	$8.84
Flow	$ 978,183	Utility Estimated Flow	3,602	$22.63	0%	$0.00
Flow	$ 978,183	Utility Estimated ERUs	3,602	$22.63	100%	$22.63
Treatment BOD	$ 952	Group Estimated Flow ERUs	11	$7.29	100%	$7.29
Treatment BOD	$ 952	Group Estimated Strength ERUs	11	$87.42	0%	$0.00
SS	$ 952	Group Estimated Flow ERUs	11	$7.29	100%	$7.29
SS	$ 952	Group Estimated Strength ERUs	11	$87.42	0%	$0.00

City of Warrenton
Sewer Rate Study
Unit Cost Development

Point Adams Packing						
Allocated Costs		Unit Cost Basis		Unit Cost	Recovery Policy	Rate Component
FUNCTION	AMOUNT	FACTOR	AMOUNT			
Customer	$ 382,158	Utility Estimated ERUs	3,602	$8.84	100%	$8.84
Flow	$ 978,183	Utility Estimated Flow	3,602	$22.63	0%	$0.00
Flow	$ 978,183	Utility Estimated ERUs	3,602	$22.63	100%	$22.63
Treatment BOD	$ 798	Group Estimated Flow ERUs	9	$7.29	100%	$7.29
Treatment BOD	$ 798	Group Estimated Strength ERUs	9	$87.42	0%	$0.00
SS	$ 798	Group Estimated Flow ERUs	9	$7.29	100%	$7.29
SS	$ 798	Group Estimated Strength ERUs	9	$87.42	0%	$0.00

Warrenton Grade School						
Allocated Costs		Unit Cost Basis		Unit Cost	Recovery Policy	Rate Component
FUNCTION	AMOUNT	FACTOR	AMOUNT			
Customer	$ 382,158	Utility Estimated ERUs	3,602	$8.84	100%	$8.84
Flow	$ 978,183	Utility Estimated Flow	3,602	$22.63	0%	$0.00
Flow	$ 978,183	Utility Estimated ERUs	3,602	$22.63	100%	$22.63
Treatment BOD	$ 716	Group Estimated Flow ERUs	8	$7.29	100%	$7.29
Treatment BOD	$ 716	Group Estimated Strength ERUs	8	$87.42	0%	$0.00
SS	$ 716	Group Estimated Flow ERUs	8	$7.29	100%	$7.29
SS	$ 716	Group Estimated Strength ERUs	8	$87.42	0%	$0.00

City of Warrenton
Sewer Rate Study
Unit Cost Development

Warrenton High School

Allocated Costs		Unit Cost Basis		Unit Cost	Recovery Policy	Rate Component
FUNCTION	AMOUNT	FACTOR	AMOUNT			
Customer	$ 382,158	Utility Estimated ERUs	3,602	$8.84	100%	$8.84
Flow	$ 978,183	Utility Estimated Flow	3,602	$22.63	0%	$0.00
Flow	$ 978,183	Utility Estimated ERUs	3,602	$22.63	100%	$22.63
Treatment BOD	$ 2,456	Group Estimated Flow ERUs	28	$7.29	100%	$7.29
Treatment BOD	$ 2,456	Group Estimated Strength ERUs	28	$87.42	0%	$0.00
SS	$ 2,456	Group Estimated Flow ERUs	28	$7.29	100%	$7.29
SS	$ 2,456	Group Estimated Strength ERUs	28	$87.42	0%	$0.00

Warrenton Mobile Home Estates

Allocated Costs		Unit Cost Basis		Unit Cost	Recovery Policy	Rate Component
FUNCTION	AMOUNT	FACTOR	AMOUNT			
Customer	$ 382,158	Utility Estimated ERUs	3,602	$8.84	100%	$8.84
Flow	$ 978,183	Utility Estimated Flow	3,602	$22.63	0%	$0.00
Flow	$ 978,183	Utility Estimated ERUs	3,602	$22.63	100%	$22.63
Treatment BOD	$ 3,786	Group Estimated Flow ERUs	43	$7.29	100%	$7.29
Treatment BOD	$ 3,786	Group Estimated Strength ERUs	43	$87.42	0%	$0.00
SS	$ 3,786	Group Estimated Flow ERUs	43	$7.29	100%	$7.29
SS	$ 3,786	Group Estimated Strength ERUs	43	$87.42	0%	$0.00

City of Warrenton
Sewer Rate Study
Existing Rate Options

Current Warrenton Sewer Rates

Rate Code	Class	Monthly Base Rate	Rate per 1000 gallons
000	No Sewer	$ -	$ -
BAS	Basic Single Unit	$ 13.00	$ -
BIO	Bioproducts	$ 40.85	
DEE	Warrenton Deep Sea	$ 18.75	
FTS	Fort Stevens	$ 1,023.75	
MET	Metered Sewer	$ 5.75	$ 1.50
PAC	Pacific Coast Seafoods	$ 85.05	
PTA	Point Adams Packing	$ 23.30	
WGS	Warrenton Grade School	$ 152.77	
WHS	Warrenton High School	$ 152.77	
WME	Warrenton Mobile Home Esta	$ 392.92	

Current Sewer Rates with Applied '01-'02 Increase [a]

Rate Code	Class	Monthly Base Rate	Rate per 1000 gallons
000	No Sewer	$ -	$ -
BAS	Basic Single Unit	$ 30.00	$ -
BIO	Bioproducts	$ 94.27	$ -
DEE	Warrenton Deep Sea	$ 43.27	$ -
FTS	Fort Stevens	$ 2,362.50	$ -
MET	Metered Sewer	$ 13.27	$ 3.46
PAC	Pacific Coast Seafoods	$ 196.27	$ -
PTA	Point Adams Packing	$ 53.77	$ -
WGS	Warrenton Grade School	$ 352.55	$ -
WHS	Warrenton High School	$ 352.55	$ -
WME	Warrenton Mobile Home Esta	$ 906.74	$ -

[a] 2001-2002 increase applied in April is 131%-no increase is planned for 2002-2003

Warrenton Current Sewer Rates	01-'02 before increase annual bills	volume	base revenue	vol revenue	total revenue	share of total
Basic Single Unit	18,986	0	246,819	-	246,819	62%
Bioproducts	12	0	478	-	478	0%
Warrenton Deep Sea	23	0	439	-	439	0%
Fort Stevens	12	0	11,986	-	11,986	3%
Metered Sewer	1,535	79,341	8,825	119,011	127,836	32%
Pacific Coast Seafoods	23	0	1,992	-	1,992	1%
Point Adams Packing	12	0	273	-	273	0%
Warrenton Grade School	12	0	1,789	-	1,789	0%
Warrenton High School	12	0	1,789	-	1,789	0%
Warrenton Mobile Home Esta	12	0	4,600	-	4,600	1%
	revenue before increase				$ 398,000	0%
	check to: revenue before increase				$ 398,000	100%

Warrenton 2002-2003 Sewer Rates	02-'03 revenue after '01-'02 increase annual bills	volume	base revenue	vol revenue	total revenue	share of total	revenue change from current
Basic Single Unit	19,594	0	587,808	-	587,808	62%	138%
Bioproducts	12	0	1,139	-	1,139	0%	138%
Warrenton Deep Sea	24	0	1,046	-	1,046	0%	138%
Fort Stevens	12	0	28,546	-	28,546	3%	138%
Metered Sewer	1,584	81,880	21,017	283,429	304,446	32%	138%
Pacific Coast Seafoods	24	0	4,743	-	4,743	1%	138%
Point Adams Packing	12	0	650	-	650	0%	138%
Warrenton Grade School	12	0	4,260	-	4,260	0%	138%
Warrenton High School	12	0	4,260	-	4,260	0%	138%
Warrenton Mobile Home Esta	12	0	10,956	-	10,956	1%	138%
	02-'03 revenue with 01-02 increase				$ 947,853	0%	138%
	check to: rate revenue after increase				$ 947,852	0.0%	138%

City of Warrenton
Sewer Rate Study
Cost of Service Rates

Unit Cost Components	per Acct	per Flow ERU	per BOD ERU	per SS ERU
Basic Single Unit	$ 15.82	$ 22.63	$ 7.29	$ 7.29
Bioproducts	$ 15.82	$ 22.63	$ 7.29	$ 7.29
Warrenton Deep Sea	$ 15.82	$ 22.63	$ 7.29	$ 7.29
Fort Stevens	$ 15.82	$ 22.63	$ 7.29	$ 7.29
Metered Sewer	$ 15.82	$ 22.63	$ 7.29	$ 7.29
Pacific Coast Seafoods	$ 15.82	$ 22.63	$ 7.29	$ 7.29
Point Adams Packing	$ 15.82	$ 22.63	$ 7.29	$ 7.29
Warrenton Grade School	$ 15.82	$ 22.63	$ 7.29	$ 7.29
Warrenton High School	$ 15.82	$ 22.63	$ 7.29	$ 7.29
Warrenton Mobile Home Estates	$ 15.82	$ 22.63	$ 7.29	$ 7.29

% Adj. to 02/03
53.57%

Compilation of Rates for 2006/2007 Test Year	Unit Cost Compilations						Test Year: 2006/2007 Rates		Back into 2002/2003 Rates	
	# Flow ERU's/Acct	Flow Rate per Account	# BOD ERU's/Acct	BOD Rate per Account	# SS ERU's/Acct	SS Rate per	Flat Rate/Acct	Vol Rate/Kgal	Flat Rate/Acct	Vol Rate/Kgal
Basic Single Unit	1	$22.63	1	$7.29	1	$7.29	$53.02	$7.44	**$28.40**	**$3.99**
Bioproducts	3.69	$83.50	3.69	$26.88	3.69	$26.88	$153.08	$7.44	**$82.00**	**$3.99**
Warrenton Deep Sea	1.13	$25.51	1.13	$8.21	1.13	$8.21	$57.76	$7.44	**$30.94**	**$3.99**
Fort Stevens	83.86	$1,897.70	167.72	$1,221.86	167.72	$1,221.86	$4,357.23	$10.35	**$2,334.23**	**$5.55**
Metered Sewer	1.00	$22.63	1.00	$7.29	1.00	$7.29	$53.02	$7.44	**$28.40**	**$3.99**
Pacific Coast Seafoods	4.77	$107.85	4.77	$34.72	4.77	$34.72	$193.11	$7.44	**$103.45**	**$3.99**
Point Adams Packing	7.99	$180.91	7.99	$58.24	7.99	$58.24	$313.21	$7.44	**$167.79**	**$3.99**
Warrenton Grade School	7.17	$162.35	7.17	$52.27	7.17	$52.27	$282.71	$7.44	**$151.45**	**$3.99**
Warrenton High School	24.60	$556.64	24.60	$179.20	24.60	$179.20	$930.86	$7.44	**$498.67**	**$3.99**
Warrenton Mobile Home Estates	37.92	$858.15	37.92	$276.27	37.92	$276.27	$1,426.51	$7.44	**$764.20**	**$3.99**

City of Warrenton
Sewer Rate Study
Cost of Service Rates

COS Price-Out to 2006/07	# Bills	Metered Flow >5Kgal	Base Rev	Vol Rev	Total Rev
Basic Single Unit	22,225	-	$ 1,178,328	$ -	$ 1,178,328
Bioproducts	14	-	$ 2,098	$ -	$ 2,098
Warrenton Deep Sea	27	-	$ 1,583	$ -	$ 1,583
Fort Stevens	14	-	$ 59,718	$ -	$ 59,718
Metered Sewer	1,797	83,891	$ 95,253	$ 624,153	$ 719,406
Pacific Coast Seafoods	27	-	$ 5,293	$ -	$ 5,293
Point Adams Packing	14	-	$ 4,293	$ -	$ 4,293
Warrenton Grade School	14	-	$ 3,875	$ -	$ 3,875
Warrenton High School	14	-	$ 12,758	$ -	$ 12,758
Warrenton Mobile Home Estates	14	-	$ 19,551	$ -	$ 19,551
TOTAL	24,158	83,891	$ 1,382,749	$ 624,153	$ 2,006,902
2006/2007 REVENUE REQ'T					$ 2,006,902
PERCENT ERROR					0.00%

COS Price-Out to 2002/03:	# Bills	Metered Flow >5Kgal	Base Rev	Vol Rev	Total Rev
Basic Single Unit	19,594	-	$ 556,520	$ -	$ 556,520
Bioproducts	12	-	$ 991	$ -	$ 991
Warrenton Deep Sea	24	-	$ 748	$ -	$ 748
Fort Stevens	12	-	$ 28,205	$ -	$ 28,205
Metered Sewer	1,584	73,960	$ 44,987	$ 294,785	$ 339,773
Pacific Coast Seafoods	24	-	$ 2,500	$ -	$ 2,500
Point Adams Packing	12	-	$ 2,027	$ -	$ 2,027
Warrenton Grade School	12	-	$ 1,830	$ -	$ 1,830
Warrenton High School	12	-	$ 6,026	$ -	$ 6,026
Warrenton Mobile Home Estates	12	-	$ 9,234	$ -	$ 9,234
TOTAL	21,298	73,960	$ 653,067	$ 294,785	$ 947,852
2002/2003 REVENUE REQ'T					$ 947,852
PERCENT ERROR					0.00%

APPENDIX – F
(Miscellaneous Correspondence)

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
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Portland, OR 97201-4987
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November 4, 2002

Scott Derickson, Manager
City of Warrenton
PO Box 250
Warrenton, OR 97146

Re: WQ - City of Warrenton
File No. 93769
Clatsop County
Comments on Draft Wastewater Facilities Plan

Dear Scott Derickson,

Thank you for this opportunity to comment on the draft wastewater facilities plan dated September, 2002, which we received September 26 from Ron Larson and Jeff Harrington PE of HLB & Associates.

We had very few comments, as attached to this letter. Please have each comment addressed prior to printing the final plan.

As you may know, we have already approved Rick Esveldt's interim treatment design concept. The final allocations and schedule must be revised as noted in our attached comments on Appendix A. The next step is urgent submittal of a pre-design report and procurement documents for the interim treatment facilities. We must review and approve the procurement documentation per OAR 340-52. We are especially interested in the performance and materials specifications for equipment that will be purchased for the interim facilities.

INQUIRIES

Please do not hesitate to call me if you or your consultants would like to discuss any of these attached comments (503/229-5310). Inquiries about the MAO should be directed to Beth Moore or Bob Baumgartner.

Respectfully,

David S. Mann, P.E.
Senior Environmental Engineer
NW Regional Water Quality

Attachment: Review Comments
cc:
Alan Johansson PE, Warrenton City Engineer, PO Box 250, Warrenton
Ron Larson PE, HLB & Associates, PO Box 219, Manzanita 97130
Rick Esveldt PE, HR Esveldt Engineering, 6450 NE Brigham Road, Bainbridge Island, WA 98110
Beth Moore, DEQ Compliance Officer, NWR
Bruce Henderson, Biosolids Coordinator, NWR
Richard Santner, SRF Project Officer, NWR
Robert P. Baumgartner, Manager, NWR
DSM/S
ec: DEQ regional sanitary engineers

REVIEW COMMENTS
WARRENTON DRAFT WASTEWATER FACILITIES PLAN

November 4, 2002

Section 4, Existing Wastewater Facilities

This section reflects an exemplary quality of work on pump station description and analysis. We have already pre-approved a few minor revisions that remain to be made, per conversations with HLB staff.

SECTION 5, Wastewater Characteristics

The report on wastewater loadings from Ft Stevens State Park has not been received. Kindly provide one copy to inform our review of this section.

Biosolids:

Appendix C Page 3-4: Please provide the specific reference in 40 CFR 503 where it is stated that a lagoon that has not had waste (raw) sludge added for at least the previous two yearswill meet the requirements for Class A biosolids. Preparation for handling of Class B biosolids in the future is advised. One year prior to removing the biosolids from the sludge storage lagoon a new Biosolids Mangement plan would be required to be submitted for approval.

Appendix J: Bruce Henderson will be in contact with Michael Dees of Lee Engineering to discuss his comments on the biosolids management plan. He made comments to Susan Foreman of Lee Engineering, however Susan Foreman is no longer with Lee Engineering.

Mixing Zone Study:

DEQ regulations require that the size of the mixing zone be designed to minimize adverse effects on the indigenous biological community especially when species are present that warrant special protection. Please provide a discussion of critical or biologically unique habitat, threatened and endangered species potential, as it pertains to the location of the proposed outfall in this document. Please present information confirming that their proposed mixing zone meets these criteria

The proposed discharge targets deep water, but is outside of the main channel (due to restrictions on structures in navigation channels). It is important that the discharge take advantage of the large dilution available by the main conveyance of the Columbia River tidal channel. Please discuss the orientation of the plume. Were velocity vectors measured with drogues? What is proximity of plume to near-shore bank? We do not want the discharge plume to encroach on the tidal shores that we are working to remove it from. This should not be difficult to demonstrate with existing modeling.

It would be beneficial for some discussion of a "re-entrainment potential" analysis to exist in this study.

If additional ambient and effluent data cannot be collected, then the PLUMES model should be run with sensitivity analysis for impact on dilution under different stratification and flow regimes. Several simulation cases are presented in attachment E. These cases should be summarized in a table demonstrating modeling sensitivity to various parameters, both ambient and effluent. The sensitivity analysis should consider ambient velocity maximums in addition to the current analysis. High ambient velocity scenarios might impede as opposed to enhance dilution. DEQ guidance recommends that the mixing zone be sized in part based on centerline dilution, which for some discharge scenarios such as straight pipe-single outfall, can be much less than average dilution. Diffuser average versus centerline dilution should be similar, but we still require centerline dilution.

Appendix B Page 7: Given a maximum ambient pH of 8.2, and a 90[th] percentile temperature of 20.1°C the acute criterion for freshwater ammonia is 3.6 mg/L.

Appendix B page 26 Dissolved Oxygen Model
Please evaluate DO profiles and measure impact of discharge into different DO "layers" along with potential entrainment effects. Please provide more details regarding how BOD modeling was parameterized. All calculations and choice of kinetic rates should be presented, at least as an attachment. The general 301(h) guidance for simple estuarine DO modeling is cited. Specific 301(h) guidance should be cited.

Appendix B Page 25 Table 10 Reasonable Potential Analysis:
Please note which was more stringent the freshwater or saltwater criteria for which the reasonable potential analysis was done.

Ammonia: The reasonable potential analysis for **ammonia** uses a maximum effluent concentration of 5 **mg/L**. This may be more of a design ammonia effluent than a maximum. If more conservative **maximum ammonia** effluent concentration of **20 mg/L** was used then the results of the reasonable potential analysis would change. The reasonable potential analysis would show that a limit for ammonia should be set for the Deepwater Discharge-12-inch Nozzle.

Metals: The reasonable potential analysis for metals uses a multiplier associated with 10 samples. If the reasonable potential analysis was conducted with the multiplier associated with 3 samples, the results of the reasonable potential analysis would change. The reasonable potential analysis would show that a limit should also be set for **copper** for the 8-port diffuser scenario.

Permit Limits

Appendix C Page 3-5: The dilutions associated with the mixing zone study are still being evaluated. The following discussion of permit limits presented below are applicable for the proposed alternative and dependent upon the dilutions obtained from the mixing zone study:

Pollutant	Facultative Lagoon Permit Limits Year round	Sequencing Batch Reactor 2023 With deep 8 port diffuser Dilutions: ZID 23 and MZ 120	
BOD_5	**Year Round**	**Summer**	**Winter**
Concentration (mg/L) monthly/weekly	30/45	20/30	30/45
Monthly lb/day	112 (@ 0.45 mgd average dry weather flow)	167 (at 1.0 mgd MDWMF)	400 (at 1.6 mgd MWWMF)
Weekly lb/day	169	250	600
Daily lb/day	225	334	801
TSS	**Year Round**	**Summer**	**Winter**

Concentration (mg/L) monthly/weekly	50/80	20/30	30/45
Monthly lb/day	188 @ 0.45 mgd average dry weather flow)	167 (at 1.0 mgd MDWMF)	400 (at 1.6 mgd MWWMF)
Weekly lb/day	300	250	600
Daily lb/day	375	334	801
Percent Removal Efficiency Year Round			
BOD	Shall not be less than 85 monthly average	85	
TSS	Shall not be less than 65 monthly average	85	
Bacteria Organisms/100ml Year round	Fecal Coliform	*E. coli*	
Monthly	200	Shall not exceed a 30-day log mean of 126. No single sample shall exceed 406. Based on a minimum of (5) samples.	
Weekly	400		
pH	6-9	6-9	

Bacteria

The bacteria standard listed above is based on freshwater recreational criteria. The Columbia River is currently listed as water quality limited for Bacteria. Permit limits set prior to the TMDL may be reopened to incorporate an allocation from the TMDL.

Chlorine

With a UV disinfection system there would be no reasonable potential for chlorine to exceed water quality criteria.

Ammonia

A reasonable potential analysis was conducted on **ammonia as nitrogen** to determine if a maximum concentration of 20 mg/L would cause the potential to exceed water quality standards. The analysis showed that with dilutions 23 in the Zone of immediate dilution and 120 at the edge of the mixing zone there was no reasonable potential to exceed water quality standards for the acute criteria of 3.6 mg/L and chronic criteria of 0.49 mg/L of ammonia. Ammonia sampling will be a requirement of the permit.

Metals

The City only has three effluent metals in their data set. Based on this data set, EPA's methodology for determining reasonable potential would indicate **copper** has the potential to violate instream water quality standards. Because there are only three effluent samples, the multiplier used in the reasonable potential analysis is very high and may produce unrealistic maximum concentrations.

For example: Three effluent lead samples, with a maximum measured at 6.5 ug/L. With a coefficient of variation of 0.6 and only 3 sample the multiplier is calculated to be 5.6. Multiplying the observed 6.5 ug/l by the multiple 5.6 results in a statistically based estimated maximum effluent concentration of 36.4 ug/L. If the RPA was based on 10 effluent copper samples, the multiplier would only be 3, and the maximum concentration reduced to 19.5 ug/L. In this case, the RPA based on 3 samples resulted in demonstrating the reasonable potential to violate the chronic copper criterion. If 10 samples had been collected and the maximum concentration was 19.5 ug/L and the CV was unchanged, there would be no reasonable potential to violate the chronic criterion.

This example demonstrates the need for the City to collect more metals data when the new facility is on line to determine if there is a reasonable potential for their discharge to violate water quality criteria for metals. The statistically-based maximum concentrations resulting from the RPA may be higher than what is present in effluent from domestic wastewater treatment plants. In addition, the effluent metal's samples are based on the current treatment facility that is overloaded.

Temperature:

The Columbia River is currently listed as water quality limited for temperature. Temperature limits will be required. The temperature limits will be in terms of an excess thermal load and depend upon the Total Maximum Daily Load (TMDL) allocations which will be developed to meet the water quality criteria during periods of critical periods of low dilution. Permit limits set prior to the TMDL may be reopened to incorporate the TMDL. Temperature monitoring will be required.

Antidegradation:

Costs

For the anti-degradation analysis another project construction cost and O&M cost will have to be presented. Please provide project cost and O&M cost for an enlarged SBR system with the deep water 8-port diffuser that would meet current permit mass load limits for BOD and TSS. This would require filters.

Temperature Management Plan

Please provide an explanation of how the temperature of SBR effluent was estimated.

The temperature management plans needs to incorporate the effluent temperature monitoring to allow measurement of the selected option's performance over time.

Please be aware that an allocation will be applied to this facility as part of the TMDL for the lower Columbia River.

Land Use Compatibility Statement

Please keep in mind that a land use compatibility statement will be required from the appropriate local land use agency as part of the anti-degradation findings.

APPENDIX A

TABLE 1 - INTERIM CAPACITY INCREASE

revision: SEP 30, 2002

	Design Data					
	Population		Flows, mgd[3]		BOD, lb/day[3]	
	Equivalents	EDU's	ann avg	max mon	ann avg	max mon
Anticipated sewer system mass load increase through 2005:						
City of Warrenton Service Area						
Hidden Estates Subdivision [2]	95	38	0.008	0.011	17	22
Clatsop Co. Corrections Facility[5]	35	14	0.003	0.005	6	9
Miles Crossing District						
Oct - Nov 2003	600	240	0.051	0.072	108	144
Possible by 2008	150	60	0.013	0.018	27	36
Allowance for growth[1]	120	48	0.010	0.015	22	29
Total Interim Increase	1,000	400	0.085	0.121	180240	
City of Warrenton Service Area						
Current service	5,600	2,240	0.70	1.1	1,000	1,500
(Ft. Stevens, of current[4]		150	0.025	0.041	67	105)
Total at plant startup	6,600	2,640	0.785	1.221	1,180	1,740

NOTES:

1. Allowance for growth is included for campgrounds and other expansion, including Fort Clatsop (See Facility Plan Section 3). See note 4 for Fort Stevens. The actual number of potential connections is unknown at this time since no actual applications have been received. Additional capacity for 1000 PE is readily available with the blowers sized for the SBR aeration basins, therefore, 120 PE = 1000 PE minus other known connections.
2. Development is the one currently approved development awaiting approval for sewer connection; any additional will be handled in "Allowance for City Growth".

3. 2.5 persons per equivalent dwelling unit (EDU) was used as the planning average in the City's Facilities Plan. Flows are derived from unit flows used in Miles Crossing Sanitary Sewer District Draft Wastewater Facilities Plan (since a majority of the connections are from this source), Tables 4-1 and 4-2, for new conventional sewer areas:

   AAF = 2.5 x 70 gpcd x 1.2 = 210 gpd/EDU

   MMWWMF = 2.5 x 70 gpcd x 1.76 = 300 gpd/EDU

   Loading, BOD, are estimated based upon:

   annual average = 0.18 ppcd x 2.5 persons/EDU = 0.45 lb/day/EDU

   max month average = 1.33 x annual average = 0.60 lb/day/EDU

4. Fort Stevens existing flows and loading were derived from: "Fort Stevens State Park Wastewater Sampling Project", Spring Technologies, LLC., March 2002. This monitoring was conducted after their scheduled expansion of the number of campsites, restrooms and RV dumps (expanded from 1 dump station to 2).
5. County Correctional Facility was planned with 30 beds, however, the project is currently held up without funding, but they hope some facility will go at the site. (Personal correspondence: Jeff Harrington, HLB & Assoc. with project personnel) The project is included as additional growth to reserve this capacity or for other currently unknown expansion.

5.0 IMPLEMENTATION SCHEDULE

revision: SEP 30, 2002

5.1 Biosolids Removal from South Lagoon

It is imperative that the removal of biosolids proceeds as scheduled, as presented in Section 1. Obtaining the requested increase in influent mass loading limits (with the addition of the recommended aeration) and meeting interim effluent requirements is dependent upon the removal of these biosolids.

5.2 Schedule

In order for the City of Warrenton to accommodate the schedule set forth in the MAO and for the City of Warrenton to be able to accept the building permit for construction of the Clatsop County Corrections Transitional Facility, the following schedule will need to be met:

Submit Revised Memorandum to ODEQ for approval	August 21, 2002
Concept approval by ODEQ	September 2002
DEQ Facility Plan Comments	November 2002
Equipment procurement bids for purchase by City	November 2002
Complete plans & specifications for interim improvements project	December 2002
After City review approval, submit to ODEQ	Dec 2002/Jan 2003
ODEQ review/revisions/publish final P/S for bids	Jan/Feb 2003
Bid electrical installation for 3-phase power system	Jan/Feb 2003

Contract(s) award by City	**February 2003**
After award, ODEQ approve Hidden Estates P.S.	**February 2003**
City approve Hidden Estates home construction	**February 2003**
Design team construction management/inspection	**March-July 2003**
Design team completion of Draft O&M Manual	**May 2003**
ODEQ review of final O&M Manual	**June/July 2003**
Startup biosolids removal from South Lagoon per approved Management Plan	**June/July 2003**
Completion of biosolids removal in South Lagoon	**September 2003**
ODEQ review of facilities start-up report & initial operations	**July/Aug 2003**
Facilities Plan, final, submitted to ODEQ for approval	**July 2003**
City resume submittal of sewer plans to ODEQ	**August 2003**

Due to occurrences outside of the control of the City of Warrenton (such as obtaining permits and receipt of funding) and the schedule constituting a "best estimation" of time line, the City maintains the right to revise the proposed schedule, either to accelerate or delay the implementation, based upon real time events and requirements.

APPENDIX L

Pump Station Reference Map does not show force mains correctly. Should be like Figure 4.1 in Appendix N.

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
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Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

September 10, 2002

Scott Derickson, Manager
City of Warrenton
PO Box 250
Warrenton, OR 97146

Re: WQ - City of Warrenton
File No. 93769
Clatsop County
Comments on Technical Memorandum Request for Interim Capacity Increase

Dear Scott Derickson,

Thank you for this opportunity to comment on the revised technical memorandum requesting an interim capacity increase dated August 20, 2002, which we received September 9 from City Engineer Alan Johansson PE.

We appreciate that the revised memorandum has addressed most of our previous comments, and we need only require revisions on three items:

1. The "Allowance for Growth" in Table 1 on page 3 needs additional detail. The table suggests that there will be 123 added population from various sources. However, the sources are not identified in Note 1.

   To perform an adequate review of the engineer's facility sizing, and to determine whether future sewer extensions can be treated during the interim period, we would need to have these sources defined and specified according to the city's preferred allocation. Kindly have Table 1 revised accordingly. Also to inform our review, provide two copies of the Ft Stevens wastewater loading study referenced in Note 4.

2. Design data, Table 5 on page 10, indicates a lagoon dike height of 9 feet. We have been told that the dikes are only 7 feet high and fairly level on top. The discrepancy should be explained or corrected.

3. The 7-point schedule in Section 5.2 on page 11 needs to be revised to include the following 9 additional milestones with dates as suggested, or as may be desired:

   - Complete plans and specifications for interim improvements project, October/November 2002
   - Following city review/approval, submit plans and specs to DEQ for review, November 2002
   - DEQ review, city fix-up, publish final plans and specifications, and bid contract, November/December 2002

- Award contract, January 2003
- Design team responsible for inspection services during construction, February–July 2003.
- Design engineer complete draft O&M manual for DEQ review, April 2003
- DEQ review of final O&M manual, May/June 2003
- Start biosolids removal from South Lagoon per approved management plan, June 2003
- DEQ review of facilities start-up report and initial operations, July 2003
- Resume submittal of sewer extension plans to DEQ, August 2003

NEXT STEP

After we receive these revisions, we anticipate prompt approval of your interim treatment pre-design concept. Preferably, the entire report should be updated and re-issued. If the revisions are formatted as replacement pages, then they should be dated.

INQUIRIES

Please do not hesitate to call me if you or your consultants would like to discuss any of these comments (503/229-5310). Inquiries about the MAO should be directed to Beth Moore or Bob Baumgartner.

Respectfully,

David S. Mann, P.E.
Senior Environmental Engineer
NW Regional Water Quality

cc:
Alan Johansson PE, Warrenton City Engineer, PO Box 250, Warrenton
Ron Larson PE, HLB & Associates, PO Box 219, Manzanita 97130
Rick Esveldt PE, HR Esveldt Engineering, 6450 NE Brigham Road,
Bainbridge Island, WA 98110
Beth Moore, DEQ Compliance Officer, NWR
Bruce Henderson, Biosolids Coordinator, NWR
Richard Santner, SRF Project Officer, NWR
Robert P. Baumgartner, Manager, NWR
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John A. Kitzhaber, M.D., Governor

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August 6, 2002

RECEIVED
AUG - 8 2002
CITY OF WARR...

Scott Derickson, Manager
City of Warrenton
PO Box 250
Warrenton, OR 97146

Re: WQ - City of Warrenton
File No. 93769
Clatsop County
Comments on Technical Memorandum Request for Interim Capacity Increase

Dear Scott Derickson,

Thank you for this opportunity to comment on your technical memorandum requesting an interim capacity increase dated July 16, 2002, which we received August 1 by FAX from the City Engineer Alan Johansson PE. You also requested us to appear at your council meeting on August 14. However, we are concerned that we could not give definitive or positive responses to your city council until your staff and consultants have addressed our comments below, and we have completed our evaluation. Then we would also like to meet beforehand with you and your wastewater consultant in Portland to confirm our understanding of your proposals, and discuss any remaining technical issues.

As a next step, before appearing before the city council, we would need to receive the various revisions and informational items described in our comments below. After we have reached concurrence on these particulars, your request for the interim increase can then be finalized in approvable form. After that, DEQ staff will be glad to appear before the city council to discuss any remaining issues.

REVIEW COMMENTS

1. Item 1.0, Influent Loading Increase Request, needs to be supported with a tabulation of identified sources and the number of connections, population, and BOD/TSS for each source to be served. This was previously requested in our review dated April 23 of your draft facilities plan, where we wrote:

   "Only new BOD loadings from each proposed incremental contribution require supplemental oxidation. The analysis should quantify and tabulate the BOD loading from each of these anticipated sources as accurately as possible. The analysis must provide a preliminary design basis for development and discussion of this alternative."

   The requested increase of 350 sewer connections must quantify the number of people, and the BOD/TSS loadings anticipated, and flows. In other words, the tabulation in the revised facilities plan must identify each new source to be connected and the number of connections for each:

   - Identify the current loading, flows, peaking factor, and the allowance for growth, from Ft. Stevens State Park, which I think the city is obliged to continue serving unconditionally.

- Identify the number of homes, population, and loadings from Mr. Sittner's subdivision which must be served when its pump station is approved and constructed.
- Identify flows, populations, connections, and loadings from any other pending residential and commercial developments inside city limits for which the city has recently issued building permits, or intends to permit in the interim MAO period, including motel additions.
- Identify facilities to be connected outside city limits, such as the correctional facility, as to number of beds, flows, and loadings.
- Identify Ft. Clatsop and Miles Crossing populations, BOD/TSS loadings, and flows.
- Fully identify and quantify any and all others that would be served in the interim MAO period.

We do not concur with the statement in Section 1.0, second paragraph, that removal of solids from the south lagoon will qualify the city for additional loadings. First the solids must be completely dredged out and the lagoon must re-establish an aerobic stratum of algae across the surface over an underlying clear zone. Solids dredging operations will tend to mix and upset the lagoon, and will likely increase loadings on the north lagoon during critical summer periods when optimum treatment is desired.

We are open to further discussion of this issue during our meeting in advance of our city council appearance. Meanwhile we concur with omitting solids removal costs from the estimates that are presented in your request, since solids removal would not necessarily benefit treatment during the initial period of interim operations, so cannot be given a capacity credit when sizing interim facilities that will be installed.

2. Item 2.0, Flow and Loading Projections from Facilities Plan, Table 1, lists a combined population of 6200 at the end of the interim MAO when the new treatment plant starts up. This is an increase of only 600 from the present population equivalent of 5600. That increment is not consistent with your request for 350 additional connections. Assuming 2.5 persons per connection, the increment would exceed 600. Kindly provide clarification of this matter, along with a copy of supporting calculations, showing how these BOD and TSS load increments were derived.

3. Item 4.1, Development Guidelines/Goals, please provide a copy of the engineering calculations that establish the basis or sources of these loadings.

- Item 4.2.2, Alternative 1b, we concur with the engineer's recommendation of Interim Treatment Alternative 1b, which is responsive to our previous review comment of April 23: "... compressed diffused air may be viable at the existing liquid depth of 5 feet, in a clean area of the primary lagoon where the sludge had been removed or transferred to the other end. Diffused air systems should be considered as an alternative to raising the containment height and installing aspirators. After sludge removal, the diffusers could be placed on the bottom of the lagoon, or suspended like a Biolac system. We hope there may be some potential for an interim blower installation that could be leased or re-used in the upgraded plant."

  The city's proposal to install aeration in the Second Lagoon allows interim treatment improvements to proceed without waiting for sludge to be removed or a sludge berm to be constructed. However, we need to base our approval on informed review of your specific engineering proposal:
  - A layout of the area that would be devoted to aeration. This area of active aeration would need to be subtracted from the passive lagoon treatment capacity that is currently available.
  - Copy of engineer's calculations for oxygen transfer. These should show lagoon depth, diffuser spacing, transfer efficiency for shallow coarse bubble piping, air supply, blower capacity, blower horsepower, etc.
  - Copy of engineer's sizing calculations for the proposed blowers, based on the incremental loadings to be treated.

4. Table 4, Design Data, kindly provide a complete tabulation per DEQ guidelines, as published at **http://www.deq.state.or.us/wq/wqrules/Engrpts.htm**

   The missing data in this table include influent flume capacity, sampler type (flow-paced), liner type (clay), internal and external side-slopes and berm height (7'), maximum depth (5'), blowers, diffusers, etc. We must require that mechanical aspects of your interim facilities meet EPA reliability standards for mechanical treatment. These include a standby blower, an emergency power generator capable of starting and running the blowers, and 24-hour telemetry of alarms to ensure uninterrupted operation of the aeration system. The approved blowers will need to operate continuously, on a 24-hour basis.

NEXT STEP

We would like to meet with you and your engineers, in particular with Mr. Esveldt, to discuss and resolve our comments. We would be glad to schedule the meeting here in Portland at any time that is convenient for you. Alternatively, the city may prefer to revise the Interim Capacity

Request as noted above, resubmit the Request, then schedule a meeting here if issues remain.

INQUIRIES

Please do not hesitate to call me if you or your consultants would like to discuss any of these comments (503/229-5310). Inquiries about the MAO should be directed to Beth Moore or Bob Baumgartner.

Respectfully,

David S. Mann, P.E.
Senior Environmental Engineer
NW Regional Water Quality

cc:
Alan Johansson PE, Warrenton City Engineer, PO Box 250, Warrenton
Ron Larson PE, HLB & Associates, PO Box 219, Manzanita 97130
Rick Esveldt PE, HR Esveldt Engineering, 6450 NE Brigham Road, Bainbridge Island, WA 98110
Beth Moore, DEQ Compliance Officer, NWR
Bruce Henderson, Biosolids Coordinator, NWR
Richard Santner, SRF Project Officer, NWR
Robert P. Baumgartner, Manager, NWR
DSM/S
cc: DEQ regional sanitary engineers

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
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April 23, 2002

Scott Derickson, Manager
City of Warrenton
PO Box 250
Warrenton, OR 97146

Re: WQ - City of Warrenton
File No. 93769
Clatsop County
Comments on Draft Wastewater Facilities Plan

Dear Scott Derickson,

Thank you for this opportunity to comment on your draft facilities plan, which we received March 29, 2002, in response to the deadline established on your MAO (Mutual Agreement and Order).

The draft plan is well researched, well documented, and clearly presented. We commend your efforts in coordinating input from 3 consultant teams to produce this excellent draft. We had very few comments.

Our comments are enclosed as an attachment to this letter. We generally concur with the population projections, flow and loading projections, and studies on the collection system. HLB's pump station descriptions and evaluations are outstanding. However, we have concerns with the analysis of both interim and long-term sewage-treatment alternatives and solutions.

We have a serious concern with waves overtopping and scouring the lagoon walls if the liquid level is raised, as proposed for interim aeration. We cannot approve a freeboard of less than 24" on your large 12-acre lagoons. Also we cannot accept the analysis for interim chemical treatment, which was based on adding treatment for the entire lagoon loading, going well beyond the incremental increase allowed under the MAO.

We are also concerned with the impact of the city's existing mass loading constraint on future treatment alternatives. This constraint does not appear to have been addressed by the treatment technologies that were considered. Specific comments are attached to this letter. From our review, it appears that neither the proposed SBR system or the aerated lagoon/wetlands treatment alternative that were presented were designed to meet this limit in a reliable manner.

Either more effective alternatives must be developed, or you must prepare a justification for a mass load increase. The facilities plan is the appropriate document for presenting these alternatives.

We would like to meet with you to discuss and resolve our comments. The city can then revise the final facilities plan to address each of the enclosed comments in detail. We look forward to working with you and the city to complete and approve this interesting and important study.

Please do not hesitate to call me if you or your consultants would like to discuss any of these comments (503/229-5310). Inquiries about the MAO should be directed to Beth Moore or Bob Baumgartner.

Respectfully,

David S. Mann, P.E.
Senior Environmental Engineer
NW Regional Water Quality

Attachments (Review Comments and Letter of December 13, 2001)
cc w/attachments (all):
Alan Johansson PE,. Director, Warrenton Public Works, PO Box 250, Warrenton
Ron Larson PE, HLB & Associates, PO Box 219, Manzanita 97130
Rick Esveldt PE, HR Esveldt Engineering, 6450 NE Brigham Road,
Bainbridge Island, WA 98110
Michael Dees PE, Lee Engineering, 1300 John Adams, Oregon City
Beth Moore, DEQ Compliance Officer, NWR
Bruce Henderson, Biosolids Coordinator, NWR
Richard Santner, SRF Project Officer, NWR
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DSM/S
ec:
DEQ regional sanitary engineers

REVIEW COMMENTS

Warrenton Draft Wastewater Facilities Plan
April 23, 2002

Section 3, Study Area Characteristics

We accept the population projections in Section 3. The population projection graph in Figure 3.2 in Appendix A is exemplary.

Section 4, Existing Wastewater Facilities

The descriptions and analyses of the pump stations and lagoons are excellent. It is a pleasure to review work of this quality.

Section 5, Wastewater Characteristics

The method of projecting future flows based on population growth and per capita flowrates is not entirely rational, since per-capita flow projections entail increases in rainfall proportional to population. However, the resulting high flows appear to have been judiciously adjusted, and appear reasonable. We accept them.

Section 6, Collection System Evaluation

We concur with the proposed pump station improvements. The details must be refined during the final design of improvements.

Section 7, Wastewater Treatment Evaluation

The design criteria presented in Table 7.1, page 7-5, must be expanded to include effluent quality to achieve existing mass load limits. The existing year-round BOD effluent limit is 112 lbs/day. At 2003 design flows of 1.1 MGD, the effluent BOD concentration will be limited to 12 mg/l in high-flow months [112/(1.1)(8.34)=12 mg/l]. At 2022 design flows of 1.6 MGD, the limit will be 8 mg/l.

The proposed alternatives must be revised to achieve the mass load limits or the facilities plan must propose a mass load increase. Neither aerated lagoon nor shallow-basin SBR alternatives can reliably produce 8 mg/l effluents during high-flow months. However, various tertiary technologies could be added as polishing steps to create a viable and approvable alternative. Examples include chemical addition with dissolved-air flotation on lagoon effluent, and filters on

SBR effluent.

Nitrification may also be necessary, as indicated in our letter of December 13, 2001 (copy enclosed for reference). This letter would help define the actions and conditions necessary to justify a mass load increase, and a copy of the letter should be added to the appendix of the final plan.

Labor and construction costs must be adjusted to reflect these revisions. The comparison on pages 3-11 and 3-12 of Appendix J, indicates that a lagoon system would incur lower operational costs than an SBR system. However, based on current experience at lagoons in Nehalem and Molalla, this is doubtful. A 24-hour 7-day dissolved-air flotation system at Warrenton would likely require an additional operator to handle the alum and polymer feed systems and to keep all the equipment in good working order. These plants also report significant chemical costs for algae removal. The cost estimates should be refined to account for these additional expenses. As a general comment, all such documentation in the appendices must support the facilities plan and its recommendations. Contradictory analyses and conclusions from earlier studies should be corrected.

Our guidelines also require that the final recommended system be described in detail. This would include a hydraulic profile, flow schematic, and table of design data, similar to a preliminary design report. Based on this preliminary design, an itemized cost estimate must also be developed, so that the city can more accurately project revenue needs to accomplish construction. State guidelines require that the recommended alternative be presented in the form of a preliminary design, in sufficient detail to enable a different design engineer to carry forward after the facilities plan has been accepted.

Appendix G, Biosolids Management Plan

We are in general agreement with the excellent biosolids management plan presented here. Bruce Henderson of our office will be in touch with the city regarding approval of the plan. Our only comment in the context of facilities planning is about Figure 3-2, the interim lagoon system and piping layout.

The outfall piping shown in the NW corner is incorrect and must be revised. An inaccurate diagram of this critical area could be confusing in the facility plan. Specifically, the outfall ditch turns northwest, then north through two tide gates that are not shown. The manhole that is shown, and the segments of piping extending NW and SE from it, do not exist in the field.

Appendix I, Interim Capacity

The discussion on page 4 of Pacific Surimi makes it clear that it would not be possible to achieve the interim limits by diverting seafood wastewater to the municipal lagoons, until after the new upgraded plant is finished and operational. However, a discussion of what could happen after the secondary cell becomes available should be added here. The discussion must be expanded to address the type of technology needed to treat this immense loading, to the extent that the city's facilities could accept the estimated 0.5 MGD industrial waste flow.

The loading from Pacific Surimi ranges roughly 20,000 – 25,000 pounds of BOD per day. This is roughly comparable to the city of Eugene and about 20 times the current municipal load. Readers would be interested in knowing about a lagoon treatment system that could accommodate this load in your 12-acre secondary cell. If the entire concept is unfeasible, then the reasons should be set forth. In our view, if there is really no practical potential for discharging the industrial waste load through the municipal lagoon, then the alternative must be frankly dismissed here. If 12 acres is enough land for a seafood wastewater treatment plant with this kind of loading, then it should be evaluated here in much more detail.

The Department would not approve Alternative 1 on page 5 of Appendix I as proposed, because of concerns with boring holes into the clay liner. The proposal does not appear to include deepening the first cell to accommodate aerators. Yet AirO2 aspirating aerators are notorious for drilling holes in the bottom of shallow clay-lined lagoons. The facilities plan does not address this design issue.

Shields or deflectors might be installed to prevent holing the bottom of the lagoon, and the aerators could be kept small. A maximum aspirating aerator of 3 HP could be accommodated in a 7-foot depth without risking the clay liner. A maximum 3-HP aspirator could likely be accommodated in a 6-foot depth as well, but only if fitted with a deflector shield. Both installations would require that the aspirators be pitched at the shallowest possible angle.

Prior to our approval of interim aeration options, the city must address these design constraints. Such basic design and cost elements to accommodate small aerators must be identified in the discussion and cost tabulation for this alternative. Since these small aerators might not be usable in the upgraded treatment plant, aerator leasing should be considered.

The aerator sizing calculations were not presented, such as aeration produced per HP-hour in shallow lagoons versus oxygen demand. Please provide calculations for incremental additional BOD loading, oxygen demand, oxygen transfer, total horsepower to be deployed, number of aerators, etc in the facilities plan. Shallow-tank aerators are not known to achieve good oxygen transfer efficiency. Possibly the aspirating aerator would be reasonably efficient. The new aerators at Nehalem Bay could perhaps provide useful performance information in this context. This may allow the city to make sure that this option enables meeting effluent load limitations. Pertinent design aspects should then be described and tabulated as described in our guidelines for engineering reports: http://www.deq.state.or.us/wq/wqrules/Engrpts.htm.

Also the proposed is based on maintaining a liquid depth of 6 feet, leaving 1 foot of freeboard. The plan does not define how structural integrity will be maintained. The lagoon dikes are only 7 feet high. Because of the high winds, large waves, and shore erosion that develop in Warrenton, currently 5 feet is the maximum safe water depth of these large lagoons to ensure against overtopping, washout, and destruction of the containment structure in a big storm. We conclude that the proposal to maintain a liquid depth of 6 feet is not approvable because of potential wave damage, unless the sidewalls are raised 12".

Aeration with small floating aspirators at a depth of 5' is not viable because of damage to the liner. To deploy aspirating aerators in the primary cell, its liquid depth must be at least 12" deeper and the aerators must be fitted with scour shields.

However, compressed diffused air may be viable at the existing liquid depth of 5 feet, in a clean area of the primary lagoon where the sludge had been removed or transferred to the other end. Diffused air systems should be considered as an alternative to raising the containment height and installing aspirators. After sludge removal, the diffusers could be placed on the bottom of the lagoon, or suspended like a Biolac system. We hope there may be some potential for an interim blower installation that could be leased or re-used in the upgraded plant.

Regarding Alternative 2, Chemical Addition, in Appendis I, the discussion on ozonation should be deleted. Ozonation is not applicable or feasible at this scale or in this context. Only practical alternatives should be discussed here.

The analysis of hydrogen peroxide addition on page 8 must be revised. It was erroneously based on oxidizing 900 lbs/day BOD, which is almost the entire current municipal load. The analysis gave no credit for the existing lagoon system.

However, the existing lagoon system, or most of it during sludge removal operations, would remain in operation. Only new BOD loadings from each proposed incremental contribution require supplemental oxidation. The analysis should quantify and tabulate the BOD loading from each of these anticipated sources as accurately as possible. The analysis must provide a preliminary design basis for development and discussion of this alternative.

The analysis of hydrogen peroxide usage for these incremental loadings was based on 50% peroxide. This should be changed to 35% solution, which is much less hazardous to use in a small wastewater plant and may cause fewer vapor-lock problems. The analysis should be based on a preliminary design including tank sizing, passivated feed equipment, etc. Leasing of reactor tanks, bulk tanks, mixers, meters, and analyzers/recorders should be considered to minimize capital costs.

All of these interim alternatives would involve certain equipment that must remain operational at all times, despite power outages. Thus the alternatives must include minimal yard lighting for safe 24-hour operation of the aerators or chemical oxidation systems, and emergency power. Possibly a small standby generator could be leased, or could be selected for compatibility with some portion of future facilities.

Because of the potential for staging incremental improvements, for leasing of equipment, and for re-using various items, these comparisons of interim improvements should include a present-worth analysis.

The implementation schedule on page 8 of Appendix I must also be revised. No submittal to DEQ was made in January, and no approval was issued in February. Submittal to DEQ was first made on March 29, 2002. The proposed equipment purchase by the city is May is not approved. As explained above, the alternative for installation of the proposed aerators is not yet approvable.

Mass Load Increase

The city has not requested a mass load increase, and the draft does not address it. Our letter dated December 13, 2001 identifies the issues related to discharge l;ocation, dilution, and mass loadings of various effluent parameters.

However, a long outfall pipe to the Columbia River would help qualify the plant for a mass load increase. A mass load increase would enable the plant to discharge higher loadings. We anticipate that a diffuser could be designed for consistency with basin concentration limits of 30 mg/l in winter and 20 mg/l in summer. Should you wish to consider an alternative discharge location, then the costs and implementation issues for extending a long outfall pipe to the Columbia River should be examined here.

The discussion should address the potential for reductions of Pacific Surimi discharges commensurate with a mass load increase into the Columbia. The possibility of building a long outfall pipe and granting a relatively harmless mass discharge increase in the Columbia, at the same time as abating the Pacific Surimi discharges, is very attractive. The final facility plan must help determine whether this attractive trade-off is environmentally and economically realistic

MAO Stipulated Draft Facility Plan Content

- Paragraph 8(A)(1)c on page 4 of the MAO would seem to entail an estimate of flows and loadings from various outside sources which may need or desire sewage treatment service from the city. Discrete flows and loadings were not fully identified or addressed in the draft facility plan.

- Paragraph 8(A)(1)d at the bottom of page 4 of the MAO would seem to entail a thorough discussion in the draft of treatment and discharge options, including mixing zone aspects. The draft did not present any such detailed or definitive discussion of these options, and particularly not of mixing zone alternatives.

enclosure (1): copy of our letter dated December 13, 2001 to the City Engineer

Memorandum

COSMOPOLITAN ENGINEERING GROUP

117 South 8th Street
Tacoma, WA 98402

Phone (253) 272-7220
Fax (253) 272-7250

DATE: March 27, 2002

TO: Jeff Harrington, HLB & Associates

FROM: Bill Fox, Cosmopolitan Engineering

RE: Response to DEQ Comments

I reviewed the DEQ letter dated February 21, 2002 addressed to the City of Warrenton. In the second paragraph, DEQ suggests that we meet before the Facilities Plan is submitted to discuss the proposed field studies. I agree that a meeting is a good idea, but it seems unlikely that this could occur before April 1. In addition to council approval to proceed, I also need to visit the site before meeting with DEQ.

I do not have any problem with the three specific comments DEQ had on our proposed field study. My specific responses:

1. I agree with their comment and will run transects as they recommend. I will work out the pattern with DEQ during the study plan phase. This will not affect the budget.

2. It will cost $3,500 for us to dechlorinate the effluent with sodium thiosulfate during the 3-day study, as requested by DEQ. I do not agree with DEQ's concern and may try to change their mind during the study plan phase. There is some literature supporting my position that I will dig up as soon as council authorizes us to proceed.

3. DEQ is correct about PLUMES limitations. These would be significant for the current channel discharge, and it would not be a good model for this application. I do believe it would be appropriate for the deeper discharge in the estuary. However, CORMIX is also EPA approved and we have no problem using it in this application.

I have modified Task 2 as described in my January 24, 2002 memo to Rick Esvelt based on the three DEQ comments. The replacement text for Task 2 is as follows:

Task 2 – Mixing Zone Study

This task will establish the acute and chronic dilution factors for the outfall alternatives. Subject to DEQ agreement, the dilution factors for the extended mixing zone established for the existing outfall will be directly measured using Rhodamine WT dye as a tracer. The dye will be injected into the effluent outlet structure at a continuous rate for three days. Effluent will be dechlorinated with sodium thiosulfate solution just upstream of the dye injection. The three-day injection period will allow the ambient concentrations to reach a pseudo-dynamic steady state. Approximately 120 lbs. of Rhodamine WT liquid dye at 23 percent solution will be used to establish an effluent tracer concentration of approximately 2,000 ppb.

Tracer concentrations will be directly measured at the acute and chronic extended mixing zone boundaries established in the study plan and approved by DEQ. Tracer concentrations will also be measured along transects across the plume boundary at various distances away from the outfall to assess the spatial characteristics of the plume. Measurements will be obtained with a Turner Designs Model 10-AU field fluorometer with internal data logging capabilities. Ambient water samples will be pumped through the fluorometer. Measurements will be made and high and low tide conditions since the boundaries of the mixing zone will vary for each condition. The dilution factors used in the water quality permit limit analysis will be adjusted from the direct readings based on the actual effluent flow during the studies to the design flows you have provided.

I have used this type of tracer study for direct dilution measurement instead of modeling for 13 other mixing zone studies, including the City of Gresham, City of Longview, and Portland's 100 mgd Columbia Blvd outfall. I also conducted a similar study last year for Raymond and South Bend in the Willapa estuary, and would encourage the City of Warrenton to contact any these cities for references.

We will use the dilution model CORMIX to establish acute and chronic dilution factors for the outfall if it were extended to deep water. Ambient data required to run the model will be obtained as part of the tracer field studies described above. This will allow the City to assess a range of effluent limits that could be achieved by an outfall improvement.

Oregon
John A. Kitzhaber, M.D., Governor

Department of Enviro[n]
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Portl[and]
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From BETH MOORE
Co. DEQ
Phone # 503 229 5586
Fax #

February 21, 2002

MR ALAN JOHANSSON
DIRECTOR OF PUBLIC WORKS
CITY OF WARRENTON
PO BOX 250
WARRENTON OR 97146-0250

RE: MAO No. WQ/M-NWR-01-281
File No. 93769

Dear Mr. Johansson:

Thank you for your letter dated February 19, 2002. The Facilities Plan which is required to be submitted by April 1, 2002 is a draft. The studies that are required to be completed as part of the Facilities Plan can be described in detail with a schedule and options based on the possible foreseen outcomes. As we have discussed previously, these outcomes may include meeting water quality standards in the ditch, applying for an extended mixing zone to the tidal channels of the Columbia, or building a new outfall.

Submitting the studies in the draft facilities plan by April 1, 2002 will give the DEQ the chance to comment on the proposed studies to be completed this summer. It would be a good idea to get together and discuss the approach to the studies before they are included in the draft Facilities Plan. In reading the January 24, 2002, Memorandum from Bill Fox, Cosmopolitan Engineering to Rick Esvelt, H.R. Esvelt Engineering, we have the following initial comments:

- Tracer concentrations should be measured along transects across the plume boundary at various distances away from the outfall rather than simply measuring concentrations at the edge of the zone of initial dilution and the mixing zone. This is a typical procedure for performing dilution dye tracer studies. This allows us to determine the extent and behavior of the plume as it exits the outfall.

- Residual chlorine in the effluent will react with the dye reducing the dye's concentration. The effluent should be dechlorinated before pumping dye into the effluent.

- The PLUMES model does not take into account boundary effects including bottom attachment and shoreline attachment which is likely in either the current channel discharge and the discharge to the shallow embayment. DEQ would recommend using the EPA supported CORMIX which has the capability of simulating boundary conditions.

We suggest that the information from Fish and Wildlife can be obtained directly by contacting Joe Scheahan at Oregon Department of Fish and Wildlife in Astoria. He can be reached at (503) 338-0106.

If we can be of help to expedite the process, please let us know. DEQ would agree to expanding the existing SRF loan for Facilities Planning. The Department feels that with this in mind the submittal of the draft Facilities Plan and the final Facilities Plan in accordance with the MAO is still achievable.

If you would like to schedule a meeting to discuss the studies you are proposing in more detail. Please call me at (503) 229-5586.

Sincerely,

Beth Moore

Beth Moore
Environmental Specialist
Water Quality Source Control Section
Northwest Region

Cc: David Mann, P.E., DEQ
Bob Baumgartner, DEQ
Steve Schnurbush,DEQ
Richard Santner, DEQ

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December 13, 2001

MR ALAN JOHANSSON
DIRECTOR OF PUBLIC WORKS
CITY OF WARRENTON
PO BOX 250
WARRENTON OR 97146-0250

RE: NPDES Permit
File No. 93769
EPA No. OR-002087-7

Dear Mr. Johansson:

As we have discussed the NPDES permit for the City of Warrenton will be renewed next year. The City of Warrenton will also develop a Facilities Plan to evaluate and select a wastewater treatment and disposal option.

In previous conversations, we discussed the issue of discharge location. The current discharge is a ditch that proceeds through tide gates to tidal wetlands of the Columbia River. Since the issuance of your last permit, the Department adopted rule changes that clarify the States policies regarding effluent discharge to ditches or other extended mixing zones in OAR 340-41-205(4)(g)(B). These rules have several options to consider as part of your facilities plan. These options include meeting water quality standards in the ditch, applying for an extended mixing zone to the tidal channels of the Columbia, or building a new outfall. The option you select could influence your final permit limits.

From our last conversation I understood the City has decided to pursue an extended mixing zone. The concept of the extended mixing zone could be applied before and after the tide gate if the information is available to support it. In order for DEQ to evaluate the potential for an extended mixing zone we would need the following information. The City needs to start gathering the information now as this information will need to be incorporated into your Facilities Plan.

- Was the channel before and after the tide gate to the Columbia constructed? Please provide the design information, Corps of Engineer permit, and/or 401 Certification from the State to show that this channel was constructed.
- Please provide information on owner ship or easement for the property that the channel goes through.
- What types of flow(s) are in the channel? Please identify if irrigation flows, storm water runoff, or wastewater flows have replaced the natural stream flow regimes.
- Does the channel meander like a natural stream or is it greatly simplified in lengthwise and cross sectional area. Please provide a view of the channel with dimensions.

- It is very important to have the dimensions of the channel after the tide gate. Please provide information on the depth, width, and length of these segments and the amount of flow through this channel.
- Whether the channel has physical and biological characteristics that are different from a similar nearby stream.
- Provide information from Oregon Department of Fish and Wildlife on whether or not Salmon use this channel or are present in the cove.

The information will provide the basis for evaluating the dilution available in the mixing zone. The amount of dilution in the mixing zone will be used to determine the effluent limits necessary to meet the water quality criteria in the lower Columbia River. The permit renewal and facilities planning processes need to demonstrate compliance with all water quality standards.

A Mixing Zone dilution study is required to determine if the discharge complies with all in-stream water quality standards and criteria. Prior to conducting the study, the scope of work should be submitted to the Department for approval at least three months prior to the date the dilution study will be conducted.

<u>Bacteria (OAR 340-041-0205(2)(e)) and Temperature (OAR 340-041-0205(2)(d))</u>
The lower portion of the Columbia River is listed as water quality limited for temperature and bacteria. The temperature and bacterial permit limits could depend upon the Total Maximum Daily Load allocations which will be developed to meet the water quality criteria during periods of critical periods of low dilution.

For temperature permit limits, a temperature management plan needs to be developed. The Department and the City of Warrenton can develop this plan together but the City needs to start gathering temperature data now. The temperature management plan will either show that there is compliance with the temperature limits at the edge of the mixing zone or a schedule for compliance which considers the use of technology or other means to meet the permit limit. A copy of the Temperature Management Plan guidance is attached.

The lower Columbia is listed for bacteria primarily due to the presence of combined sewer overflows in the Cities of Astoria and Portland. The bacteria standard for shellfish growing waters is 14 fecal coliform organisms per 100 ml with not more than 10% of the samples exceeding 43 organisms per 100 ml. The permit limit for bacteria will be based on the shellfish standard and the available dilution in the mixing zone.

<u>Ammonia and Chlorine (OAR 340-041-0205(2)(p)(B))</u>
Ammonia and chlorine limits will be established to meet the water quality criteria in the estuarine environment. The permit limits will be based in part on the amount of dilution available, which depends in part on the decision the City makes regarding where to discharge. In estuarine waters the water quality criteria for ammonia is dependent upon temperature, pH and salinity. The acute water quality criteria for ammonia is 7.01 mg/L and

chronic water quality criteria for ammonia is 1.73 mg/L. In freshwater, the acute water quality is 9.15 mg/L and the chronic water quality criteria for ammonia is 1.25 mg/L. The acute water quality criteria for chlorine is 0.013 mg/L and the chronic water quality criterion for chlorine is 0.0075 mg/L. Because of the low dilution estimated chlorine reduction will be required.

The chronic criterion is applied at the edge of the mixing zone. The acute criterion is applied at the zone of initial dilution. With an estimated dilution of 5:1 at the edge of the mixing zone in the tidal channel and 2:1 at the edge of the zone of initial dilution, the following permit limits would be applied.

Parameter	Maximum Daily	Average Monthly Limit
Ammonia (mg/L) May 1 to October 30	10.27	5.12
Ammonia (mg/L) November 1 to April 30	14.02	6.99
Chlorine (mg/L)	0.03	0.01

These estimates of mixing can greatly influence permit limits and you are encouraged to evaluate mixing as part of the information provided in the Facilities Plan.

<u>BOD and TSS limits</u>

The basin rules (OAR 340-041-0215) establish the minimum design criteria for the treatment and control of wastewater in the North Coast Lower Columbia Basin for BOD_5 and TSS, which will be applied to the facility. For treatment from a lagoon the permit limits will be the same. For a new or modified facility the permit limits that apply are based on the following design criteria and no increase in the mass load limits.

Treated Effluent Outfall 001

(1) May 1 - October 31:

Parameter	Average Effluent Concentrations		Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
	Monthly	Weekly			
BOD_5	20 mg/L	30 mg/L	112	169	225
TSS	20 mg/L	30 mg/L	188	300	375

(2) November 1 - April 30:

Parameter	Average Effluent Concentrations		Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
	Monthly	Weekly			
BOD_5	30 mg/L	45 mg/L	112	169	225
TSS	30 mg/L	45 mg/L	188	300	375

*Mass load limits based upon previous permit using a design average dry weather flow of 0.45 MGD, monthly BOD_5 of 30 mg/L, weekly BOD_5 of 45, monthly TSS of 50 mg/L, and weekly TSS of 80 mg/L.

(3) Year Round

Other parameters	Limitations
BOD_5 and TSS Removal Efficiency	Shall not be less than 85% monthly average for BOD_5 and 85% monthly average for TSS.

Increased flows should be compensated for with improved treatment efficiency. If a mass load increase is proposed for any permitted load, then information will be required in order for the Department to make sufficient findings under the Anti-degradation Policy, per Oregon Administrative Rule 340-041-0026(1) and (3). Guidance is available.

With a BOD permit limit of 20 mg/L the minimum design criteria (OAR 340-041-0215(1)(c)) also requires the dilution in the receiving water to be at least twenty times (ratio of receiving stream flow to effluent flow).

pH

The pH for the facility will be the same as the previous permit: 6-9 SU

Metals

The Department does not have metals data for this facility. In order to evaluate whether the facility will meet water quality standards for metals, the Department requests that the City obtains metals data over time for the effluent and receiving water. The data will be used in a reasonable potential analysis to determine if permit limits are needed to assure water quality standards are being met under OAR 340-041-215(p)(B) Table 20. The reasonable potential analysis as defined by EPA is dependent upon the number of samples collected. At least ten samples are recommended. The detection limits for the metal analysis should follow the USEPA methods that best provide the following "minimum quantitative level" as defined in standard methods:

PARAMETER	μg/l	PARAMETER	μg/l
ALUMINUM	87.00	SELENIUM	54
ARSENIC	13.00	SILVER	2.3
CADMIUM	9.3	ZINC	86
CHROMIUM	11.00		
COPPER *	2.9		
IRON	1000.00		
LEAD	5.6		
MERCURY	0.012		
NICKEL	8.3		

<u>Biosolids Management Plan</u>
The Department requires a Biosolids Management Plan. The plan must be approved prior to implementation.

<u>Notification Plan</u>
A current notification plan is required in the event of an upset or discharge of untreated or partially treated wastewater. The purpose of the notification plan is to identify contacts and procedures if an upset occurs. The Department has a template that will assist you in preparing the Notification Plan.

<u>Emergency Overflows</u>
The permit will contain a requirement that prohibits raw sewage discharges to waters of the state from November 1st through May 21st except during a storm event greater than the one-in-five year, 24 hour duration storm. The same requirement prohibits raw sewage discharges to waters of the state from May 22nd through October 31st except during a storm event greater than the one-in-ten year, 24-hour duration storm.

As per MAO No. WQ/M-NWR-01-281, the Facilities Plan should contain an evaluation of the options available based on this information. This information can be used to address the continued use of the current outfall, whether to construct a new outfall and/or the design of the facilities that will meet the water quality standards.

If you would like to schedule a meeting to discuss this letter and its requirements in more detail. Please call me at (503) 229-5586.

Sincerely,

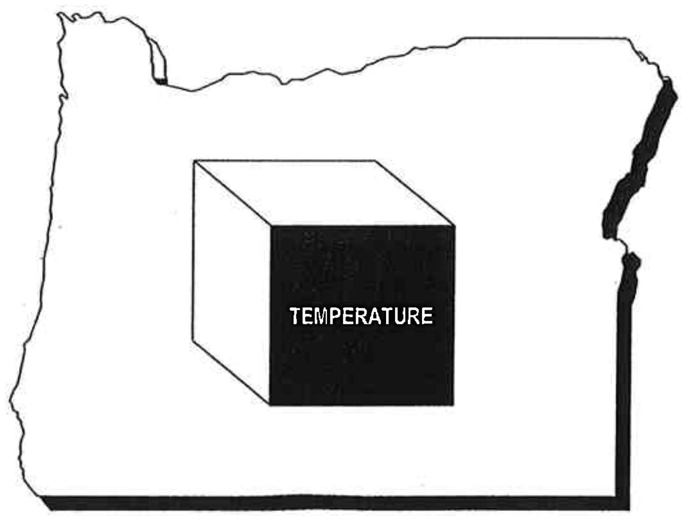
Beth Moore

Beth Moore
Environmental Specialist
Water Quality Source Control Section
Northwest Region

Cc: David Mann, P.E., DEQ
Bob Baumgartner, DEQ

State of Oregon

Temperature Management Plans: Internal Management Directive for Existing Point Source Dischargers



Oregon Department of Environmental Quality
Water Quality Division
811 SW Sixth Avenue
Portland, Oregon 97204

Oregon Department of Environmental Quality

Temperature Implementation Internal Management Directive For Existing Point Source Dischargers

Purpose of Guidance: The purpose of this guidance is to provide information to permit writers concerning development of Temperature Management Plans. This guidance deals exclusively with application to existing National Pollutant Discharge Elimination System (NPDES) permitted sources. The guidance focuses on TMP requirements that will apply for permit renewals prior to completion of a total maximum daily load (TMDL) for water bodies listed as water quality impaired.

I. SUMMARY OF TEMPERATURE RULE AND POLICY

A. The Purpose of the Water Quality Standard for Temperature

The purpose of the temperature standard, like all water quality standards, is to protect the beneficial uses of waters of the state and to preserve the health of our aquatic ecosystems. In achieving these purposes, the water quality standards also serve the goal of the federal Clean Water Act: to maintain and restore the chemical, physical and biological integrity of the nation's waters. The beneficial uses most sensitive to water temperature are fish and aquatic life and, therefore, the temperature standard is based on protecting these beneficial uses.

B. Basin Standards and Temperature Criteria

There are two primary aspects relative to the Department's policy for controlling thermal discharges: (1) a requirement that all sources apply highest and best practicable control to keep water temperatures at the lowest possible level; and (2) specific standards and policies for temperature itself.

Each basin in the State has adopted water quality standards. These basin standards all begin with the following statement: "Notwithstanding the water quality standards contained below, the highest and best practicable treatment and/or control of wastes, activities, and flows shall in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor, and other deliterious factors at the lowest possible levels".

A more specific policy for surface water temperature is cited in OAR 340-41-0120(11)(a)-(g). In general, the policy aims to protect aquatic ecosystems from adverse surface water warming caused by anthropogenic activities through: 1) encouraging proactive Best Management Practices (BMPs) or other measures to prevent thermal pollution; and 2) requiring the development and implementation of surface water Temperature Management Plans (TMP) for those basins or point sources exceeding the numeric temperature criteria identified in the basin standards.

The rule for each basin states in part that no measurable increase from anthropogenic sources is allowed in basins that exceed the numeric criteria unless specifically allowed under a Department approved surface water TMP. The requirements for a TMP are outlined in OAR 340-41-0026(3)(a)(D). Subparagraph (D)(i) requires the plan to describe the best management practices, measures and/or control technologies that will be used to *reverse the warming trend.* Subparagraph (D)(iv) states that for point sources the plan will be part of the NPDES permit.

Under OAR 340-041-026, the Department may determine the requirements of the TMP based on the relative contribution of the source to the overall temperature problem. This determination is dependent on the mixing zone characteristics. Regardless of what the Department may allow within the mixing zone, however, the permittee will ultimately be required to comply with a specific thermal load allocated by the TMDL.

D. Total Maximum Daily Loads (TMDLs)

The Department is required to complete TMDLs on waterbodies listed as water quality limited for temperature. In the TMDL, waste load allocations will be established for the point sources. These waste load allocations identify temperature reductions for point sources necessary to meet water quality standards. Mixing zones are also taken into consideration in the development of a TMDL. The waste load allocations will be incorporated into the permits and point sources will be required to develop TMPs to comply with the waste load allocation. A TMP does not shield a source from having to comply with waste load allocations.

II. TEMPERATURE MANAGEMENT PLANS

A. When a Temperature Management Plan is Required

Point sources are required to develop and implement a TMP if they discharge to a waterbody that is water quality limited for temperature, unless the discharge temperature is below the applicable numeric criteria, AND its discharge will not contribute to a downstream exceedance of an applicable criteria. **For streams that have been listed as water quality limited for temperature, permitted sources that cannot meet the numeric criteria must submit a TMP before a permit can be renewed.** Point sources are also required to develop and implement a TMP if they discharge to a waterbody that is upstream of a water quality limited waterbody, unless the discharge will not contribute to a downstream exceedance of an applicable criteria. (Note: In the event a discharge is below the temperature criteria and threatened and endangered species are present, no increase over the current discharge temperature will be allowed.) The State's 303(d) list identifies those waterbodies listed for temperature. This demonstration can be made through temperature dilution calculations as shown in Appendix A. It may also be possible to use a reasonable potential analysis to demonstrate that there is no potential to contribute to a downstream exceedance of a numeric temperature criterion.

A TMP may also be required for discharges to non-listed waterbodies if there is any measurable temperature increase outside the assigned mixing zone and the discharge is to 1) ecologically significant cold-water refugia, 2) streams containing federally-listed threatened or endangered species where the discharge would impair the biological integrity of the listed species, 3) streams where dissolved oxygen is close to existing criteria (defined as within 0.5 mg/L or 10 percent saturation of the water column or intergravel DO criterion) , and 4) natural lakes.

In basins where stream temperatures are below the applicable temperature criteria, the rule requires that these temperatures be maintained by implementing technology-based permits and/or best management practices [OAR 340-41-0120(11)(g)]. This section also states that any measurable increase in surface water temperature resulting from anthropogenic activities in these basins will be in accordance with the Department's Antidegradation Policy in OAR 340-41-0026. Any permit resulting in a measurable increase in temperature must either be covered by a TMP or the Department must have made the necessary findings in OAR 340-41-0026. An antidegradation review could determine that a TMP should be prepared by a permitted source.

4) Based upon the information in the 3 items above, an analysis of whether or not the discharge is causing a measurable increase (O.25° F) in temperature above the appropriate criteria outside the permit's regulatory mixing zone or causing an a measurable increase in stream temperature in a 303(d) listed waterbody downstream. (Note: these calculations should be made as if background was at the appropriate criteria [55° F (12.8° C) if discharging to a stream during salmonid spawning, for example], not actual background).

In those cases where there is a measurable increase in either instance or if the discharge temperature causes acute temperatures within the mixing zone (> 77° F, > 25° C), the temperature management plan should include, in addition, the following information:

5) Analysis of facilities options for internal management practices (flow/process changes) that will reduce the discharge temperature so that there is no measurable increase over the appropriate criteria outside the mixing zone. When applicable, also include analysis of industrial pretreatment program ordinance provisions pertaining to permit specific limits or BMPs, local limits for temperature, and/or identify significant thermal discharges and control options.
6) Analysis of options for capital improvements (technology) or alternative disposal methods (land application) that will reduce the discharge temperature so that there is no measurable increase over the appropriate criteria outside the mixing zone. Include estimated costs and likelihood of success.
7) Identification of a preferred option(s) that will achieve compliance with no measurable increase or an assigned TMDL waste load allocation. Include proposed schedule for this permit cycle for initiating and completing the preferred option as well as interim steps planned to mitigate or minimize the thermal discharge.
8) Describe a proposed monitoring program that will allow measurement of the selected option(s) performance over time.

Post-TMDL TMPs: For those sources that have been assigned a temperature permit limit based on the TMDL WLA, the temperature management plan should include the following information:

1) The permit effluent limit based on the TMDL waste load allocation.
2) Analysis of facilities options for internal management practices (flow/process changes) that will reduce the discharge temperature to meet the permit limit. When applicable, also include analysis of industrial pretreatment program ordinance provisions pertaining to permit specific limits or BMPs, local limits for temperature, and/or identify significant thermal discharges and control options.
3) Analysis of options for capitol improvements (technology) or alternative disposal methods (land application) that will reduce the discharge temperature to meet the assigned WLA. Include estimated costs and likelihood of success.
4) Identification of a preferred option(s) that will achieve compliance with the permit limit. Include proposed schedule for initiating and completing the preferred option as well as interim steps planned to mitigate or minimize the thermal discharge.
5) Describe a proposed monitoring program that will allow measurement of the selected option(s) performance over time.

The Department is aware that the Association of Clean Water Agencies (ACWA) has developed a TMP Guidance Manual that is available to their members and other interested parties. The Department recognizes the ACWA manual as a good reference and guide for completing a TMP. Although the ACWA manual is tailored for municipal treatment facilities, the general structure could be used by other dischargers to facilitate their development of a TMP. Any user of the ACWA manual or other available guidance materials is cautioned to make certain that all required information and analysis is provided in accordance with current DEQ TMP requirements.

should also consider elimination of acute temperature impacts (> 77° F, >25° C) in the mixing zone.

- The cost and practicality of implementing the interim options. For water quality limited streams, best available treatment technologies must be considered in the evaluation. In considering costs, interim options that significantly increase user rates (e.g. >20%) or cause a commercial or industrial discharger to become noncompetitive should not be considered. The preparer of a TMP may want to include such information in the submitted TMP. In considering practicality, proposed alternatives that may not be compatible with meeting an eventual WLA should not be required. In addition, options that require excessive energy for minor reductions in effluent temperature should also not be required. Note: options not required as interim steps may still ultimately be necessary to meet a WLA.

- The public benefit derived from the discharge should also be evaluated. If the cost of treatment would pose an undue hardship (i.e., would threaten the economic viability of the source), this could be justification for a less effective interim alternative. Examples of public benefit include:
  - the source provides an important service or product not otherwise available locally;
  - the source is an important local employer;
  - the source is important to the well-being of a disadvantaged community.

E. Incorporating TMPs into Permits

TMPs should be required in conjunction with a permit application. Those elements of an approved TMP that will be required for implementation should be specified directly in a new permit (e.g. monitoring, reporting and compliance due dates). Permit renewal applications have already been submitted for many sources that are pending review (i.e. backlogged). When appropriate, permit writers should request submittal of a TMP for backlogged permits prior to the development of a permit renewal proposal.

III. SCHEDULE FOR SUBMITTING TEMPERATURE MANAGEMENT PLANS

The Department should implement the requirements for a TMP according to the following scenarios:

1) Pre-TMDL - The Department will put a low priority on writing permits and incorporating TMPs in basins where the TMDL is scheduled to be completed before 2003. Sources in these basins are not extected to need a TMP prior to the TMDL, unless the permit must be renewed early for some other reason.

2) For sources located in waterbodies that have established TMDLs. All sources must submit and/or update the TMP on a timetable set forth in the TMDL implementation documents.

3) All other sources not included above in III.1 or 2, should submit a TMP prior to permit renewal. These sources will be notified about the need to prepare a TMP and the timetable for submittal to the Department. The Department will base the decision for notifying sources that potentially require a TMP in accordance with the Statewide TMDL Schedule. Prior to official notification the Department encourages permit holders to begin collecting information necessary to complete a TMP.

APPENDIX A

TEMPERATURE DILUTION CALCULATION

To determine whether or not the discharge results in a measurable temperature increase at the edge of the mixing zone, a mixing zone analysis must be performed. This analysis should be conducted for low flow conditions generally defined as the 7Q10 (the minimum 7-day average flow over the last 10 years). In some cases, the discharge from a facility may affect both salmonid rearing waters and salmonid spawning waters depending on the time of year. Consequently, during part of the year, the 64° F (17.8° C) criterion will apply and at other times of the year, the 55° F (12.8° C) criterion will apply. If this is the situation, the mixing zone analysis needs to address the 7Q10 for each time period.

In-stream flows can be obtained from Oregon Department of Water Resources or United States Geological Survey (USGS). The stream flow data should be for sites as close to the discharge point as possible. Where in-stream flow data is not available or inadequate, stream flow can be estimated using stream flow data from similar streams. The USGS has a publication that describes empirical equations for different parts of the state for estimating discharge from un-gauged streams[1]. To use these equations, information on the drainage area and slope are required. For urban streams, the comparison should be based on gauged urban streams such as those on the Tualatin River. The Department may also require stream flow monitoring to confirm data used in the evaluation.

Mixing zone dilution during the critical low flow can be best estimated using a modeling evaluation. Mixing models such as CORMIX or PLUMES calculate the dilution at the edge of the mixing zone as a concentration dilution ratio ("S" for CORMIX). The temperature can be calculated directly from the concentration dilution ratio as follows:

$T_{MZ} = T_e / S$ (or concentration dilution in PLUMES)

Alternatively, if there is not enough information available to perform a modeling evaluation, the permit writer may estimate the dilution available based on an estimate of the amount of the stream that is available for dilution. If the maximum effluent flow and temperature (i.e. heat load) are not expected to coincide with low in-stream flow conditions (i.e. 7Q10 flow conditions), the worst-case scenario that would be expected to actually occur should be evaluated.

The following equation may be used to evaluate the temperature at the edge of the mixing zone:

$$T_{MZ} = (T_E + DT_S)/(D + 1)$$

Where:

T_{MZ} = temperature of the stream at the edge of the regulatory mixing zone
T_E = effluent temperature
T_S = applicable temperature criteria
D = dilution at the edge of the mixing zone.

D is defined algebraically as follows:

$$D = Q_{ACTIVE}/Q_E$$

[1] Riggs - LOW-FLOW INVESTIGATIONS - Techniques of Water-Resources Investigations of the United States Geological Survey - Book 4 - Chapter B1 - 1972

APPENDIX B

NPDES DISCHARGE PERMIT SCENARIOS - EXAMPLES

(Note: All scenarios assume that no TMDL has been established. Once TMDLs are established, then the appropriate waste load allocation as identified in the TMDL must be included in the permit, as expressed through an effluent limit.)

The rule has somewhat differing implications for NPDES permitted sources, whether existing, new or increased. To aid the permit writer in interpreting rule, this guidance focuses on existing sources, and provides three common scenarios, as follows:

- An existing discharge to a water quality limited (WQL) stream within a WQL basin but causes no measurable increase outside the mixing zone or in a listed water body downstream.
- An existing discharge to a water quality limited (WQL) stream within a WQL basin but causes a measurable increase outside the mixing zone or in a listed water body downstream.
- An existing discharge to a stream that meets water quality standards within a WQL basin

Scenario #1: An existing discharge to a water quality limited (WQL) stream within a WQL basin but causes no measurable increase outside the mixing zone or in a listed water body downstream.

When the thermal load is not anticipated to cause a measurable increase above the appropriate numeric criteria (measurable is defined in the standard as being equal to or less than 0.25° F) at the edge of an appropriately sized mixing zone, then the permit should include requirements for monitoring effluent temperature and flow. The permit should contain an effluent limit as determined through the dilution/mixing zone study.

In this situation the source may not be expected to need to reduce effluent temperature to comply with a TMDL. Therefore, the TMP does not necessarily need to have a requirement to evaluate temperature reduction strategies.

The Department must determine that the mixing zone is appropriately sized and that the mixing zone does not impinge upon critical cold water habitat. The Department may require an evaluation of thermal control options if the temperature outside the assigned mixing zone harms any endangered species that are present. The TMP may provide a schedule for providing information on any further analysis to protect endangered species.

All permits shall include a condition prohibiting an increase discharge of thermal load. Increased thermal load is defined as any increase in effluent temperature and/or volume beyond current permit limitations.

Scenario #2: An existing discharge to a water quality limited (WQL) stream within a WQL basin but causes a measurable increase outside the mixing zone.

The rule requires all sources discharging to water quality limited streams and causing a measurable increase over the appropriate temperature criterion to develop and implement a surface water temperature management plan. A temperature dilution calculation can be used to determine whether the discharge is causing a measurable increase. The procedure and information needed for conducting a temperature dilution evaluation is shown in Appendix A.

temperature such that the discharge does not create a measurable change in stream temperature, or otherwise mitigate the affects of heated effluent in the receiving stream . (To be placed in Schedule A.)

3. a. Effluent limits will be included in the permit based on effluent temperature and dilution analysis/mixing zone study. b. Effluent limits will be included in the permit if the permittee chooses to install technology to reduce the temperature of their discharge. c. Effluent limits will be included if the discharge has a reasonable potential to violate incipient lethal temperature at the edge of the zone of immediate dilution.

4. Prior to increasing thermal load (flow or temperature) beyond current permit limitations, the permittee shall notify the Department and apply and be issued a permit modification allowing the increase.

Scenario #3: An existing discharge to a stream that meets water quality standards and is in a basin that is not water quality limited for temperature.

As is the case for any other standard, DEQ is responsible for demonstrating that a permitted discharge does cause or contribute to water quality standards violations. Existing sources that request an increase in the thermal load discharged are subject to an Antidegradation Review. Existing sources that discharge to streams that meet water quality standards can continue to discharge at the same or lower thermal loading as long as the discharge does not raise stream temperature above the basin standard at the edge of the mixing zone and the discharge is not impacting the beneficial uses. However, the Department may require a source that is discharging to a stream that meets water quality standards to adhere to the requirements for sources that discharge to a water quality limited stream if the stream and/or source contribute a significant thermal load to the water quality limited stream. A temperature dilution evaluation (see procedure in Appendix A) can be used to evaluate whether the discharge would meet the basin temperature standard at the edge of the mixing zone.

Permits for existing sources would include monitoring requirements for effluent flow and temperature. If the discharge has reasonable potential to exceed water quality standards, the permit must include thermal load limits. The Department may require stream flow and temperature monitoring, mixing zone studies, and in-stream biological monitoring to confirm data used in the evaluation and to ensure that beneficial uses are not being impacted. The permit would also include a condition that would require the source to notify the Department if there is any increase in thermal load beyond current permit limitations. For POTWs, this evaluation would be conducted based on the design flow of the treatment plant; for industrial sources, it would be conducted based on the observed flow over the five-year permit cycle.

If an existing source is impacting beneficial uses or if the discharge is raising stream temperature above the basin standard, then the Department will require the source to reduce its thermal load to a level that would meet the basin temperature standard and would be protective of beneficial uses.

APPENDIX C

DEQ PROCEDURAL GUIDANCE FOR WATER TEMPERATURE MONITORING

Revised May 6, 1997

Purpose:

Revisions to the water temperature standard were adopted by the Environmental Quality Commission on January 11, 1996, and become effective July 1, 1996. This guidance was developed by the Department's Water Quality Monitoring staff to ensure statewide consistency in the collection of water temperature data.

Data Objectives:

The Oregon Administrative Rules (OAR 340-41) give "Numeric Temperature Criteria" which prohibit "measurable surface water temperature increase resulting from anthropogenic activities". The criteria are specific to the waterbodies and the beneficial uses being protected. The following table gives a brief summary of the numeric criteria. These criteria are the basis for the temperature monitoring and data quality protocols described in this guidance. The DEQ is working with the Oregon Department of Fish and Wildlife to generate maps which will be useful when applying the numeric temperature criteria.

Designated Beneficial Use or Waterbody	**Numeric Criteria – No Increase above**	
	Temperature °F	**Temperature °C**
Oregon Bull Trout habitat.	50.0	10.0
Native salmonid spawning, egg incubation, fry emergence.	55.0	12.8
Salmonid fish rearing.	64.0	17.8
Columbia River, its sloughs and channels, river mile 0 to 309.	68.0	20.0
Willamette River, its sloughs and channels, river mile 0 to 50.	68.0	20.0
Significant cold-water refugia.	No increase.	
Stream segments with temperature sensitive Threatened and Endangered species.	No increase.	
Waters when dissolved oxygen (DO) levels are within 0.5 mg/l or 10% saturation of the water column or intergravel DO criterion.	No increase.	
Natural lakes.	No increase.	

According to the OAR, the numeric temperature criteria "are measured as the seven-day moving average of the daily maximum temperatures. If there is insufficient data to establish a seven-day average of maximum temperatures, the numeric criteria shall be applied as an instantaneous maximum. The measurements shall be made using a sampling protocol appropriate to indicate impact to the beneficial uses;".

Once a site is selected, it is important to record descriptive information such as general flow conditions and depths, and references to landmarks such as tributary names, river mile, roads, and bridges. The latitude and longitude of the site is an important piece of information that can be obtained from a topographic map, or from a global positioning device (GPS).

Miniature dataloggers frequently become coated with algae or silt, and can be difficult to locate when one returns to retrieve the unit or perform an audit. A photograph of the monitoring site can be useful for locating equipment.

Data Quality:

The following procedures must be followed to ensure that temperature data is of acceptable quality. These procedures document instrument accuracy, test for proper functioning during the sampling period, and set criteria for data acceptance.

Accuracy Testing and Recording
A National Institute of Standards and Technology (NIST) traceable thermometer, with a resolution of 0.1 °C or better, and an accuracy of 0.2 °C or better must be used to test the accuracy of temperature monitoring equipment. The NIST traceable thermometer should be calibrated annually, with at least two calibration points between 10 °C and 20 °C.

The accuracy of temperature monitoring instruments must be tested pre- and post-deployment, at one or more calibration temperatures, preferably between 10 °C and 20 °C. Testing is done using a stable thermal mass, such as a water-filled thermos bottle or ice chest. The stable temperature of the insulated water mass allows direct comparison of the unit's readout with that of the NIST thermometer. Accuracy must be within $\pm$ 0.5 °C.

Monitoring equipment with detachable sensors must be marked in order to match sensors with dataloggers. This allows an instrument and sensor to be tested pre-deployment, and also makes malfunctions easier to diagnose and correct. A logbook must be kept which documents each unit's calibration date, test results, and the reference thermometer used.

Field Auditing of Instrument Performance
In addition to laboratory calibrations, temperature monitoring equipment must be audited during the deployment period. A minimum of two field temperature audits should be taken during the sampling period -- one after deployment when the instrument has reached thermal equilibrium, and one prior to recovery. A third, mid-deployment audit is recommended.

Thermometers used for auditing must have an accuracy of $\pm$ 0.5 °C, and resolution of 0.1 °C.
An audit is performed by placing the auditing thermometer's sensor close to the monitoring instrument's sensor. The audit value is recorded when a stable reading is obtained. A stable reading is usually achieved within ten thermal time constants. For example, an auditing thermometer with a ten second time constant should give a stable reading within 100 seconds.

Most general purpose data loggers allow the user to connect a computer in the field and view "real-time" temperature data without interfering with the datalogger's sampling schedule. This feature allows immediate comparison of the datalogger's reading with the audit thermometer's reading. Real-time audit accuracy must be within $\pm$ 1.5 °C.

Conversely, most brands of miniature dataloggers interrupt data collection when the unit is connected to a computer. With this type of unit, field audit data can only be applied by "post-processing", i.e. the stored

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ACCESSIBILITY INFORMATION

This information is available in alternate format (e.g., large type, Braille) by calling DEQ Public Affairs at (503) 229-5766 or 1-800-452-4011, toll-free inside Oregon. People with hearing impairments can call DEQ's TDD number at (503) 229-6993.

Oregon

John A. Kitzhaber, M.D., Governor

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March 23, 2001

Scott C. Derickson, Manager
City of Warrenton
PO Box 250
Warrenton, OR 97146

Re: Sewer Lagoon Improvement Project
CWSRF Loan R94940
Project Performance Certification and Corrective Action

Dear Mr. Derickson:

This letter is intended to supplement the February 20, 2001 letter to you from David S. Mann, PE, of our staff. Our focus herein is the Project Performance and Corrective Action requirements for CWSRF funded projects. You may want to review Article 6, Paragraph 4 of your CWSRF Loan Agreement and the letter to the City from Mr. Mann dated November 26, 1999 in order to assist your understanding of issues addressed in this letter.

Please be advised of the following:

1. It is the determination of the Department, as documented in Mr. Mann's February 20 letter, that your CWSRF project cannot at this time be Positively Certified because the work done thus far has not achieved the original performance objectives of the project. Additional work will be needed to achieve the project objectives. In view of our determination, we hereby waive submittal of the Negative Certification Form.

2. The "technical memorandum" referred to in Mr. Mann's February 20 letter in fact constitutes the Corrective Action Plan described in the CWSRF documents. We believe it would be appropriate for the Plan to be submitted to us by April 30. If this is not possible, please advise of us the anticipated submittal date. The approximately $50,000 unexpended balance of your current CWSRF Loan R94940 may be used to pay for consultant fees for the preparation of the Plan.

3. Once Mr. Mann has approved the Corrective Action Plan, we would be pleased to receive a request from the City to increase the Loan Agreement amount to cover the design and construction cost for the Corrective Action work specified in the Plan. We should be able to complete the Loan Agreement Amendment in about two or three weeks from receipt of your request.

4. We will expect the development of a revised set of Performance Evaluation Standards and new Performance Evaluation Report for the additional work, as per the Loan Agreement. The consultant fees for this work are loan reimbursable.

5. Construction contracts for the additional CWSRF funded work must be bid in accordance with CWSRF requirements. Please contact me for any guidance you or your consultant may need on this matter.

6. Since it is nearly one year since completion of the lagoon work done thus far, it is the preference of the Department that repayment of the approximately $200,000 borrowed up to now begin in the near future, as has been discussed by your staff with Rick Watters (503-229-6814) of our CWSRF loan office. Furthermore, the $50,000 remaining in the current Loan Agreement, if borrowed, and any additional amounts borrowed under an expanded Loan Agreement, would be folded into the Repayment Schedule about six month after completion of the Corrective Action work. Please contact Mr. Watters for any further discussion of repayment issues.

Please contact me at 503-229-5219 if I can provide any further information or assistance on the CWSRF aspects of your lagoon improvement work.

Sincerely,

Richard J. Santner
Project Officer
Water Quality: Source Control

Cc: Alan Johansson
E-cc: Pete Dalke; David Mann; Beth Moore, Rick Watters, DEQ

-22-2001 11:46AM FROM HLB MANZANITA 1 503 3685847 P. 1

To Jon:

Oregon

John A. Kitzhaber, M.D., Governor

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February 20, 2001

RECEIVED

2

Scott C. Derickson, Manager
City of Warrenton
PO Box 250
Warrenton, OR 97146

Re: WQ - City of Warrenton
File No. 93769
Clatsop County
Status of Wastewater Treatment Capacity Limitations

Dear Scott Derickson:

Thank you for meeting with us last Friday, regarding improvements at your wastewater plant. We appreciate the city's determination to overcome capacity limitations and provide for reliable wastewater treatment. However, as we explained at the meeting, our recent Notice of Noncompliance should be considered as a warning that our regulations will require us to assess penalties for additional violations. We are glad to see that the city is willing to work with us to solve problems and avoid more formal enforcement actions.

We also recognize that important improvements to the lagoons have been made. Unfortunately, the lagoons remain overloaded. Because of the overloading, it is likely that violations will resume by next summer, unless the city acts quickly to restore adequate treatment capacity. We would therefore like to continue our efforts to work with the city to solve the capacity problem.

In order to provide guidance, we have reviewed Warrenton's file. As an indication of overloading, it is our understanding that your12-acre primary lagoon contains an average accumulation of 18" of sludge and sand, leaving only 30" for treatment. Based on this extremely shallow depth, we would de-rate the nominal capacity of this primary lagoon at least 50%. We estimate its safe treatment capacity at roughly 25 lbs per acre per day, for a total loading of about 300 lbs per day. Currently the BOD loading on the primary lagoon is often over 1,000 lbs, so it is being loaded perhaps 3 or 4 times above its margin of safety.

As a first step, the city should seriously consider dredging and cleaning the primary lagoon. This should be started right away. The biosolids should be hauled away and applied to pasture land or hayfields. This must be done in accordance with our approved Biosolids Management Plan (BSMP) and Biosolids Land Application Site Authorization. As we discussed at our meeting, the city must follow the formal permit-modification procedure for adoption of a BSMP.

If the hill in the lagoon proves to be a sand deposit, it could be washed, piled, and drained on one side of the lagoon, such that all leachate drains back to the lagoon. This would be done in preparation for its disposal as solid waste. You should get in touch with Bruce Henderson of our staff concerning a biosolids program.

Meanwhile, in order to expedite solutions, we believe that your facilities planning efforts should be focused on alternatives to upgrading treatment capacity to meet current and anticipated loads. A reasonable BOD design loading, based on summer loadings and pending development, appears from our initial review to be around 2,500 – 3,000 lbs per day. The most promising alternative is to build an aeration cell inside primary lagoon, as designated "Alternative 3" in CH2M's 1995 report. However, the aerator sizing in that report was too small for current loadings. The cell needs to be larger, and it will require bigger aerators.

This should be the topic of a technical memorandum, which ought to be completed as soon as possible. We were glad to hear the city's proposal to authorize HLB Engineers to address this topic on a priority basis. Also please remember to coordinate the memorandum with your process consultant Mr. Esveldt. The city should obtain his review and concurrence on the draft memorandum before sending it to us for approval.

We are hopeful that the city can make this happen right away. We consider the aeration cell and aerators a necessary expansion of the headworks and baffle project for which the City has received an SRF loan. We also anticipate that these improvements will remain ineffective until the sludge is removed from the primary cell, restoring its full treatment capacity. All this additional work is needed to achieve the original objectives of the SRF project.

We expect that you will have an estimate of the cost of the additional work in the technical memorandum. This will enable you to request an increase to your current SRF Design and Construction Loan, which we will implement subject to fund availability.

We look forward to reviewing the design of your aeration cell in the near future. Note that all aspects of the work that will be SRF funded must be bid in accordance with SRF procurement requirements. Please contact your SRF Project Officer, Richard Santner (503/229-5219), for guidance on these points.

Pending your plant expansion, DEQ would remain unable to approve further sewer extensions due to inadequate treatment capacity. Under Oregon Administrative Rules, DEQ is responsible for review and approval of any sewer extension, in accordance with OAR 340-52-015(3)(c) and OAR 340-52-035(3)(a). Approval would require the city to demonstrate that it has adequate treatment capacity. Since the city cannot make that demonstration, we cannot issue further approvals for sewer extensions until the capacity limitations are resolved.

Of course, as we discussed, the purview of our authority is limited to common (shared) sewers. It does not extend to the city's control over plumbing and occupancy permits for individual homes. As soon as the sludge is removed and the aeration cell operational, the city could resume sewer extensions and development without risk of water quality violations caused by inadequate treatment.

Please let me know if questions remain about this letter, our expectations, or about our water quality regulations (503/229-5310). I hope that the city will urgently contact Bruce Henderson about finalizing your sludge management plan (503/229-5616). Questions about compliance with your NPDES permit should be directed to Beth Moore (503) 229-5586.

Respectfully,

David S. Mann, P.E.
Senior Environmental Engineer
NW Regional Water Quality

cc:
Alan Johansson PE, City of Warrenton
Ron Larson PE HLB & Associates, PO Box 219, Manzanita 97130
Beth Moore, DEQ Compliance Officer, NWR
Bruce Henderson, Biosolids Coordinator, NWR
Richard Santner, SRF Project Officer, NWR
Robert P. Baumgartner, Manager, NWR
DSM/S
ec:
DEQ regional sanitary engineers

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

February 9, 2001

MR SCOTT DERICKSON
CITY MANAGER
CITY OF WARRENTON
PO BOX 250
WARRENTON OR 97146-0250

RE: WQ Clatsop County
City of Warrenton WWTP
EPA # OR-002087-7
File No. 93769
WQ-NWR-01-013
NOTICE OF NONCOMPLIANCE

Dear Mr. Derickson:

The Discharge Monitoring Reports (DMR) from March 1999 to the present have recently been reviewed for the City of Warrenton Wastewater Treatment Plant. As shown in the table below, the Department has determined that at times the discharge has not met the concentration limit and mass load limit for BOD or TSS. The concentration limits were high in the August and September 2000 DMRs as well.

Date	Type	Measured	Limit	Class II	Class III
Aug 1-7, 1999	BOD	60 mg/L	45 mg/L (weekly)	♦	
Oct. 10-16, 1999	BOD	50 mg/L	45 mg/L (weekly)		♦
Oct 10-16, 1999	TSS	92 mg/L	80 mg/L (weekly)		♦
Oct 24-16, 1999	BOD	94 mg/L	45 mg/L (weekly)	♦	
Oct 24-30, 1999	TSS	120 mg/L	80 mg/L (weekly)	♦	
OCT	BOD	49 mg/L	30 mg/L (monthly)	♦	
OCT	TSS	74 mg/L	50 mg/L (monthly)	♦	
Nov 1-6, 1999	BOD	92 mg/L	45 mg/L (weekly)	♦	
Nov 1-6, 1999	TSS	85 mg/L	80 mg/L (weekly)		♦
Nov 7-13, 1999	BOD	64 mg/L	45 mg/L (weekly)	♦	
Nov 21-27, 1999	BOD	55 mg/L	45 mg/L (weekly)	♦	
NOV	BOD	63 mg/L	30 mg/L (monthly)	♦	
NOV	TSS	56 mg/L	50 mg/L (monthly)		♦

Date (continued)	Type	Measured	Limit	Class II	Class III
Dec 12-18, 1999	BOD	94 mg/L	45 mg/L (weekly)	♦	
DEC	BOD	40 mg/L	30 mg/L (monthly)	♦	
Jun 11-17, 2000	BOD	316 lbs	169 lbs (weekly)	♦	
JULY	TSS	53 mg/L	50 mg/L (monthly)		♦
JULY	TSS	189 lbs	188 lbs (month)		♦
Aug 1-5, 2000	BOD	176 lbs	169 lbs (weekly)		♦
Oct 8-14, 2000	BOD	46 mg/L	45 mg/L (weekly)		♦
Oct 8-14, 2000	BOD	188 lbs	169 lbs (weekly)	♦	
Total Class II				13	
Total Class III					8

This is the second Class II violation of your permit. Oregon Administrative Rule 340-012-041(2)(c) states that if a permitee receives more than three NONs for the same Class II violation within a 36 month period, they may be subject to a Notice of Permit Violation (NPV). An NPV is a more formal enforcement action, which may include a civil penalty.

The others violations cited are Class III violations. If the City receives more than four NONs for the same Class III violation, then the Department is required to take the same enforcement action. The last Class II and Class III violations were issued together in one NON dated March 29, 1999.

In a September 10, 1999 letter, the Department stated its concerns over the solids loading at the facility, requested that the City evaluate the solids loading and voluntarily halt any further sewer connections. A March 7, 2000 letter from HLB & Associates, Inc. suggests that inaccurate flow measurements may have caused apparent high solids loading at the facility. However, a new headworks at the lagoons has been in operation since April of 2000, the facility remains overloaded and is still exceeding the permit limits.

The Department recognizes that the city is completing a facilities plan to address performance issues, but remains concerned that the high solids loading at the facility has not been corrected. The Department is not proceeding with formal enforcement at this time, however the Department requests that the City of Warrenton investigate why there is a problem with meeting the permit limits and what actions the City proposes to take to resolve the problems. The Department requests that the evaluations include mass load calculations for the lagoon and how the RV parks influence the solids loading at the facility. The Department requests a meeting to discuss the results of the evaluation and the direction of the facility plan.

Please contact Beth Moore (503) 229-5586 if you have any questions or comments regarding this action.

Sincerely,

Robert P. Baumgartner
Manager, Water Quality
Northwest Region Source Control Section

cc: NWR Enforcement Section
EPA-OOO
Terry Ager, Public Works Department, City of Warrenton
Dave Haskell, Superintendent of Public Works, City of Warrenton
Alan Johansson Director of Public Works, City of Warrenton
David Mann, DEQ
Richard Santner, SRF Project Officer

CITY OF WARRENTON
Warrenton, Oregon 97146-0250
P.O. Box 250 • 503/861-2233
FAX: 503/861-2351

September 1, 2000

Barney Reily
Fort Stevens State Park
Warrenton, OR 97146

Subject: Violation of City Sewage Ordinance

Barney:

This is to confirm our phone conversation this morning and provide you with the documentation on the sewage situation at Fort Stevens.

The City of Warrenton has taken sewage samples at the City of Warrenton's Pump Station located near your entrance station. The sewage flow was sampled on August 20, 2000. The sample was analyzed for 5 day BOD and TSS by AMTest Oregon LLC, test results attached. It was found that the BOD was 2.5 times as strong than allowed by City Ordinance, 300 mg/l, ordinance attached.

The discharge into the City's sewer system is required to comply with the City's ordinance. As I said on the phone there are several ways to address the problem. Working together with your staff and the State Department of Environmental Quality we can come to a resolution.

Currently our lagoons are overloaded during the summer and will require augmentation to meet the BOD and TSS demands. The overloading points to the highly concentrated effluent from your system.

Thank you for your concern and attention to this situation.

Sincerely,

Alan Johansson
Director of Public Works/City Engineer

Attachment: Analysis Report
City Ordinance

cc: Scott Derickson, City Manager
David Mann, DEQ

AMTEST OREGON L.L.C.
Professional Laboratory Services
13035 S.W. Pacific Hwy.
Tigard, OR 97223
Tel 503 639 9311
Fax 503 684 1588

ANALYSIS REPORT

CLIENT

City of Warrenton
P.O. Box 250
Warrenton, OR 97146

Phone: 503-861-0914
Fax: 503-861-2351

Date Reported: 8/30/00
Date Sampled: 8/20/00
Date Received: 8/22/00
Job Number: 00235/19-24

Sample Type: Waste Water

Lab Number	Client Identification	BOD mg/L;ppm	TSS mg/L;ppm
00235/19	Jetty St. 9:15a	190	180
00235/20	Jetty St. 1p	340	280
00235/21	Jetty St. 5p	300	270
00235/22	Fort Stevens 9:30a	82	190
00235/23	Fort Stevens 1:15p	750	340
00235/24	Fort Stevens 5:30p	83	270
	Method:	405.1	160.2
	Laboratory Reporting Limit:	4	2

Reviewed By:

John Scholz

warrenton2 8/28/00

Section 503. Except as hereinafter provided, no person shall discharge or cause to be discharged any of the following described waters or wastes to any public sewer:

COPY

(a) Any liquid or vapor having a temperature higher than 150° F.

(b) Any water or waste which may contain more than 100 parts per million, by weight, of fat, oil or grease.

(c) Any gasoline, benzene, naptha, fuel oil, or other flammable or explosive liquid, solid, or gas.

(d) Any household garbage that has not been properly shredded.

(e) Any ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, paunch manure, or any other solid or viscous substance capable of causing obstruction to the flow in sewers or other interference with the proper operation o the sewage collection facilities, pumping stations, pipelines an treatment works.

(f) Any waters or wastes having a pH lower than 6.0 or higher than 8.5 or having any other corrosive property capable of causing damage or hazard to structures, equipment, and personnel of the sewage works.

(g) Any waters or wastes containing a toxic or poisonous substance i sufficient quantity to injure or interfere with any sewage treatment process, constitute a hazard to humans, animals, or fish life, or create any hazard in waters receiving the effluent from the treatment works.

(h) Any waters or wastes containing suspended solids of such charact and quantity that unusual attention or expense is required to handle such material at the sewage treatment plant.

(i) Any noxious or malodorous gas or substance capable of creating a public nuisance.

Section 504. Grease, oil and sand interceptors shall be provided when, in the opinion of the Superintendent, they are necessary for the proper handling of liquid wastes containing grease in excessive amounts, or any flammable wastes, sand, and other harmful ingredients, except that such interceptors shall be of a type and capacity approved by the Superintendent, and shall be located as to be readily and easily accessible for cleaning and inspection.

Grease and oil interceptors shall be constructed of impervious materials capable of withstanding abrupt and extreme changes in temperature. They shall be of substantial construction, watertight, and equipped with easily removable covers which, when bolted in place, shall be gastight and watertight.

Section 505. Where installed, all grease, oil and sand interceptors shall be maintained by the owner, at his expense, in continuously efficient operation at all times.

Section 506. The admission into the public sewers of any waters or wastes having (a) a five-day biochemical oxygen demand greater than 300 parts per million by weight, or (b) containing any quantity of substances having the characteristics described in Section 503, or (c) containing more than 350 parts per million by weight of suspended solids, or (d) having an average daily flow greater than 2% of the average daily sewage flow of the city, shall be subject to the review and approval of the Superintendent. Where necessary in the opinion of the Superintendent, the owner shall provide, at his expense, such preliminary treatment as may be necessary to, (a) reduce the biochemical oxygen demand to 300 parts per million and the suspended solids to 350 parts per million by weight, or (b) reduce objectionable characteristics or constituents to within the maximum limits provided for in Section 503, or (c) control the quantities and rates of discharge of such waters or wastes. Plans, specifications, and any other pertinent information relating to proposed preliminary treatment facilities shall be submitted for the approval of the Superintendent and of the Oregon State Sanitary Authority, and no construction of such facilities shall be commenced until said approvals are obtained in writing.

Section 507. Where preliminary treatment facilities are provided for any waters or wastes, they shall be maintained continuously in satisfactory and effective operation, by the owner at his expense.

Section 508. When required by the Superintendent, the owner of any property served by a building sewer carrying industrial wastes shall install a suitable control manhole in the building sewer to facilitate observation, sampling and measurement of the wastes.

Such manhole, when required, shall be accessible and safely located, and shall be constructed in accordance with plans approved by the Superintendent. The manhole shall be installed by the owner at his expense, and

Memorandum, Warrenton, OR

to:	Jon Forrester
title:	HLB Engineering Tech.
from:	Alan Johansson, Director of Public Works / City Engineer
re:	Wastewater Facilities Plan
cc:	
date:	Monday, November 15, 1999

LAJ

Camp Rilea's wastewater should be considered as a possible future addition to our system. We have had discussions with Mr. Rankin their engineer on the project. Please use the attached information in the WWFP for the City.

Attch: Rankin letter 991026

RECEIVED OCT 2 9 1999

JB RANKIN ENGINEERING Inc.
CIVIL ENGINEERING
P.O. BOX 187 - 679 EAST HARBOR
WARRENTON, OREGON 97146
(503) 861-0779 E-Mail: jbreng@seasurf.net

JAMES B. RANKIN, PE
President

October 26, 1999

Mr. Gil Gramson, City Manager
City of Warrenton
P.O. Box 250
Warrenton, OR 97146

Dear Gil:

On Friday, October 22, 1999 we met, along with the City Engineer Johannson, to discuss the possibility of Camp Rilea connecting its sanitary sewer collection system to the City of Warrenton's treatment system. At this point, all issues are just in the discussion stage, no formal requests have been made. The City of Warrenton has retained the engineering services of HLB, Inc to update the City's wastewater collection and treatment facility plan. You have proposed to include within this study, the possibility that Camp Rilea may one day connect to Warrenton. For your assistance, I am enclosing a copy of Camp Rilea's original design criteria and a summary of 1994 and 1998 data on influent and effluent loadings.

Camp Rilea's collection and treatment system began in 1973. It is most likely that at peak loading periods, this system is operating at design volume capacity. There are just a couple of problem areas with Camp Rilea's wastewater facility: 1) The nitrogen and suspended loading in the effluent is too high, and we hope to resolve this with some slight modification in the lagoon process; 2) Some stormwater enters the collection system; 3) A lot of rainwater falls in the lagoons; 4) The pastureland used for treating the effluent needs to be reconstructed.

Camp Rilea is still in the process of looking at all of its options on how to resolve the problems with its wastewater collection and treatment operations. I would be glad to meet again to provide you with more information. Please do not hesitate to contact me, should you have any questions.

Very truly yours,

Jim Rankin

James B. Rankin, PE
cc: Mr. Gerald E. Elliott
File #105-99

TABLE-1

Full Camp Utilization:
Design Population 1,500 persons
Number of Days Utilized: 42 days (June – August)
Per Capita Wastewater volume: 100 gallons per day per person
Average Daily wastewater Flow: 150,000 gallons per day
Per Capita BOD5 Loading: 0.17 pounds per person per day
Average Daily BOD5 Loading: 255 Pounds per day

Intermediate Camp Utilization:
Design Population: 650 persons
Number of Days Utilized: 56 days (May – October)
Per Capita Wastewater Flows: 100 gallons per person per day
Average Daily wastewater Flows: 65,000 gallons per day
Per Capita BOD5 Loading: 0.17 pounds per person per day
Average Daily BOD5 Loading: 110.5 Pounds per day

Maintenance Staff Utilization:
Design Population: 20 persons
Number of Days Utilized: Year round
Per Capita Wastewater Flow: 100 Gallons per person per day
Infiltration-inflow Allowance: 3,000 gallons per day
Average Daily Wastewater Flow 5,000 gallons per day
Per Capita BOD5 Loading: 0.17 pounds per person per day
Average Daily BOD5 Loading: 3.4 pounds

Aerated Primary Basin:
Design Level: Average daily flow at full camp utilization
Average Daily Wastewater Flow: 150,000 gallons per day
Average Daily BOD5 Loading: 255 pounds per day
BOD5 Removal Efficiency: 85%
Critical Temperature: 13 Degrees C
Required Aeration Detention Time: 18 days
Total Cell Volume: 3.19 million gallons
Cell Liquid Depth: 15 feet (constant)
Effective Cell Area: 0.65 acres
Freeboard: 3 feet

Aerated Storage Basin:
Detention Period: 15 days at full camp utilization; complete detention November through February
Total Cell Volume: 2.934 million gallons
Pond Liquid Depth: Maximum – 15 feet
Minimum – 3 feet
Effective Cell Area: 0.60 acres
Freeboard: 3 feet

TABLE -2

	1994			1998		
	INFLUENT	EFFLUENT	RAINFALL	INFLUENT	EFFLUENT	RAINFALL
JAN	198,820 gal	1,092,000 gal	6.81-inches	802,900 gal	2,063,000 gal	16.49-inches
FEB	443,640	96,000	10.18	983,630	2,451,000	9.33
MAR	271,990	972,000	5.82	1,280,780	1,575,000	11.86
APR	263,210	1,069,000	4.09	602,940	1,294,000	2.85
MAY	396,100	-0-	2.29	574,880	1,286,000	3.71
JUNE	1,042,990	621,000	1.96	403,600	220,000	1.93
JULY	874,670	1,960,000	0.95	532,110	-0-	0.62
AUG	693,030	862,000	1.67	564,330	896,000	0.34
SEPT	387,280	733,000	2.30	328,170	918,000	0.96
OCT	495,950	954,000	11.34	355,860	56,000	5.73
NOV	371,040	-0-	11.07	450,000	2,623,000	19.08
DEC	452,480	174,000	15.04	325,720	2,224,000	16.53
TOTAL	5,891,200	8,533,000	73.52	7,204,920	15,606,000	89.43

TABLE 3

1994

	INFLUENT BOD5	INFLUENT TSS	INFLUENT PH	EFFLUENT BOD5	EFFLUENT TSS	EFFLUENT TKN	EFFLUENT Nitrates	EFFLUENT PH
IAN	50mg/l	24	5.0	3mg/l	38mg/l	3.5mg/l	6.5mg/l	3.5
EB	70	50	5.0	3	32	ND	ND	3.9
AR	40	52	7.3	3	26	30	ND	6.5
PR	30	18	7.1	3	26	1.9	4.1	6.6
AY	40	46	7.0	3	13	2.3	2.1	NA
IUNE	250	84	7.5	3	42	7.5	0.5	6.6
IULY	270	230	7.6	3	48	6.9	2.1	6.9
UG	130	110	6.9	3	52	5.8	3.5	6.4
EPT	60	34	7.0	3	220	12	4.2	6.4
CT	70	82	7.2	26	730	33	9.7	5.8
IOV	160	100	6.8	NA	NA	NA	NA	NA
EC	50	52	7.6	3	ND	ND	ND	4.4

1998

	INFLUENT BOD5	INFLUENT TSS	INFLUENT PH	EFFLUENT BOD5	EFFLUENT TSS	EFFLUENT TKN	EFFLUENT Nitrates	EFFLUENT PH
JAN	60mg/l	64mg/l	ND	3mg/l	58mg/l	5.8mg/l	13mg/l	4.5
FEB	20	30	ND	0	42	6.1	11	5.0
MAR	170	88	ND	0	18	4.9	9.8	5.4
APR	50	53	ND	4	24	4	0	3.9
MAY	190	140	ND	0	42	3.8	11	4.7
JUNE	170	79	ND	0	48	3.5	8.6	3.8
JULY	150	65	ND	0	33	0	0	ND
AUG	550	170	ND	0	50	2.1	8.5	5.1
SEPT	130	62	ND	3	51	3.2	8.2	5.4
OCT	110	110	ND	0	35	3.1	7.8	6.2
NOV	120	34	ND	4	48	4.4	4	5.8
DEC	140	63	ND	0	43	3.2	9.8	4.7

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
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October 7, 1999

Alan Johanssen PE, City Engineer
City of Warrenton
PO Box 250
Warrenton, OR 97146

Re: WQ - City of Warrenton
File No. 93769
Clatsop County
Review of Draft Scope of Work for Wastewater Facilities Plan

Dear Alan Johanssen:

Thank you for the opportunity to review the draft scope of work for your wastewater facilities plan, as proposed by HLB & Associates. We are enclosing our review comments in the form of an attachment to this letter.

To ensure that the report presents adequate information to enable the recommended projects to go forward, our comments highlight where DEQ has established guidelines for making wastewater evaluations. There are specific procedures to be followed which, we recognize, may add costs to the preparation of the report. However, the purpose of the guidelines is to ensure a prompt and orderly review process.

The various guidelines are published on the internet. The URL for accessing the guidelines is http://waterquality.deq.state.or.us/wq/wqrules/Guidance.htm. Where information in wastewater reports was developed and presented as explained in these guidelines, approval has been a prompt and routine matter.

With this goal in mind, we hope that the city will support the attached additions to the scope of the study. However, if you would like further explanation, or if you have concerns about any of our comments, I hope you will not hesitate to contact us. I can be reached at 229-5310.

Meanwhile, we are enclosing information on the preferred method of flow measurement and pump checking. If drawdown tests are performed, as proposed, they must be triplicate due to poor precision. The necessary six drawdowns for a duplex pump station can take several hours.

Review Comments for Scope of Work, Wastewater Facilities Plan
City of Warrenton
October 7, 1999

Task 2, Research:

- ADD graphical presentation of projected population growth for next 20-year period, in context of last 20 years. Quantify commercial and industrial components and waste strengths. Recreational.
- ✓ (Verify and resolve concerns about influent loading data) Derive current per capita loadings. Estimate current flows based on 5-year storm statistics, in accordance with DEQ's published guidelines. Present graphs and flow tabulations in the text or in an appendix.
- Regarding the last item in Task 2, evaluation criteria for pump stations and treatment works are normally based on accepted standards of practice in the industry and current professional literature. An exhaustive tabulation of these criteria is fortunately not necessary here. The list of criteria can be skipped.
- However, if complete evaluation criteria are desired, we recommend making reference to the 1998 DOE Orange Book at **http://www.wa.gov/ecology/wq/orange**.
- Here or below, add development of waste loads and flow projections to be used as the basis of design.

Task 3, Existing Facilities, add the following:

- Examine plant flow charts to quantify and distinguish dry-weather inflows due to rainfall from wet-weather infiltration caused by high groundwater levels. Quantify inflow in units of MGD (million gallons per day) per inch of rain, and infiltration in gpd (gallons per day) per inch-diameter per mile.
- Since all plant influent flow is pumped, it may be necessary to perform night-time flow measurements in key locations, known as flow-mapping, to distinguish infiltration from base sewage flows. This should be accomplished as a priority before winter rains raise groundwater levels.
- Project future flows and loadings in accordance with DEQ guidelines, using a rational method of projection. Unit per capita flows cannot be applied directly to flow projections for wet-weather flows, since peak flow rates do not increase in direct proportion to population.
- Identify and tabulate design data for all sewage pump stations in accordance with DEQ guidelines for engineering reports.
- Confirm actual pumping capacity of each station by field flow measurement. See enclosed O&M notes for procedures on flow measurement. Delete or edit the 5 bullets on procedures for characterizing pump stations. Since the proposed drawdown tests would need to be performed in triplicate to attain reasonable accuracy, they would be very expensive and are not recommended.
- Use measurements of pumping capacity to determine average force main detention time, based on each station's August/September 1999 hour meter readings.
- Perform field checks for corrosion and structural integrity of all pump station discharge manholes per DEQ guidelines for engineering reports.
- Evaluate all aspects of each station, identifying deficiencies and past overflows, and recommending necessary improvements.
- Identify stations where peak flows at times caused all pumps to run, leaving no reserve, and

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

Z 004 366 677

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

March 29, 1999

Mr. David Haskell
Director of Public Works
P.O. Box 250
Warrenton, OR 97146

Re: WQ – Clatsop County
City of Warrenton POTW
P.O. Box 250
Warrenton, OR 97146
NPDES Permit # 100874
WQ – NWR- 99 – 033
NOTICE OF PERMIT VIOLATION

Dear Mr. Haskell:

A review of our records, namely the monthly DMR's submitted by the city, and the City of Warrenton permit file have revealed a number of permit violations. The DMR's were reviewed from 1995 to the present.

The following violations are of a serious nature and have been ongoing for a number of years. Namely:

1. Schedule "C" of your permit, Compliance Schedules and Conditions, item (2) requires "The permittee shall conduct a continuing program to identify and reduce infiltration and inflow (I/I) into the sewage collection system and to submit a report to DEQ by May 1st of each year noting the progress achieved and future work planned.

To wit: Since 1992 the Department has only received one such required report. That report was dated March 30, 1992 and was severely lacking in content.

Violation of a permit compliance schedule is a Class I violation in accordance with ORS 340-012-0055(f).

Capsule

2. Schedule "C" of your permit, Compliance Schedules and Conditions, item (3) requires that "within 90 days of permit issuance, the permittee shall submit plans and specifications for approval, including a construction schedule, for correcting short-circuiting within the lagoon cells. The work shall be completed by March 31, 1993.

To wit: The report required by Schedule "C" item 3 was never received and to our knowledge the required work to prevent short-circuiting was never performed.

Violation of a permit compliance schedule is a Class I violation in accordance with OAR 340-012-0055(f).

3. Schedule "B" of your permit requires the monitoring and reporting of influent pH three times per week.

To wit: Influent pH has not been reported on the monthly DMR's since April of 1995.

Failure to monitor pursuant to your NPDES permit requirements is a Class II violation in accordance with OAR 340-012-0055(2)(f).

4. Your NPDES permit requires the effluent to have a fecal coliform count per 100 mL of less than 200 monthly average.

To wit: Your monthly average limit for fecal coliform was exceeded in the following reporting periods;

Reporting Period	Monthly Average
January, 1993	403
October, 1993	501
November, 1994	600
August, 1996	255
October, 1998	230
December, 1998	452

Exceeding the permit parameter for fecal coliform is a Class II violation.

5. Schedule "B" of your permit requires the monitoring and reporting of fecal coliform bacteria counts in the effluent at least twice a month.

To wit: On your December, 1992 DMR only one test for fecal coliform was reported. On your June, 1996 DMR only one test for fecal coliform was reported.

Failure to monitor pursuant to your NPDES permit requirements is a Class II violation in accordance with OAR 340-012-0055(2)(f).

6. Schedule "B" of your permit requires the monitoring and reporting of BOD_5 and TSS at least once per month.

To wit: Your October, 1994 DMR did not report BOD_5 nor TSS.

Failure to monitor pursuant to your NPDES permit requirements is a Class II violation in accordance with OAR 340-012-0055(2)(f).

7. Schedule "A", item 2 of your permit requires a BOD_5 efficiency of at least 85%.

To wit: Your removal efficiency for BOD_5 for the December, 1995 reporting period was only 71.4%, the removal efficiency for BOD_5 for the August, 1996 reporting period was 79%, and the removal efficiency for BOD_5 for the August, 1996 reporting period was 81%.

These are Class II violations in accordance with OAR 340-012-0055(g).

8. Schedule "A", item 1 of your permit requires that the daily maximum pounds for BOD_5 not exceed 225 pounds.

To wit: Your July, 1998 DMR reported a daily maximum BOD_5 as 229 pounds.

This is a Class III violation in accordance with OAR 340-012-0055(c).

9. Schedule "A", item 1 of your permit requires that the daily maximum pounds for BOD_5 not exceed 225 pounds.

To wit: Your December, 1998 DMR reported a daily maximum BOD_5 as 257 pounds and your October, 1998 DMR reported a daily maximum BOD_5 as 433 pounds.

These are Class II violations in accordance with OAR 340-012-0055(g).

These sixty one violations (includes forty four instances of not monitoring/reporting influent pH) are considered to be a serious violation of your permit and of Oregon environmental law. Therefore, we are referring these violations to the Department's Enforcement Section with a recommendation to initiate a formal enforcement action. The formal enforcement action will consist of a Mutual Agreement and Order and may also include a civil penalty assessment for each day of violation.

Further, the City of Warrenton shall, upon receipt of this Notice of Permit Violation, perform weekly testing for Fecal Coliform bacteria, TSS, and BOD5. The results of these tests to be reported on the monthly DMR form.

If you have any questions, please contact me at 503-229-5323.

Sincerely,

Robert P Baumgartner

Robert P. Baumgartner
Manager, Northwest Region
Water Quality Source Control Section

cc: Les Carlough, Manager, Enforcement, Northwest Region
DEQ/NWR/file

APPENDIX – G
(NPDES Permits)

REVIEW

Expiration Date: 3-31-97
Permit Number: 100274
File Number: 93769
Page 1 of 5 Pages

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT

Department of Environmental Quality
811 S.W. Sixth Avenue, Portland, OR 97204
Telephone: (503) 229-5696

Issued pursuant to ORS 468.740 and The Federal Clean Water Act

---

ISSUED TO:

CITY OF WARRENTON
P O BOX 250
WARRENTON OR 97146

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Outfall Location
Domestic Sewage	001	R.M. 7.0

PLANT TYPE AND LOCATION:

Two Cell Lagoon
Sewage Treatment Plant
Warrenton, Oregon
Treatment System Class: I
Collection System Class: II

RECEIVING SYSTEM INFORMATION:

Basin: North Coast-Lower Columbia
Sub-Basin: Lower Columbia/Youngs
Stream: Columbia River
Hydro Code: 10=-COLU 7.0 I
County: Clatsop

EPA REFERENCE NO: OR 002087-7

Issued in response to Application No. 997759 received September 23, 1991.

This permit is issued based on the land use findings in the permit record.

______________________________ ________________
Charles K. Ashbaker, Manager — Date
Water Quality, Northwest Region

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system and discharge to public waters adequately treated wastewaters only from the authorized discharge point or points established in Schedule A and only in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:

Each other direct and indirect discharge to public waters is prohibited.

This permit does not relieve the permittee from responsibility for compliance with any other applicable federal, state, or local law, rule, standard, ordinance, order, judgment, or decree.

SCHEDULE A

1. **Waste Discharge Limitations not to be Exceeded After Permit Issuance.**

a. Outfall Number 001 (Lagoon Discharge):

(1) Parameters	Average Effluent Concentrations Monthly	Average Effluent Concentrations Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
a. BOD-5	30 mg/l	45 mg/l	112	169	225
b. TSS	50 mg/l	80 mg/l	188	300	375
c. FC/100ml	200	400			

*Based on average dry weather design flow to the facility equaling 0.45 MGD.

(2) Other parameters

a. pH	Shall be within the range 6.0 - 9.0
b. BOD Removal Efficiency	Shall not be less than 85% monthly average
c. TSS Removal Efficiency	Shall not be less than 65% monthly average

(3) Not withstanding the effluent limitations established by this permit, no wastes shall be discharged and no activities shall be conducted which violate Water Quality Standards as adopted in OAR 340-41-205 except in the defined mixing zone:

That portion of the Columbia River within 100 feet of the point of discharge.

SCHEDULE B

1. Minimum Monitoring and Reporting Requirements.
(unless otherwise approved in writing by the Department)

Outfall Number 001

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)(Influent)	Daily	Measurement
Total Flow (MGD)(Effluent)	Daily	Measurement
BOD-5 (Influent)	Monthly	Composite
BOD-5 (Effluent)	Monthly	Composite
TSS (Influent)	Monthly	Composite
TSS (Effluent)	Monthly	Composite
pH (Influent and Effluent)	3/week	Grab
Fecal Coliform	2/month	Grab
Quantity Chlorine Used	Daily	Measurement
Chlorine Residual	Daily	Grab
Average Percent Removed (BOD and TSS)	Monthly	Calculation

The permittee shall submit an annual report to the Department in accordance with Schedule C, Condition 2 detailing plans and progress toward the reduction of Inflow and Infiltration to the Collection System.

2. Reporting Procedures

Monitoring results shall be reported on approved forms. The reporting period is the calendar month. Reports must be submitted to the Department by the 15th day of the following month.

State monitoring reports shall identify the name, certificate classification and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Monitoring reports shall also identify each system classification as found on page one of this permit.

SCHEDULE C

Compliance Schedules and Conditions

1. The permittee shall submit, and obtain approval of, a sludge management plan in accordance with Oregon Administrative Rule 340, Division 50, "Disposal of Sewage Treatment Plant Sludge and Sludge Derived Products Including Septage", prior to removal of any sludge from the lagoons. The management plan shall include a plan and schedule for the sludge treatment process in order to meet federal "Processes to Significantly Reduce Pathogens (PSRP)". Upon approval of the plan by the Department, the plan shall be implemented by the permittee.

2. The permittee shall conduct a continuing program to identify and reduce infiltration and inflow into the sewage collection system. A report shall be submitted by May 1st of each year noting progress achieved and future work planned.

3. Within 90 days of permit issuance, the permittee shall submit plans and specifications for approval, including a construction schedule, for correcting short-circuiting within the lagoon cells. The work shall be completed by March 31, 1993.

4. The permittee is expected to meet the compliance dates which have been established in this schedule. Either prior to or no later than 14 days following any lapsed compliance date, the permittee shall submit to the Department a notice of compliance or noncompliance with the established schedule. The Director may revise a schedule of compliance if he determines good and valid cause resulting from events over which the permittee has little or no control.

SCHEDULE D

Special Conditions

1. The permittee shall comply with Oregon Administrative Rules (OAR), Chapter 340, Division 49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and accordingly:

   a. The permittee shall have its wastewater system supervised by one or more operators who are certified in a classification and grade level (equal to or greater) that corresponds with the classification (collection and/or treatment) of the system to be supervised as specified on page one of this permit.

      Note: A "supervisor" is defined as the person exercising authority for establishing and executing the specific practice and procedures of operating the system in accordance with the policies of the permittee and requirements of the waste discharge permit. "Supervise" means responsible for the technical operation of a system, which may affect its performance or the quality of the effluent produced. Supervisors are not required to be on-site at all times.

   b. The permittee's wastewater system may not be without supervision (as required by Special Condition 1(a) above) for more than thirty (30) days. During this period, and at any time that the supervisor is not available to respond on-site (i.e. vacation, sick leave or off-call), the permittee must make available another person who is certified in the proper classification and at grade level I or higher.

   c. The permittee is responsible for ensuring the wastewater system has a properly certified supervisor available at all times to respond on-site at the request of the permittee and to any other operator.

   d. The permittee shall notify the Department of Environmental Quality in writing within thirty (30) days of replacement or redesignation of certified operators responsible for supervising wastewater system operation. The notice shall be filed with the Water Quality Division, Operator Certification Program (see address on page one). This requirement is in addition to the reporting requirements contained under Schedule B of this permit.

2. The permittee shall notify the DEQ Northwest Region office (phone: 229-5263) of any malfunction so corrective action can be coordinated between the permittee and the Department.

APPENDIX – H

(Mutual Agreement and Order - MAO)

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF:	)MUTUAL AGREEMENT
	)AND ORDER
	)
CITY OF WARRENTON,	)NO. WQ/M-NWR-01-281
Permittee	)CLATSOP COUNTY
	)

WHEREAS:

1. On April 10, 1992, the Department of Environmental Quality (Department) issued a National Pollutant Discharge Elimination System Waste Discharge Permit No. 100874 (Permit) to the City of Warrenton (the City). The Permit authorizes the City to construct, install, modify or operate wastewater treatment control and disposal facilities (facilities) and discharge adequately treated wastewaters into the Columbia River, waters of the state, in conformance with the requirements, limitations and conditions set forth in the Permit. The Permit expired on March 31, 1997. The Permit has remained in effect and is in effect on this date as the City has made timely application for renewal.

2. Condition 1 of Schedule A of the Permit does not allow the City to exceed the following waste discharge limitations after the Permit issuance date:

OUTFALL NUMBER 001 (Lagoon Discharge)
Applies all year

Average Effluent Concentrations			Effluent Loadings		
			Monthly	Weekly	Daily
Parameter	Monthly	Weekly	Average	Average	Maximum
	mg/L	mg/L	lbs/day	lbs/day	lbs
BOD_5	30	45	112	169	225
TSS	50	80	188	300	375
FC/100ml	200	400			
Other Parameters					
PH	Shall be within the range 6-9				
BOD_5 removal efficiency	Shall not be less than 85% monthly average				
TSS removal efficiency	Shall not be less than 65% monthly average				
Average Dry Weather Flow	0.45 MGD				

3. On March 29, 1999 and February 9, 2001, the Department issued a Notice of Noncompliance to the City for Permit violations. The March 29, 1999 Notice of Noncompliance addressed a lapse in reporting, high Fecal Coliform and BOD&TSS percent removal violations. Even though important improvements have been made to the facilities, the Permit limits for the mass load and concentration of BOD and TSS continued to be exceeded and were cited in the February 9, 2001 violation.

4. The Department believes that the City is having difficulty meeting Permit limits because the facility remains overloaded by influent BOD and TSS. The Department and the City recognize that because of the overloading, it is likely that Permit violations will continue unless necessary improvements are made to the City's facilities.

5. The facilities are presently able to treat effluent so as to meet the following effluent limitations.

OUTFALL NUMBER 001 (Lagoon Discharge)

Applies All Year

Average Effluent Concentrations			Effluent Loadings		
			Monthly	Weekly	Daily
			Average	Average	Maximum
Parameter	Monthly	Weekly	lbs/day	lbs/day	lbs
BOD_5	75	100	469	704	938
TSS	75	120	469	704	938
FC/100ml	200	400			

Monthly Flow is based on 0.75 MGD

Weekly Flow is based on 1.5 x 0.75 MGD =1.125MGD

Daily Flow is based on 2 x 0.75 MGD= 1.5 MGD

Other Parameters All year Round

PH	Shall be within the range 6-9
BOD_5 removal efficiency	Shall not be less than 70% monthly average
TSS removal efficiency	Shall not be less than 65% monthly average

6. The Department and the City recognize that the Environmental Quality Commission has the power to impose a civil penalty and to issue an abatement order for violations of conditions

in the Permit. Therefore pursuant to ORS 183.415(5), the Department and the City wish to limit and resolve any past and future violations referred to in Paragraphs 3 and 4 by entering into this Mutual Agreement and Order (MAO).

7. This MAO is not intended to settle any violation of any interim effluent limitations set forth paragraph 8B below. Furthermore, this MAO is not intended to limit, in any way, the Department's right to proceed against the City in any forum for any past or future violations not expressly settled herein.

NOW THEREFORE, it is stipulated and agreed that:

8. The Environmental Quality Commission hereby issues a final order:

A. Requiring the City to comply with the following schedule:

(1) By April 1, 2002, or within four months of having been provided by DEQ with proposed effluent limits and other proposed conditions to be included in renewed Permit, whichever is later, submit for DEQ review and comment a draft <u>Wastewater Facilities Plan (Plan)</u>. The draft <u>Plan</u> shall at a minimum include and address the following:

a. Twenty year planning period.

b. All aspects of City's wastewater collection, treatment and disposal system.

c. Discussion of the possibility of the City providing sewage treatment and disposal services to other public and private wastewater sources in the Warrenton area. Waste load projections shall clearly indicate which if any additional sources are included.

d. Evaluation of a range of wastewater treatment options capable of meeting Permit effluent limits, Minimum Design Criteria and water quality standards, including evaluation of alternative discharge location and mixing zone characteristics demonstrating compliance with regulatory mixing zone requirements for the projected 20-year waste loads, and identification of sludge management options for existing lagoons which may be needed to accommodate wastewater treatment options.

(2) The City shall conduct a One-stop meeting within six (6) months of the signing of this MAO. In addition, the City will pursue all potential state and federal funding programs as deemed appropriate by City Officials, DEQ and OECDD. Once funding sources have been identified the City shall submit all appropriate funding applications, as suggested by DEQ and OEDCC, as needed for engineering and construction prior to December 31, 2002.

(3) The City shall submit a pre-application to the Department for the federal year 2003 Clean Water State Revolving Fund (CWSRF) loan program for design and construction of facilities and improvements.

(4) As a component of the City's Sewer Rate Study being performed by FSC Group, the city shall consider a debt services schedule as part of the City's user rate methodology in anticipation of future CWSRF loans. The City anticipates its new user rate methodology will be effective January 1, 2002.

(5) In order to facilitate the policy decisions needed to comply with this MAO, DEQ agrees to participate as needed in meetings designed for community education and input on topics such as, but not limited to, DEQ regulatory compliance issues in Warrenton and the need for new wastewater facilities.

(6) Nothing in this MAO will prevent the City from accelerating the schedule of events once funding is made available.

(7) The City may prepare and submit for DEQ approval after May 30, 2002, any Interim Engineering Study for proposed interim improvements to existing lagoons and timelines needed to provide capacity to allow additional waste loads during the term of the MAO subject to the effluent limits set forth in paragraph 8(B) of this MAO. Once interim improvements are implemented the City may allow additional sewer extension only as approved in writing by the DEQ.

(8) By September 30, 2002 submit for DEQ approval a final Plan. Final Plan shall include:

a. A selected alternative that describes all wastewater facilities proposed for construction during the twenty-year planning period, including any phasing of construction.

b. An implementation program, including a financing plan.

c. An Environmental Analysis and any other content required for the Plan to serve as a qualifying document for funding from federal and state funding agencies if financing plan indicates such funding will be pursued.

(9) Within three months of approval of the Plan by DEQ, the City shall submit a biosolids management plan that is consistent with approved Plan.

(10) By April 1, 2003 submit for DEQ approval a Predesign Report, conforming to DEQ requirements for such documents, consistent with the approved Plan.

(11) Within 243 days of DEQ approval of the Predesign Report identified in paragraph 8.A(10), but no latter than December 31, 2003 submit for DEQ approval Plans and Specifications (P&S) consistent with approved Predesign Report.

(12) Within 151 days of DEQ approval of the Plans and Specifications identified in paragraph 8.A(11), award contract(s) for construction of approved P&S.

(13) Within fifteen (15) months of the awarding of contracts identified in paragraph 8.A(12) above complete construction of approved P&S.

(14) Within three (3) months of complete construction as identified in paragraph 8.A(13) achiéve full operation of new facilities so as to meet consistently all Permit limits, Minimum Design Criteria and applicable water quality standards.

B. Requiring the City to operate facilities as effectively as possible but not to exceed the following interim effluent discharge limits until full operation of the facility has been achieved per paragraph 8.A.14:

Interim Limits for the City of Warrenton Wastewater Treatment Facility					
All Year Round					
Outfall Number 001 (Lagoon Discharge)					
	Avg. Effluent Conc.		AVERAGE		
Parameters	Monthly	Weekly	Monthly	Weekly	Daily
	mg/L	mg/L	lb/day*	lb/day*	lb/day*
BOD_5	75	100	469	704	938
TSS	75	120	469	704	938

Monthly Flow is based on 0.75 MGD

Weekly Flow is based on 1.5 x 0.75 MGD =1.125 MGD

Daily Flow is based on 2x 0.75 MGD= 1.5 MGD

Other Parameters all year Round

pH	Shall be within the range 6-9
BOD_5 Removal Efficiency	Shall not be less than 70% monthly average
TSS Removal Efficiency	Shall not be less than 65% monthly average

C. Requiring the City, upon receipt of a written Penalty Demand notice from the Department, to pay the following civil penalties:

(a) $250 for each day of each violation of the compliance schedule set forth in Paragraph 8A.

(b) $100 for each violation of each daily or weekly average waste discharge limitation set forth in Paragraph 8B.

(c) $500 for each violation of each monthly average waste discharge limitation set forth in Paragraph 8B.

9. If any event occurs that is beyond the City's reasonable control and that causes or may cause a delay or deviation in the performance of the requirements of this MAO, the City shall notify the DEQ via telephone within 24 hours and take immediate action to prevent or minimize the delay or deviation. The notification via telephone shall be followed within fourteen (14) days by written notification containing information about the cause of delay or deviation and its anticipated duration, the measures that have been or will be take to prevent or

minimize the delay or deviation, and the timetable by which the City proposes to carry out such measures. It is the City's responsibility in the written notification to demonstrate to DEQ's satisfaction that the delay or deviation has been or will be caused by circumstances beyond the control and despite due diligence of the City. If the City so demonstrates, DEQ shall extend times of performance of related activities and/or re-evaluate and possibly amend interim limits under this MAO as appropriate. Circumstances beyond the City's control include but are not limited to, acts of nature, unforeseen strikes, work stoppages, fires, explosion, riot, sabotage; or war. The DEQ may also consider other circumstances or events as beyond the City's control. These may include changes in State statute which may delay or limit the opportunity of the City to obtain voter approval for the sale of bonds, significant reductions or delays in the receipt of awarded state or federal grants or loans, or substantial increased cost from unforeseen problems or delays that the DEQ agrees the city would not have been expected to anticipate. These other circumstances or events will only be considered if they are not due to any action of inaction of the City. Failure of the City's consultant to provide timely reports might not be considered a circumstance beyond the City's control.

10. Regarding the violations set forth in Paragraph 3 above, which are expressly settled herein without penalty, The City and the Department hereby waive any and all of their rights to any and all notices, hearings, judicial review, and to service of a copy of the final order herein. The Department reserves the right to enforce this MAO through appropriate administrative and judicial proceedings.

11. The terms of this MAO may be amended by the mutual agreement of the Department and the City.

12. All reports, notices and other communications required under or relating to this MAO should be directed to the Department's Northwest Region Water Quality Section at 202 SW 4th Ave., Suite 400, Portland, OR 97201, phone number (503) 229-5263.

13. The City acknowledges that it has actual notice of the contents and requirements of the MAO and that failure to fulfill any of the requirements would constitute a violation of the MAO and subject the City to payment of civil penalties pursuant to Paragraph 8C above.

14. Any stipulated penalty imposed pursuant to Paragraph 8C above shall be due upon written demand. Stipulated civil penalties shall be paid by check or money order made payable to the "State Treasurer, State of Oregon" and sent to the Business Office, Department of Environmental Quality, 811 SW Sixth Avenue, Portland, OR 97204. Payment is due within 21 days of receipt of a "Demand for Payment of Stipulated Civil Penalty" notice from the Department. The City may request a hearing to contest the Demand Notice. At any such hearing, the issue shall be limited to the City's compliance or non-compliance with this MAO. The amount of each stipulated civil penalty for each violation and/or day of violation is established in advance by this MAO and shall not be a contestable issue.

15. The Department may amend the compliance schedule and conditions in this MAO upon finding that such modification is necessary because of changed circumstances or to protect public health and the environment. The Department shall provide the City a minimum of thirty (30) days written notice prior to issuing an Amended Order modifying any compliance schedules or conditions. If the City contests the Amended Order, the applicable procedures for conduct of contested cases in such matters shall apply.

CITY OF WARRENTON

12/05/01 Date

Mayor Jeff Hazen
City of Warrenton

DEPARTMENT OF ENVIRONMENTAL QUALITY

12/24/01 Date

Neil Mullane

Neil Mullane
Division Administrator

FINAL ORDER

IT IS SO ORDERED:

ENVIRONMENTAL QUALITY COMMISSION

12/24/01 Date

Neil Mullane

Neil Mullane, Division Administrator
Department of Environmental Quality
Pursuant to OAR 340-011-136(1)

APPENDIX – I
(Oregon Administrative Rules)

The Oregon Administrative Rules contain OARs filed through February 15, 2002

DEPARTMENT OF ENVIRONMENTAL QUALITY

WATER POLLUTION

DIVISION 41

STATE-WIDE WATER QUALITY MANAGEMENT PLAN;

BENEFICIAL USES, POLICIES, STANDARDS, AND TREATMENT CRITERIA FOR OREGON

340-041-0001

Preface

(1) The rules which follow, together with the applicable laws of the State of Oregon and the applicable regulations of the Environmental Quality Commission, set forth Oregon's plans for management of the quality of public waters within the State of Oregon.

(2) Under this plan, the Department of Environmental Quality will continue to manage water quality by evaluating each discharge and activity, whether existing or a new proposal, on a case-by-case basis, based on best information currently available and within the limiting framework of minimum standards, treatment criteria, and policies which are set forth in the plan.

(3) The EQC recognizes that the deadlines for adoption of this plan prevented thorough involvement by local government in the development and review of the plan. Accordingly, the Department will review the contents of this plan with affected local governments and will use their comments and suggestions in preparing amendments for consideration by the EQC not later than December, 1977. At a minimum, the processes of coordination with local governments will consist of the following elements:

(a) Work with county coordinators to set up meetings to explain the plan to groups of local governments and solicit their comments;

(b) Provide copies of the plan and supporting documents to any affected local governments who have not already received them;

(c) Seek input from councils of governments;

(d) Upon request, visit local level governments to discuss the plan;

(e) Work with statewide associations of local governments and others to inform local governments of the plan.

Stat. Auth.: ORS 468
Stats. Implemented: ORS 468.015, ORS 468.035 & ORS 468B.015
Hist.: DEQ 128, f. & ef. 1-21-77

340-041-0006

Definitions

Definitions applicable to all basins unless context requires otherwise:

(1) "BOD" means 5-day 20°C. Biochemical Oxygen Demand.

(2) "DEQ" or "Department" means the Oregon State Department of Environmental Quality.

(3) "DO" means dissolved oxygen.

(4) "EQC" or "Commission" means the Oregon State Environmental Quality Commission.

(5) "Estuarine Waters" means all mixed fresh and oceanic waters in estuaries or bays from the point of oceanic water intrusion inland to a line connecting the outermost points of the headlands or protective jetties.

(6) "Industrial Waste" means any liquid, gaseous, radioactive, or solid waste substance or a combination thereof resulting from any process of industry, manufacturing, trade, or business, or from the development or recovery of any natural resources.

(7) "Marine Waters" means all oceanic, offshore waters outside of estuaries or bays and within the territorial limits of the State of Oregon.

(8) "mg/l" means milligrams per liter.

(9) "Pollution" means such contamination or other alteration of the physical, chemical, or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt, or odor of the waters, or such radioactive or other substance into any waters of the state which either by itself or in connection with any other substance present, will or can reasonably be expected to create a public nuisance or render such waters harmful, detrimental, or injurious to public health, safety, or

welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses or to livestock, wildlife, fish or other aquatic life, or the habitat thereof.

(10) "Public Water" means the same as "waters of the state".

(11) "Sewage" means the water-carried human or animal waste from residences, buildings, industrial establishments, or other places together with such groundwater infiltration and surface water as may be present. The admixture with sewage as herein defined of industrial wastes or wastes, as defined in sections (6) and (13) of this rule, shall also be considered "sewage" within the meaning of this division.

(12) "SS" means suspended solids.

(13) "Wastes" means sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive, or other substances which will or may cause pollution or tend to cause pollution of any water of the state.

(14) "Waters of the State" include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon, and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters which do not combine or effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction.

(15) "Low Flow Period" means the flows in a stream resulting from primarily groundwater discharge or baseflows augmented from lakes and storage projects during the driest period of the year. The dry weather period varies across the state according to climate and topography. Wherever the low flow period is indicated in the Water Quality Management Plans, this period has been approximated by the inclusive months. Where applicable in a waste discharge permit, the low flow period may be further defined.

(16) "Secondary Treatment" as the following context may require for:

(a) "Sewage Wastes" means the minimum level of treatment mandated by EPA regulations pursuant to Public Law 92-500;

(b) "Industrial and other waste sources" imply control equivalent to best practicable treatment (BPT).

(17) "Nonpoint Sources" refers to diffuse or unconfined sources of pollution where wastes can either enter into -- or be conveyed by the movement of water to -- public waters.

(18) "Loading Capacity (LC)" -- The greatest amount of loading that a water can receive without violating water quality standards.

(19) "Load Allocation (LA)" -- The portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources. Load allocations are best estimates of the loading which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading. Whenever possible, natural and nonpoint source loads should be distinguished.

(20) "Wasteload Allocation (WLA)" -- The portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. WLAs constitute a type of water quality-based effluent limitation.

(21) "Total Maximum Daily Load (TMDL)" -- The sum of the individual WLAs for point sources and LAs for nonpoint sources and background. If a receiving water has only one point source discharger, the TMDL is the sum of that point source WLA plus the LAs for any nonpoint sources of pollution and natural background sources, tributaries, or adjacent segments. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure. If Best Management Practices (BMPs) or other nonpoint source pollution controls make more stringent load allocations practicable, then wasteload allocations can be made less stringent. Thus, the TMDL process provides for nonpoint source control tradeoffs.

(22) "Land Development" refers to any human induced change to improved or unimproved real estate, including but not limited to construction, installation or expansion of a building or other structure, land division, drilling, and site alteration such as that due to land surface mining, dredging, grading, construction of earthen berms, paving, improvements for use as parking or storage, excavation or clearing.

(23) "Jurisdiction" refers to any city or county agency in the Tualatin River and Oswego Lake subbasins that regulates land development activities within its boundaries by approving plats, site plans or issuing permits for land development.

(24) "Erosion Control Plan" shall be a plan containing a list of best management practices to be applied during construction to control and limit soil erosion.

(25) "Public Works Project" means any land development conducted or financed by a local, state, or federal governmental body.

(26) "Stormwater Quality Control Facility" refers to any structure or drainage way that is designed, constructed, and maintained to collect and filter, retain, or detain surface water runoff during and after a storm event for the purpose of water quality improvement. It may also include, but not be limited to, existing features such as wetlands, water quality swales, and ponds which are maintained as stormwater quality control facilities.

(27) "Water Quality Swale" is a natural depression or wide shallow ditch used to temporarily store, route, or filter runoff for the purpose of improving water quality.

(28) "In Lieu Fee" means a fee collected by a jurisdiction in lieu of requiring construction of on-site stormwater quality control facilities.

(29) "Effluent Limited" can mean one of the following categories:

(a) A receiving stream which is meeting and/or is expected to meet water quality standards with the implementation of standard treatment technology which is secondary treatment for sewage wastes and best practicable treatment (BPT) for industrial and other waste sources;

(b) A receiving stream for which there is insufficient information to determine if water quality standards are being met with standard treatment technology.

(30) "Water Quality Limited" can mean one of the following categories:

(a) A receiving stream which does not meet instream water quality standards during the entire year or defined season even after the implementation of standard technology;

(b) A receiving stream which achieves and is expected to continue to achieve instream water quality standard but utilizes higher than standard technology to protect beneficial uses;

(c) A receiving stream for which there is insufficient information to determine if water quality standards are being met with higher than standard treatment technology or where through professional judgment the receiving stream would not be expected to meet water quality standards during the entire year or defined season without higher than standard technology.

(31) "Reserve Capacity" means that portion of a receiving stream's loading capacity which has not been allocated to point sources or nonpoint sources and natural background as waste load allocations or load allocations, respectively. The reserve capacity includes that loading capacity which has been set aside for a safety margin and is otherwise unallocated.

(32) "Aquatic Species" means any plants or animals which live at least part of their life cycle in waters of the State.

(33) "Biological Criteria" means numerical values or narrative expressions that describe the biological integrity of aquatic communities inhabiting waters of a given designated aquatic life use.

(34) "Designated Beneficial Use" means the purpose or benefit to be derived from a water body, as designated by the Water Resources Department or the Commission.

(35) "Indigenous" means supported in a reach of water or known to have been supported according to historical records compiled by State and Federal agencies or published scientific literature.

(36) "Resident Biological Community" means aquatic life expected to exist in a particular habitat when water quality standards for a specific ecoregion, basin, or water body are met. This shall be established by accepted biomonitoring techniques.

(37) "Without Detrimental Changes in the Resident Biological Community" means no loss of ecological integrity when compared to natural conditions at an appropriate reference site or region.

(38) "Ecological Integrity" means the summation of chemical, physical and biological integrity capable of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat of the region.

(39) "Appropriate Reference Site or Region" means a site on the same water body, or within the same basin or ecoregion that has similar habitat conditions, and represents the water quality and biological community attainable within the areas of concern.

(40) "Critical Habitat" means those areas which support rare, threatened or endangered species, or

serve as sensitive spawning and rearing areas for aquatic life.

(41) "High Quality Waters" means those waters which meet or exceed those levels that are necessary to support the propagation of fish, shellfish, and wildlife and recreation in and on the water, and other designated beneficial uses.

(42) "Outstanding Resource Waters" means those waters designated by the Environmental Quality Commission where existing high quality waters constitute an outstanding state or national resource based on their extraordinary water quality or ecological values, or where special water quality protection is needed to maintain critical habitat areas.

(43) "Short-Term Disturbance" means a temporary disturbance where water quality standards may be violated briefly, but not of sufficient duration to cause acute or chronic effects on beneficial uses.

(44) "Intergravel Dissolved Oxygen" (IGDO) -- The concentration of oxygen measured in the stream gravel pore water. For the purposes of compliance with criteria, the dissolved oxygen concentration should be measured within a redd or artificial redd, down-gradient of the egg pocket. Measurements should be taken within a limited time period; for example, prior to emergence of fry during the month of March.

(45) "Spatial Median" -- The value which falls in the middle of a data set of multiple IGDO measurements taken within a spawning area. Half the samples should be greater than, and half the samples should be less than the spatial median.

(46) "Daily Mean" (dissolved oxygen) -- The numeric average of an adequate number of data to describe the variation in dissolved oxygen concentration throughout a day, including daily maximums and minimums. For the purpose of calculating the mean, concentrations in excess of 100 percent of saturation are valued at the saturation concentration.

(47) "Monthly (30-day) Mean Minimum" (dissolved oxygen) -- The minimum of the 30 consecutive day floating averages of the calculated daily mean dissolved oxygen concentration.

(48) "Weekly (seven-day) Mean Minimum" (dissolved oxygen) -- The minimum of the seven consecutive day floating average of the calculated daily ***mean*** dissolved oxygen concentration.

(49) "Weekly (seven-day) Minimum Mean" (dissolved oxygen) -- The minimum of the seven consecutive day floating average of the daily ***minimum*** concentration. For purposes of application of the criteria, this value will be used as the reference for diurnal minimums.

(50) "Minimum" (dissolved oxygen) -- The minimum recorded concentration including seasonal and diurnal minimums.

(51) "Cold-Water Aquatic Life" -- The aquatic communities that are physiologically restricted to cold water, composed of one or more species sensitive to reduced oxygen levels. Including but not limited to *Salmonidae* and cold-water invertebrates.

(52) "Cool-Water Aquatic Life" -- The aquatic communities that are physiologically restricted to cool waters, composed of one or more species having dissolved oxygen requirements believed similar to the cold-water communities. Including but not limited to *Cottidae*, *Osmeridae*, *Acipenseridae*, and

sensitive *Centrarchidae* such as the small-mouth bass.

(53) "Warm-Water Aquatic Life" -- The aquatic communities that are adapted to warm-water conditions and do not contain either cold- or cool-water species.

(54) "Numeric Temperature Criteria" are measured as the seven-day moving average of the daily maximum temperatures. If there is insufficient data to establish a seven-day average of maximum temperatures, the numeric criteria shall be applied as an instantaneous maximum. The measurements shall be made using a sampling protocol appropriate to indicate impact to the beneficial uses;

(55) "Measurable Temperature Increase" means an increase in stream temperature of more than 0.25° F;

(56) "Anthropogenic", when used to describe "sources" or "warming", means that which results from human activity;

(57) "Ecologically Significant Cold-Water Refuge" exists when all or a portion of a waterbody supports stenotypic cold-water species (flora or fauna) not otherwise widely supported within the subbasin, and either:

(a) Maintains cold-water temperatures throughout the year relative to other segments in the subbasin, providing summertime cold-water holding or rearing habitat that is limited in supply, or;

(b) Supplies cold water to a receiving stream or downstream reach that supports cold-water biota.

Stat. Auth: ORS 183.500, ORS 468.020, ORS 468B.048, ORS 468.705, ORS 468.710 & ORS 468.735
Stats. Implemented: ORS 468B.048
Hist.: DEQ 128, f. & ef. 1-21-77; DEQ 24-1981, f. & ef. 9-8-81; DEQ 16-1988, f. & cert. ef. 7-13-88; DEQ 16-1989, f. & cert. ef. 7-31-89 (and corrected 8-3-89); DEQ 30-1989, f. & cert. ef. 12-14-89; DEQ 22-1990, f. & cert. ef. 7-6-90; DEQ 14-1991, f. & cert. ef. 8-13-91; DEQ 17-1991, f. & cert. ef. 9-30-91; DEQ 5-1996, f. & cert. ef. 3-7-96

340-041-0026

Policies and Guidelines Generally Applicable to All Basins

(1) In order to maintain the quality of waters in the State of Oregon, the following is the general policy of the EQC:

(a) Antidegradation Policy for Surface Waters. The purpose of the Antidegradation Policy is to guide decisions that affect water quality such that unnecessary degradation from point and nonpoint sources of pollution is prevented, and to protect, maintain, and enhance existing surface water quality to protect all existing beneficial uses. The standards and policies set forth in OAR 340-041-0120 through 340-041-0962 are intended to implement the Antidegradation Policy;

(A) High Quality Waters Policy: Where existing water quality meets or exceeds those levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, and other designated beneficial uses, that level of water quality shall be maintained and protected. The Environmental Quality Commission, after full satisfaction of the intergovernmental coordination and public participation provisions of the continuing planning process, and with full consideration of sections (2), (3) and (5) of this rule, however, may allow a lowering of water quality in these high quality waters if they find:

(i) No other reasonable alternatives exist except to lower water quality; and

(ii) The action is necessary and justifiable for economic or social development benefits and outweighs the environmental costs of lowered water quality; and

(iii) All water quality standards will be met and beneficial uses protected.

(B) The Director or a designee may allow lower water quality on a short term basis in order to respond to emergencies or to otherwise protect public health and welfare;

(C) Water Quality Limited Waters Policy: For water quality limited waterbodies, the water quality shall be managed as described in section (3) of this rule;

(D) Outstanding Resource Waters Policy: Where existing high quality waters constitute an outstanding state or national resource such as those waters designated as extraordinary resource waters, or as critical habitat areas, the existing water quality and water quality values shall be maintained and protected, and classified as "Outstanding Resource Waters of Oregon". The Commission may specially designate high quality waterbodies to be classified as Outstanding Resource Waters in order to protect the water quality parameters that affect ecological integrity of critical habitat or special water quality values that are vital to the unique character of those waterbodies. The Department will develop a screening process and establish a list of nominated waterbodies for Outstanding Resource Waters designation in the Bienniel Water Quality Status Assessment Report (305(b) Report). The priority waterbodies for nomination include:

(i) National Parks;

(ii) National Wild and Scenic Rivers;

(iii) National Wildlife Refuges;

(iv) State Parks; and

(v) State Scenic Waterways.

(E) The Department will bring to the Commission a list of waterbodies which are proposed for designation as Outstanding Resource Waters at the time of each Trienniel Water Quality Standards Review;

(F) In designating Outstanding Resource Waters, the Commission shall establish the water quality values to be protected and provide a process for determining what activities are allowed that would not affect the outstanding resource values. After the designation, the Commission shall not allow activities that may lower water quality below the level established except on a short term basis to respond to emergencies or to otherwise protect human health and welfare.

(b) Point source discharges shall follow policies and guidelines in sections (2), (5) and (6) of this rule, and nonpoint source activities shall follow guidelines in sections (7), (8), (9), (10), and (11) of this rule.

(2) In order to maintain the quality of waters in the State of Oregon, it is the general policy of the EQC to require that growth and development be accommodated by increased efficiency and effectiveness of waste treatment and control such that measurable future discharged waste loads from existing sources do not exceed presently allowed discharged loads except as provided in section (3) of this rule.

(3) The Commission or Department may grant exceptions to sections (2) and (6) of this rule and approvals to section (5) of this rule for major dischargers and other dischargers, respectively. Major dischargers include those industrial and domestic sources that are classified as major sources for permit fee purposes in OAR 340-045-0075(2).

(a) In allowing new or increased discharged loads, the Commission or Department shall make the following findings:

(A) The new or increased discharged load would not cause water quality standards to be violated;

(B) The new or increased discharged load would not unacceptably threaten or impair any recognized beneficial uses. In making this determination, the Commission or Department may rely upon the presumption that if the numeric criteria established to protect specific uses are met the beneficial uses they were designed to protect are protected. In making this determination the Commission or Department may also evaluate other state and federal agency data that would provide information on potential impacts to beneficial uses for which the numeric criteria have not been set;

(C) The new or increased discharged load shall not be granted if the receiving stream is classified as being water quality limited under OAR 340-041-0006(30)(a), unless:

(i) The pollutant parameters associated with the proposed discharge are unrelated either directly or indirectly to the parameter(s) causing the receiving stream to violate water quality standards and being designated water quality limited; or

(ii) Total maximum daily loads (TMDLs), waste load allocations (WLAs) load allocations (LAs), and the reserve capacity have been established for the water quality limited receiving stream; and compliance plans under which enforcement action can be taken have been established; and there will be sufficient reserve capacity to assimilate the increased load under the established TMDL at the time of discharge; or

(iii) Effective July 1, 1996, in waterbodies designated water-quality limited for dissolved oxygen, when establishing WLAs under a TMDL for waterbodies meeting the conditions defined in this rule, the Department may at its discretion provide an allowance for WLAs calculated to result in no measurable reduction of dissolved oxygen. For this purpose, "no measurable reduction" is defined as no more than 0.10 mg/L for a single source and no more than 0.20 mg/L for all anthropogenic activities that influence the water quality limited segment. The allowance applies for surface water DO criteria and for Intergravel DO if a determination is made that the conditions are natural. The allowance for WLAs would apply only to surface water 30-day and seven-day means, and the IGDO action level; or

(iv) Under extraordinary circumstances to solve an existing, immediate, and critical environmental problem that the Commission or Department may consider a waste load increase for an existing source on a receiving stream designated water quality limited under OAR 340-041-0006(30)(a) during the period between the establishment of TMDLs, WLAs and LAs and their achievement based on the following conditions:

(I) That TMDLs, WLAs and LAs have been set; and

(II) That a compliance plan under which enforcement actions can be taken has been established and is being implemented on schedule; and

(III) That an evaluation of the requested increased load shows that this increment of load will not have an unacceptable temporary or permanent adverse effect on beneficial uses; and

(IV) That any waste load increase granted under subparagraph (iv) of this paragraph is temporary and does not extend beyond the TMDL compliance deadline established for the waterbody. If this action will result in a permanent load increase, the action has to comply with sub-paragraphs (i) or (ii) of this paragraph.

(D) Effective July 1, 1996, in any waterbody identified by the Department as exceeding the relevant numeric temperature criteria specified for each individual water quality management basin identified in OAR 340-041-0205, OAR-340-041-0245, OAR-340-041-0285, OAR-340-041-0325, OAR-340-041-0365, OAR-340-041-0445, OAR-340-041-0485, OAR-340-041-0525, OAR-340-041-0565, OAR-340-041-0605, OAR-340-041-0645, OAR-340-041-0685, OAR-340-041-0725, OAR-340-041-0765, OAR-340-041-0805, OAR-340-041-0845, OAR-340-041-0885, OAR-340-041-0925, OAR-340-041-0965, and designated as water quality limited under Section 303(d) of the Clean Water Act, the following requirements shall apply to appropriate watersheds or stream segments in accordance with priorities established by the Department. The Department may determine that a plan is not necessary for a particular stream segment or segments within a water-quality limited basin based on the contribution of the segment(s) to the temperature problem:

(i) Anthropogenic sources are required to develop and implement a surface water temperature management plan which describes the best management practices, measures, and/or control technologies which will be used to reverse the warming trend of the basin, watershed, or stream segment identified as water quality limited for temperature;

(ii) Sources shall continue to maintain and improve, if necessary, the surface water temperature management plan in order to maintain the cooling trend until the numeric criterion is achieved or until the Department, in consultation with the Designated Management Agencies (DMAs), has determined that all feasible steps have been taken to meet the criterion and that the designated beneficial uses are not being adversely impacted. In this latter situation, the temperature achieved after all feasible steps have been taken will be the temperature criterion for the surface waters covered by the applicable management plan. The determination that all feasible steps have been taken will be based on, but not limited to, a site-specific balance of the following criteria: protection of beneficial uses; appropriateness to local conditions; use of best treatment technologies or management practices or measures; and cost of compliance;

(iii) Once the numeric criterion is achieved or the Department has determined that all feasible steps have been taken, sources shall continue to implement the practices or measures described in the surface water temperature management plan in order to continually achieve the temperature criterion;

(iv) For point sources, the surface water temperature management plan will be part of their National Pollutant Discharge Elimination System Permit (NPDES);

(v) For nonpoint sources, the surface water temperature management plan will be developed by designated management agencies (DMAs) which will identify the appropriate BMPs or measures;

(vi) A source (including but not limited to permitted point sources, individual landowners and land managers) in compliance with the Department or DMA (as appropriate) approved surface water temperature management plan shall not be deemed to be causing or contributing to a violation of the numeric criterion if the surface water temperature exceeds the criterion;

(vii) In waters the Department determines to be critical for bull trout recovery, the goal of a bull trout surface water temperature management plan is to specifically protect those habitat ranges necessary to maintain the viability of existing stocks by restoring stream and riparian conditions or allowing them to revert to conditions attaining the coolest surface water temperatures possible under natural background conditions;

(E) Waters of the state exceeding the temperature criteria will be identified in the Clean Water Act (CWA), Section 303(d) list developed by the Department according to the schedule required by the Clean Water Act. This list will be prioritized in consul-tation with the DMAs to identify the order in which those waters will be addressed by the Department and the DMAs;

(F) In basins determined by the Department to be exceeding the numeric temperature criteria, and which are required to develop surface water temperature management plans, new or increased discharge loads from point sources which require an NPDES permit under Section 402 of the Clean Water Act or hydro-power projects which require certification under Section 401 of the Clean Water Act are allowed a 1.0°F total cumulative increase in surface water temperatures as the surface water temperature management plan is being developed and implemented for the water quality limited basin if:

(i) In the best professional judgment of the Department, the new or increased discharge load, even with the resulting 1.0°F cumulative increase, will not conflict with or impair the ability of a surface water temperature management plan to achieve the numeric temperature criteria; and

(ii) A new or expanding source must demonstrate that it fits within the 1.0°F increase and that its activities will not result in a measurable impact on beneficial uses. This latter showing must be made by demonstrating to the Department that the temperature change due to its activities will be less than or equal to 0.25°F under a conservative approach or by demonstrating the same to the EQC with appropriate modeling.

(G) Any source may petition the Department for an exception to paragraph (F) of this subsection, provided:

(i) The discharge will result in less than 1.0°F increase at the edge of the mixing zone, and subparagraph (ii) or (iii) of this paragraph applies;

(ii) The source provides the necessary scientific information to describe how the designated beneficial uses would not be adversely impacted; or

(iii) The source demonstrates that:

(I) It is implementing all reasonable management practices;

(II) Its activity will not significantly affect the beneficial uses; and

(III) The environmental cost of treating the parameter to the level necessary to assure full protection would outweigh the risk to the resource.

(H) Any source or DMA may petition the Commission for an exception to paragraph (F) of this subsection, provided:

(i) The source or DMA provides the necessary scientific information to describe how the designated beneficial uses would not be adversely impacted; or

(ii) The source or DMA demonstrates that:

(I) It is implementing all reasonable management practices;

(II) Its activity will not significantly affect the beneficial uses; and

(III) The environmental cost of treating the parameter to the level necessary to assure full protection would outweigh the risk to the resource.

(I) In waterbodies designated by the Department as water-quality limited for bacteria, and in accordance with priorities established by the Department, development and implementation of a bacteria management plan shall be required of those sources that the Department determines to be contributing to the problem. The Department may determine that a plan is not necessary for a particular stream segment or segments within a water-quality limited basin based on the contribution of the segment(s) to the problem. The bacteria management plans will identify the technologies, BMPs and/or measures and approaches to be implemented by point and nonpoint sources to limit bacterial contamination. For point sources, their National Pollutant Discharge Elimination System permit is their bacteria management plan. For nonpoint sources, the bacteria management plan will be developed by designated management agencies (DMAs) which will identify the appropriate BMPs or measures and approaches.

(J) The activity, expansion, or growth necessitating a new or increased discharge load is consistent with the acknowledged local land use plans as evidenced by a statement of land use compatibility from the appropriate local planning agency.

(b) Oregon's water quality management policies and programs recognize that Oregon's water bodies have a finite capacity to assimilate waste. Unused assimilative capacity is an exceedingly valuable resource that enhances in-stream values specifically, and environmental quality generally. Allocation of any unused assimilative capacity should be based on explicit criteria. In addition to the conditions in subsection (a) of this section, the Commission or Department shall consider the following:

(A) Environmental Effects Criteria:

(i) Adverse Out-of-Stream Effects. There may be instances where the non-discharge or limited discharge alternatives may cause greater adverse environmental effects than the increased discharge alternative. An example may be the potential degradation of groundwater from land application of wastes;

(ii) Instream Effects. Total stream loading may be reduced through elimination or reduction of other source discharges or through a reduction in seasonal discharge. A source that replaces other sources, accepts additional waste from less efficient treatment units or systems, or reduces discharge loadings during periods of low stream flow may be permitted an increased discharge load year-round or during seasons of high flow, as appropriate;

(iii) Beneficial Effects. Land application, upland wetlands application, or other non-discharge alternatives for appropriately treated wastewater may replenish groundwater levels and increase streamflow and assimilative capacity during otherwise low streamflow periods.

(B) Economic Effects Criteria. When assimilative capacity exists in a stream, and when it is judged that increased loadings will not have significantly greater adverse environmental effects than other alternatives to increased discharge, the economic effect of increased loading will be considered. Economic effects will be of two general types:

(i) Value of Assimilative Capacity. The assimilative capacity of Oregon's streams are finite, but the potential uses of this capacity are virtually unlimited. Thus it is important that priority be given to those beneficial uses that promise the greatest return (beneficial use) relative to the unused assimilative capacity that might be utilized. In-stream uses that will benefit from reserve assimilative capacity, as well as potential future beneficial use, will be weighed against the economic benefit associated with increased loading;

(ii) Cost of Treatment Technology. The cost of improved treatment technology, non-discharge and limited discharge alternatives shall be evaluated.

(4)(a) A receiving stream shall be designated as water quality limited through the biennial water quality status assessment report prepared to meet the requirements of Section 305(b) of the Water Quality Act. Appendix A of the Status Assessment report shall identify: what waterbodies are water quality limited, the time of year the water quality standards violations occur, the segment of stream or area of waterbody limited, the parameter(s) of concern, whether it is water quality limited under OAR 340-041-0006(30)(a), (b) or (c). Appendix B and C of the Status Assessment report shall identify the specific evaluation process for designating waterbodies limited;

(b) The WQL list contained in Appendix A of the Status Assessment report shall be placed on public notice and reviewed through the public hearing process. At the conclusion of the hearing process and the evaluation of the testimony received, Appendix A will become the official water quality limited list. The Department may add a waterbody to the water quality limited list between status assessment reports after placing that action out on public notice and conducting a public hearing;

(c) For interstate waterbodies, the state shall be responsible for completing the requirements of section (3) of this rule for that portion of the interstate waterbody within the boundary of the state;

(d) For waterbodies designated WQL under OAR 340-041-0006(30)(c), the Department shall establish a priority list and schedule for future water quality monitoring activities to determine: if the waterbody should be designated WQL under OAR 340-041-0006(30)(a) or (b), if estimated TMDLs need to be prepared, and if an implementation plan needs to be developed and implemented;

(e) For waterbodies designated WQL under OAR 340-041-0006(30)(b), requests for load increases shall be considered following subsection (3)(b) of this rule.

(5) For any new waste sources, alternatives which utilize reuse or disposal with no discharge to public waters shall be given highest priority for use wherever practicable. New source discharges may be approved subject to the criteria in section (3) of this rule.

(6) No discharges of wastes to lakes or reservoirs shall be allowed except as provided in section (3) of this rule.

(7) Log handling in public waters shall conform to current EQC policies and guidelines.

(8) Sand and gravel removal operations shall be conducted pursuant to a permit from the Division of State Lands and separated from the active flowing stream by a watertight berm wherever physically practicable. Recirculation and reuse of process water shall be required wherever practicable. Discharges, when allowed, or seepage or leakage losses to public waters shall not cause a violation of water quality standards or adversely affect legitimate beneficial uses.

(9) Logging and forest management activities shall be conducted in accordance with the Oregon Forest Practices Act so as to minimize adverse effects on water quality.

(10) Road building and maintenance activities shall be conducted in a manner so as to keep waste materials out of public waters and minimize erosion of cut banks, fills, and road surfaces.

(11) In order to improve controls over nonpoint sources of pollution, federal, state, and local resource management agencies will be encouraged and assisted to coordinate planning and implementation of programs to regulate or control runoff, erosion, turbidity, stream temperature, stream flow, and the withdrawal and use of irrigation water on a basin-wide approach so as to protect the quality and beneficial uses of water and related resources. Such programs may include, but not be limited to, the following:

(a) Development of projects for storage and release of suitable quality waters to augment low stream flow;

(b) Urban runoff control to reduce erosion;

(c) Possible modification of irrigation practices to reduce or minimize adverse impacts from irrigation return flows;

(d) Stream bank erosion reduction projects.

Stat. Auth: ORS 183.500, ORS 468.020, ORS 468B.048, ORS 468.705, ORS 468.710 & ORS

468.735
Stats. Implemented: ORS 468B.048
Hist.: DEQ 128, f. & ef. 1-21-77; DEQ 1-1980, f. & ef. 1-9-80; DEQ 13-1989, f. & cert. ef. 6-14-89; DEQ 22-1990, f. & cert. ef. 7-6-90; DEQ 17-1991, f. & cert. ef. 9-30-91; DEQ 5-1996, f. & cert. ef. 3-7-96

340-041-0027

Biological Criteria

Waters of the state shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.

Stat. Auth.: ORS 468.735
Stats. Implemented: ORS 468B.048
Hist.: DEQ 14-1991, f. & cert. ef. 8-13-91

340-041-0034

Policy on Sewerage Works Planning and Construction

(1) Oregon's publicly owned sewerage utilities have since 1956 developed an increasing reliance on federal sewerage works construction grant funds to meet a major portion of the cost of their sewerage works construction needs. This reliance did not appear unreasonable based on federal legislation passed up through 1978. Indeed, the Environmental Quality Commission (EQC) has routinely approved compliance schedules with deadlines contingent on federal funding. This reliance no longer appears reasonable based on recent and proposed legislative actions and appropriations and the general state of the nation's economy.

(2) The federal funds expected for future years will address a small percentage of Oregon's sewerage works construction needs. Thus, continued reliance by DEQ and public agencies on federal funding for sewerage works construction will not assure that sewage from a growing Oregon population will be adequately treated and disposed of so that health hazards and nuisance conditions are prevented and beneficial uses of public waters are not threatened or impaired by quality degradation.

(3) Therefore, the following statements of policy are established to guide future sewerage works planning and construction:

(a) The EQC remains strongly committed to its historic program of preventing water quality problems by requiring control facilities to be provided prior to the connection of new or increased waste loads;

(b) The EQC urges each sewerage utility in Oregon to develop, as soon as practicable, a financing plan which will assure that future sewerage works construction, operation, maintenance and replacement needs can be met in a timely manner. Such financing plans will be a prerequisite to Department issuance of permits for new or significantly modified sewerage facilities, for approval of plans for new or significantly modified sewerage facilities, or for access to funding assistance from the state pollution control bond fund. The Department may accept assurance of development of such financing plan if necessary to prevent delay in projects already planned and in the process of implementation. The Department will work with the League of Oregon Cities and others as necessary to aid in the development of financing plans;

(c) No sewerage utility should assume that it will receive grant assistance to aid in addressing its planning and construction needs;

(d) Existing sewerage facility plans which are awaiting design and construction should be updated where necessary to include:

(A) Evaluation of additional alternatives where appropriate, and re-evaluation of costs of existing alternatives;

(B) Identification and delineation of phased construction alternatives; and

(C) A financing plan which will assure ability to construct facilities over an appropriate time span with locally derived funds.

(e) New sewerage works facility planning initiated after October 1, 1981 should not be approved without adequate consideration of alternatives and phased construction options, and without a financing plan which assures adequate funding for construction, operation, maintenance and replacement of sewerage facilities:

(A) The EQC recognizes that many cities in need of immediate sewerage works construction have completed planning and are awaiting design or construction funding. These cities have developed their program relying on 75 percent federal grants. They will have difficulty developing and implementing alternatives to fund immediate construction needs. Many are, or will be, under moratoriums on new connections because existing facilities are at, or near, capacity. The EQC will consider the following interim measures as a means of assisting these cities to get on a self-supporting basis provided that an approvable long-range program is presented:

(i) Temporary increases in waste discharge loading may be approved provided a minimum of secondary treatment, or equivalent control is maintained and beneficial uses of the receiving waterway are not impaired;

(ii) Installation and operation of temporary treatment works may be approved providing:

(I) The area served is inside an approved urban growth boundary and the proposal is consistent with State Land Use Planning laws;

(II) A master sewerage plan is adopted which shows how and when the temporary facilities will be phased out;

(III) The public agency responsible for implementing the master plan is the owner and operator of the temporary facilities;

(IV) Sewerage service to the area served by the temporary facility is necessary as part of the financing program for master plan implementation and no other option for service is practicably available;

(V) An acceptable receiving stream or method of effluent disposal is available for the temporary facility.

(B) Compliance schedules and other permit requirements may be modified to incorporate an approved interim program. Compliance with a permit so modified will be required at all times.

(f) Sewerage Construction programs should be designed to eliminate raw sewage bypassing during the summer recreation season (except for a storm event greater than the one in ten year 24 hour storm) as soon as practicable. A program and timetable should be developed through negotiation with each affected source. Bypasses which occur during the remainder of the year should be eliminated in accordance with an approved longer term maintenance based correction program. More stringent schedules may be imposed as necessary to protect drinking water supplies and shellfish growing areas;

(g) Any sewerage utility that is presently in compliance and foresees a need to plan for future expansion to accommodate growth but elects to wait for federal funds for planning and construction will make such election with full knowledge that if existing facilities reach capacity before new facilities are completed, a moratorium on new connections will be imposed. Such moratorium will not qualify them for any special consideration since its presence is deemed a matter of their choice;

(h) The Department will continue to assist cities to develop interim and long-range programs, and construction schedules and to secure financing for essential construction.

Stat. Auth.: ORS 183
Stats. Implemented: ORS 468.035 & ORS 468B.035
Hist.: DEQ 29-1981, f. & ef. 10-19-81

340-041-0120

Implementation Program Applicable to All Basins

(1) No waste treatment and disposal facilities shall be constructed or operated and no wastes shall be discharged to public waters without obtaining a permit from the Department as required by ORS 468.740.

(2) Plans for all sewage and industrial waste treatment, control, and disposal facilities shall be submitted to the Department for review and approval prior to construction as required by ORS 468.742.

(3) Minimum design criteria for waste treatment and control facilities prescribed under this plan and such other waste treatment and controls as may be necessary to insure compliance with the water quality standards contained in this plan shall be provided in accordance with specific permit conditions for those sources or activities for which permits are required and the following implementation program:

(a) For new or expanded waste loads or activities, fully approved treatment or control facilities, or both shall be provided prior to discharge of any wastes from the new or expanded facilities or conduct of the new or expanded activity;

(b) For existing waste loads or activities, additional treatment or control facilities necessary to correct specific unacceptable water quality conditions shall be provided in accordance with a specific program and timetable incorporated into the waste discharge permit for the individual discharger or activity. In developing treatment requirements and implementation schedules for existing installations or activities, consideration shall be given to the impact upon the overall environmental quality including air, water, land use, and aesthetics;

(c) Wherever minimum design criteria for waste treatment and control facilities set forth in this plan are more stringent than applicable federal standards and treatment levels currently being provided, upgrading to the more stringent requirements will be deferred until it is necessary to expand or otherwise modify or replace the existing treatment facilities. Such deferral will be acknowledged in the permit for the source;

(d) Where planning or design or construction of new or modified waste treatment and controls to meet prior applicable state or federal requirements is underway at the time this plan is adopted, such plans, design, or construction may be completed under the requirements in effect when the project was initiated. Timing for upgrading to meet more stringent future requirements will be as provided in section (3) of this rule.

(4) Confined animal feeding operations shall be regulated pursuant to OAR 340-041-0005 through 340-051-0080 in order to minimize potential adverse effect on water quality.

(5) Programs for control of pollution from nonpoint sources when developed by the Department, or by other agencies pursuant to Section 208 of Public Law 92-500 and approved by the Department, shall as applicable, be incorporated into this plan by amendment via the same process used to adopt the plan unless other procedures are established by law.

(6) Where minimum requirements of federal law or enforceable regulations are more stringent than specific provisions of this plan, the federal requirements shall prevail.

(7) Within framework of state-wide priority and available resources, the Department will monitor water quality within the basin for the purposes of evaluating conformance with the plan and developing information for future additions or updating.

(8) The EQC recognizes that the potential exists for conflicts between water quality management plans and the land use plans and resource management plans which local governments and other agencies must develop pursuant to law. In the event any such conflicts develop, it is the intent of the Department to meet with the local government or responsible agency to formulate proposed revisions to one or both so as to resolve the conflict. Revisions will be presented for adoption via the same process used to adopt the plan unless other specific procedures are established by law.

(9) The Department shall calculate and include effluent limits specified in pounds per day, which shall be the mass load limits for biochemical oxygen demand or carbonaceous biochemical oxygen demand and total suspended solids in National Pollutant Discharge Elimination System permits issued to all sewage treatment facilities. These limits shall be calculated as follows:

(a) Except as noted in paragraph (H) of this subsection, for existing facilities and for facilities receiving engineering plans and specifications approval from the Department for new treatment facilities or treatment facilities expanding the average dry weather treatment capacity, prior to June 30, 1992:

(A) During periods of low stream flows (approximately May 1 through October 31), the monthly average mass load expressed as pounds per day shall not exceed the applicable monthly concentration effluent limit times the design average dry weather flow expressed in million gallons per day times 8.34 pounds per gallons. The weekly average mass load expressed as pounds per day shall not exceed the monthly average mass load times 1.5. The daily mass load expressed in pounds per day shall not exceed the monthly average mass load times 2.0;

(B) During the period of high stream flows (approximately November 1 through April 30), the monthly average mass load expressed as pounds per day shall not exceed the monthly concentration effluent limit times the design average wet weather flow expressed in million gallons per day times 8.34 pounds per gallon. The weekly average mass load expressed as pounds per day shall not exceed the monthly average mass load times 1.5. The daily mass load expressed in pounds per day shall not exceed the monthly average mass load times 2.0;

(C) On any day that the daily flow to a sewage treatment facility exceeds the lesser hydraulic capacity of the secondary treatment portion of the facility or twice the design average dry weather flow, the daily mass load limit shall not apply. The permittee shall operate the treatment facility at highest and best practicable treatment and control;

(D) The design average wet weather flow used in calculating mass loads shall be approved by the Department in accordance with prudent engineering practice and shall be based on a facility plan approved by the Department, engineering plans and specifications approved by the Department, or an engineering evaluation. The permittee shall submit documentation describing and supporting the design average wet weather flow with the permit application, application for permit renewal, or modification request, or upon request by the Department. The design average wet weather flow is defined as the average flow between November 1 and April 30 when the sewage treatment facility is projected to be at design capacity for that portion of the year;

(E) Mass loads assigned as described in paragraphs (B) and (C) of this subsection will not be subject to OAR 340-041-0026(3);

(F) Mass loads as described in this rule will be included in permits upon renewal, or upon permit modification request;

(G) Within 180 days after permit renewal or modification, permittees receiving higher mass loads under this rule and having a separate sanitary sewer system shall submit to the Department for review and approval a proposed program and time schedule for identifying and reducing inflow. The program shall consist of the following:

(i) Identification of all overflow points and verification that sewer system overflows are not occurring up to a 24-hour, five-year storm event or equivalent;

(ii) Monitoring of all pump station overflow points; and

(iii) A program for identifying and removing all inflow sources into the permittees sewer system over which the permittee has legal control; and

(iv) For those permittees not having the necessary legal authority for all portions of the sewer system discharging into the permittee's sewer system or treatment facility, a program and schedule for gaining legal authority to require inflow reduction and a program and schedule for removing inflow sources.

(H) Within one year after the Department's approval of the program, the permittee shall begin implementation of the program.

(I) Paragraphs (A) through (G) of this subsection shall not apply to the cities of Athena, Elgin, Adair Village, Halsey, Harrisburg, Independence, Carlton and Sweet Home. Mass load limits have been individually assigned to these facilities.

(b) For new sewage treatment facilities or treatment facilities expanding the average dry weather treatment capacity, and receiving engineering plans and specifications approval from the Department after June 30, 1992, the mass load limits shall be calculated by the Department based on the proposed treatment facility capabilities and the highest and best practicable treatment to minimize the discharge of pollutants;

(c) Mass load limits as defined in this rule may be replaced by more stringent limits if required by waste load allocations established in accordance with a TMDL for treatment facilities discharging to water quality limited streams, or if required to prevent or eliminate violations of water quality standards;

(d) In the event that the design average wet weather flow or the hydraulic secondary treatment capacity is not known or has not been approved by the Department at the time of permit issuance, the permit shall include as interim mass load limits the mass load limits in the previous permit issued to the permittee for the treatment facility. The permit shall also include a requirement that the permittee shall submit to the Department the design average wet weather flow and hydraulic secondary treatment capacity within 12 months after permit issuance. Upon review and approval of the design flow information, the Department will modify the permit and include mass load limits as described in subsection (a) of this section;

(e) Each permittee with existing sewage treatment facilities otherwise subject to subsection (a) of this section may choose mass load limits calculated as follows:

(A) The monthly average mass load expressed as pounds per day shall not exceed the applicable monthly concentration effluent limit times the design average dry weather flow expressed in million gallons per day times 8.34 pounds per gallon;

(B) The weekly average mass load expressed as pounds per day shall not exceed the monthly average mass load times 1.5;

(C) The daily mass load expressed in pounds per day shall not exceed the monthly average mass load times 2.0. In the event that existing mass load limits are retained by the permittee, the terms and requirements of subsection (a) of this section shall not apply.

(f) The Commission may grant exceptions to subsection (a) of this section. In allowing increased discharged loads, the Commission shall make the findings specified in OAR 340-041-0026(3) for waste loads, and in addition shall make the following findings:

(A) That mass loads as calculated in subsection (a) of this section cannot be achieved with the existing treatment facilities operated at maximum efficiency at projected design flows; and

(B) That there are no practicable alternatives to achieving the mass loads as calculated in subsection (a) of this section.

(10) Agricultural water quality management plans to reduce agricultural nonpoint source pollution shall be developed and implemented by the Oregon Department of Agriculture (ODA) through a cooperative agreement with the Department of Environmental Quality (DEQ) to implement applicable provisions of ORS 568.900–933 and ORS 561.191. If DEQ has reason to believe that agricultural discharges or activities are contributing to water quality problems resulting in water quality standards violations, DEQ shall hold a consultation with the ODA. If water quality impacts are likely from agricultural sources, and DEQ determines that a water quality management plan is necessary, the Director of DEQ shall write a letter to the Director of the ODA requesting that such a management plan be prepared and implemented to reduce pollutant loads and achieve the water quality criteria.

(11) EQC policy on surface water temperature (as regulated in the basin standards found in OAR 340-041-0205, OAR-340-041-0245, OAR-340-041-0285, OAR-340-041-0325, OAR-340-041-0365, OAR-340-041-0445, OAR-340-041-0485, OAR-340-041-0525, OAR-340-041-0565, OAR-340-041-0605, OAR-340-041-0645, OAR-340-041-0685, OAR-340-041-0725, OAR-340-041-0765, OAR-340-041-0805, OAR-340-041-0845, OAR-340-041-0885, OAR-340-041-0925, OAR-340-041-0965:

(a) It is the policy of the Environmental Quality Commission (EQC) to protect aquatic ecosystems from adverse surface water warming caused by anthropogenic activities. The intent of the EQC is to minimize the risk to cold-water aquatic ecosystems from anthropogenic warming of surface waters, to encourage the restoration of critical aquatic habitat, to reverse surface water warming trends, to cool the waters of the State, and to control extremes in temperature fluctuations due to anthropogenic activities:

(A) The first element of this policy is to encourage the proactive development and implementation of best management practices or other measures and available temperature control technologies for nonpoint and point source activities to prevent thermal pollution of surface waters;

(B) The second element of this policy is to require the development and implementation of surface water temperature management plans for those basins exceeding the numeric temperature criteria identified in the basin standards. The surface water temperature management plans will identify the best management practices (BMPs) or measures and approaches to be taken by nonpoint sources, and technologies to be implemented by point sources to limit or eliminate adverse anthropogenic warming of surface waters.

(b) Surface water temperatures in general are warming throughout the State. These water temperatures are influenced by natural physical factors including, but not limited to solar radiation, stream-side shade, ambient air temperatures, heated water discharges, cold-water discharges, channel morphology, and stream flow. Surface water temperatures may also be affected by anthropogenic activities that discharge heated water, widen streams, or reduce stream shading, flows, and depth. These anthropogenic activities, as well as others, increase water temperatures. Anthropogenic activities may also result in the discharge of cold water that decreases water temperatures and affects biological cycles of aquatic species;

(c) The temperature criteria in the basin standards establish numeric and narrative criteria to protect designated beneficial uses and to initiate actions to control anthropogenic sources that adversely increase or decrease stream temperatures. Natural surface water temperatures at times exceed the numeric criteria due to naturally high ambient air temperatures, naturally heated discharges, naturally low stream flows or other natural conditions. These exceedances are not water quality standards violations when the natural conditions themselves cause water temperatures to exceed the numeric criteria. In these situations, the natural surface water temperatures become the numeric criteria. In surface waters where both natural and anthropogenic factors cause exceedances of the numeric criteria, each anthropogenic source will be responsible for controlling, through implementation of a management plan, only that portion of the temperature increase caused by that anthropogenic source;

(d) The purpose of the numeric criteria in the basin standards is to protect designated beneficial uses; this includes specific life cycle stages during the time periods they are present in a surface water of the state. Surface water temperature measurements taken to determine compliance with the identified criteria will be taken using a sampling protocol appropriate to indicate impact to the beneficial use. The EQC, in establishing these criteria, recognizes that new information is constantly being developed on water temperatures and how water temperatures affect different beneficial uses. Therefore, continued reevaluation of temperature information is needed to refine and revise numeric criteria in the basin standards over time. The EQC also recognizes that the development and implementation of control technologies and best management practices or measures to reduce anthropogenic warming is evolving and the achievement of the numeric criteria will be an iterative process;

(e) Surface water temperature management plans will be required according to OAR 340-041-0026 (3)(a)(D) when the relevant numeric temperature criteria are exceeded and the waterbody is designated as water-quality limited under Section 303(d) of the Clean Water Act. The plans will identify those steps, measures, technologies, and/or practices to be implemented by those sources determined by the Department to be contributing to the problem. The plan may be for an entire basin, a single watershed, a segment of a stream, single or multiple nonpoint source categories, single or multiple point sources or any combination of these, as deemed appropriate by the Department, to address the identified temperature problem:

(A) In the case of state and private forest lands, the practices identified in rules adopted pursuant to the State Forest Practices Act (FPA) will constitute the surface water temperature management plan for the activities covered by the act. Consequently, in those basins, watersheds or stream segments exceeding the relevant temperature criterion, and for those activities covered by the Forest Practices Act, the forestry component of the temperature management plan will be the practices required under the FPA. If the mandated practices need to be improved in specific basins, watersheds or stream segments to fully protect identified beneficial uses, the Departments of Forestry and Environmental Quality will follow the process described in ORS 527.765 to establish, implement, and improve practices in order to reduce thermal loads to achieve and maintain the surface water temperature criteria. Federal forest management agencies are required by the federal Clean Water Act to meet or exceed the substantive requirements of the state forestry nonpoint source program. The Department currently has Memoranda of Understanding with the U.S. Forest Service and Bureau of Land Management to implement this aspect of the Clean Water Act. These memoranda will be used to identify the temperature management plan requirements for federal forest lands;

(B) The temperature management plan for agricultural nonpoint sources shall be developed and implemented in the manner described in section (10) of this rule;

(C) The Department will be responsible for determining the appropriate surface water temperature management plan for individual and general NPDES permitted sources. The requirement for a surface water temperature management plan and the content of the plan will be appropriate to the contribution the permitted source makes to the temperature problem, the technologies and practices available to reduce thermal loads, and the potential for trading or mitigating thermal loads;

(D) In urban areas, the Department will work with appropriate state, county, municipal, and special district agencies to develop surface water temperature management plans that reduce thermal loads in basins, watersheds, or stream segments associated with the temperature violations so that the surface water temperature criteria are achieved.

(f) The EQC encourages the release of stored water from reservoirs to cool surface water in order to achieve the identified numeric criteria in the basin standards as long as there is no significant adverse impact to downstream designated beneficial uses from the cooler water temperatures. If the Department determines that a significant adverse impact is resulting from the cold-water release, the Department shall, at its discretion, require the development of a management plan to address the adverse impact created by the cold-water release;

(g) Maintaining low stream temperatures to the maximum extent practicable in basins where surface water temperatures are below the specific criteria identified in this rule shall be accomplished by implementing technology based permits, best management practices or other measures. Any measurable increase in surface water temperature resulting from anthropogenic activities in these basins shall be in accordance with the antidegradation policy contained in OAR 340-041-0026.

(12) Effluent Limitations for Bacteria: Except as allowed in subsection (c) of this section, upon NPDES permit renewal or issuance, or upon request for a permit modification by the permittee at an earlier date, effluent discharges to freshwaters, and estuarine waters other than shellfish growing waters shall not exceed a monthly log mean of 126 E. coli organisms per 100 ml. No single sample shall exceed 406 E. coli organisms per 100 ml. However, no violation will be found, for an exceedance if the permittee takes at least five consecutive re-samples at four-hour intervals beginning as soon as practicable (preferably within 28 hours) after the original sample was taken and the log mean of the five re-samples is less than or equal to 126 E. coli. The following conditions apply:

(a) If the Department finds that re-sampling within the timeframe outlined in this section would pose an undue hardship on a treatment facility, a more convenient schedule may be negotiated in the permit, provided that the permittee demonstrates that the sampling delay will result in no increase in the risk to water contact recreation in waters affected by the discharge;

(b) The in-stream criterion for chlorine listed in **Table 20** shall be met at all times outside the assigned mixing zone;

(c) For sewage treatment plants that are authorized to use reclaimed water pursuant to OAR Chapter

340, Division 55, and which also use a storage pond as a means to dechlorinate their effluent prior to discharge to public waters, effluent limitations for bacteria shall, upon request by the permittee, be based upon appropriate total coliform, limits as required by OAR Chapter 340, Division 55: For Level II limitations, no two consecutive samples shall exceed 240 total coliform per 100 ml and for Level III and Level IV limitations, no single sample shall exceeds 23 total coliform per 100 ml. However, no violation will be found for an exceedance under this paragraph if the permittee takes at least five consecutive re-samples at four hour intervals beginning as soon as practicable (preferably within 28 hours) after the original sample(s) were taken; and in the case of Level II effluent, the log mean of the five re-samples is less than or equal to 23 total coliform per 100 ml or, in the case of Level III and IV effluent, if the log mean of the five re-samples is less than or equal to 2.2 total coliform per 100 ml.

(13) Sewer Overflows in Winter: Domestic waste collection and treatment facilities are prohibited from discharging raw sewage to waters of the State during the period of November 1 through May 21, except during a storm event greater than the one-in-five-year, 24-hour duration storm. However, the following exceptions apply:

(a) The Commission may on a case-by-case basis approve a bacteria control management plan to be prepared by the permittee, for a basin or specified geographic area which describes hydrologic conditions under which the numeric bacteria criteria would be waived. These plans will identify the specific hydrologic conditions, identify the public notification and education processes that will be followed to inform the public about an event and the plan, describe the water quality assessment conducted to determine bacteria sources and loads associated with the specified hydrologic conditions, and describe the bacteria control program that is being implemented in the basin or specified geographic area for the identified sources;

(b) Facilities with separate sanitary and storm sewers existing on January 10, 1996, and which currently experience sanitary sewer overflows due to inflow and infiltration problems, shall submit an acceptable plan to the Department at the first permit renewal, which describes actions that will be taken to assure compliance with the discharge prohibition by January 1, 2010. Where discharges occur to a receiving stream with sensitive beneficial uses, the Department may negotiate a more aggressive schedule for discharge elimination;

(c) On a case-by-case basis, the beginning of winter may be defined as October 15 if the permittee so requests and demonstrates to the Department's satisfaction that the risk to beneficial uses, including water contact recreation, will not be increased due to the date change.

(14) Sewer Overflows in Summer: Domestic waste collection and treatment facilities are prohibited from discharging raw sewage to waters of the State during the period of May 22 through October 31, except during a storm event greater than the one-in-ten-year, 24-hour duration storm. The following exceptions apply:

(a) For facilities with combined sanitary and storm sewers, the Commission may on a case-by-case basis approve a bacteria control management plan such as that described in subsection (13)(a) of this rule;

(b) On a case-by-case basis, the beginning of summer may be defined as June 1 if the permittee so requests and demonstrates to the Department's satisfaction that the risk to beneficial uses, including water contact recreation, will not be increased due to the date change;

(c) For discharge sources whose permit identifies the beginning of summer as any date from May 22 through May 31: If the permittee demonstrates to the Department's satisfaction that an exceedance occurred between May 21 and June 1 because of a sewer overflow, and that no increase in risk to beneficial uses, including water contact recreation, occurred because of the exceedance, no violation shall be triggered if the storm associated with the overflow was greater than the one-in-five-year, 24-hour duration storm.

(15) Storm Sewers Systems Subject to Municipal NPDES Storm Water Permits: Best management practices shall be implemented for permitted storm sewers to control bacteria to the maximum extent practicable. In addition, a collection-system evaluation shall be performed prior to permit issuance or renewal so that illicit and cross connections are identified. Such connections shall be removed upon identification. A collection system evaluation is not required where the Department determines that illicit and cross connections are unlikely to exist.

(16) Storm Sewers Systems Not Subject to Municipal NPDES Storm Water Permits: A collection system evaluation shall be performed of non-permitted storm sewers by January 1, 2005, unless the Department determines that an evaluation is not necessary because illicit and cross connections are unlikely to exist. Illicit and cross-connections shall be removed upon identification.

(17) Water Quality Limited for Bacteria: In those waterbodies, or segments of waterbodies identified by the Department as exceeding the relevant numeric criteria for bacteria in the basin standards and designated as water-quality limited under Section 303(d) of the Clean Water Act, the requirements specified in OAR 340-041-0026(3)(a)(I) and in section (10) of this rule shall apply.

[ED. NOTE: The Table(s) referenced in this rule is not printed in the OAR Compilation. Copies are available from the agency.]

Stat. Auth.: ORS 468B.030 & ORS 468B.048
Stats. Implemented: ORS 468B.048
Hist.: DEQ 128, f. & ef. 1-21-77; DEQ 16-1992, f. & cert. ef. 8-7-92; DEQ 5-1996, f. & cert. ef. 3-7-96; DEQ 11-1997, f. & cert. ef. 6-11-97

340-041-0150

Nuisance Phytoplankton Growth

The following values and implementation program shall be applied to lakes, reservoirs, estuaries and streams, except for ponds and reservoirs less than ten acres in surface area, marshes and saline lakes:

(1) The following average Chlorophyll **a** values shall be used to identify water bodies where phytoplankton may impair the recognized beneficial uses:

(a) Natural lakes which thermally stratify: 0.01 mg/1;

(b) Natural lakes which do not thermally stratify, reservoirs, rivers and estuaries: 0.015 mg/1;

(c) Average Chlorophyll **a** values shall be based on the following methodology (or other methods approved by the Department): A minimum of three samples collected over any three consecutive months at a minimum of one representative location (e.g., above the deepest point of a lake or reservoir or at a point mid-flow of a river) from samples integrated from the surface to a depth equal to twice the secchi depth or the bottom (the lesser of the two depths); analytical and quality assurance methods shall be in accordance with the most recent edition of **Standard Methods for the Examination of Water and Wastewater**.

(2) Upon determination by the Department that the values in section (1) of this rule are exceeded, the Department shall:

(a) In accordance with a schedule approved by the Commission, conduct such studies as are necessary to describe present water quality; determine the impacts on beneficial uses; determine the probable causes of the exceedance and beneficial use impact; and develop a proposed control strategy for attaining compliance where technically and economically practicable. Proposed strategies could include standards for additional pollutant parameters, pollutant discharge load limitations, and other such provisions as may be appropriate. Where natural conditions are responsible for exceedance of the values in section (1) of this rule or beneficial uses are not impaired, the values in section (1) of this rule may be modified to an appropriate value for that water body;

(b) Conduct necessary public hearings preliminary to adoption of a control strategy, standards or modified values after obtaining Commission authorization;

(c) Implement the strategy upon adoption by the Commission.

(3) In cases where waters exceed the values in section (1) of this rule and the necessary studies are not completed, the Department may approve new activities (which require Department approval), new or additional (above currently approved permit limits) discharge loadings from point sources provided that it is determined that beneficial uses would not be significantly impaired by the new activity or discharge.

[Publications: The publication(s) referred to or incorporated by reference in this rule are available from the agency.]

Stat. Auth.: ORS 468
Stats. Implemented: ORS 468B.048
Hist.: DEQ 7-1986, f. & ef. 3-26-86

North Coast-Lower Columbia Basin

340-041-0202

Beneficial Water Uses to be Protected

Water quality in the North Coast-Lower Columbia River Basin (see **Figures 1** and **2**) shall be managed to protect the recognized beneficial uses as indicated in **Table 1**.

[ED. NOTE: The Figure(s) and Table referenced in this rule are not printed in the OAR Compilation. Copies are available from the agency.]

Stat. Auth.: ORS 468
Stats. Implemented: ORS 468B.048
Hist.: DEQ 128, f. & ef. 1-21-77; DEQ 9-1985, f. & ef. 8-6-85

340-041-0205

Water Quality Standards Not to be Exceeded (To be Adopted Pursuant to ORS 468.735 and Enforceable Pursuant to ORS 468.720, 468.990 and 468.992)

(1) Notwithstanding the water quality standards contained below, the highest and best practicable treatment and/or control of wastes, activities, and flows shall in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor, and other deleterious factors at the lowest possible levels.

(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the North Coast -- Lower Columbia River Basin:

(a) Dissolved oxygen (DO): The changes adopted by the Commission on January 11, 1996, become effective July 1, 1996. Until that time, the requirements of this rule that were in effect on January 10, 1996, apply:

(A) For waterbodies identified by the Department as providing salmonid spawning, during the periods from spawning until fry emergence from the gravels, the following criteria apply:

(i) The dissolved oxygen shall not be less than 11.0 mg/l. However, if the minimum intergravel dissolved oxygen, measured as a spatial median, is 8.0 mg/l or greater, then the DO criterion is 9.0 mg/l;

(ii) Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 11.0 mg/l or 9.0 mg/l criteria, dissolved oxygen levels shall not be less than 95 percent of saturation.

(B) For waterbodies identified by the Department as providing salmonid spawning during the period from spawning until fry emergence from the gravels, the spatial median intergravel dissolved oxygen concentration shall not fall below 6.0 mg/l;

(C) A spatial median of 8.0 mg/l intergravel dissolved oxygen level shall be used to identify areas where the recognized beneficial use of salmonid spawning, egg incubation and fry emergence from the egg and from the gravels may be impaired and therefore require action by the Department. Upon determination that the spatial median intergravel dissolved oxygen concentration is below 8.0 mg/l, the Department may, in accordance with priorities established by the Department for evaluating water quality impaired waterbodies, determine whether to list the waterbody as water quality limited under the Section 303(d) of the Clean Water Act, initiate pollution control strategies as warranted, and where needed cooperate with appropriate designated management agencies to evaluate and implement necessary best management practices for nonpoint source pollution control;

(D) For waterbodies identified by the Department as providing cold-water aquatic life, the dissolved oxygen shall not be less than 8.0 mg/l as an absolute minimum. Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 8.0 mg/l, dissolved oxygen shall not be less than 90 percent of saturation. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen shall not fall below 8.0 mg/l as a 30-day mean minimum, 6.5 mg/l as a seven-day minimum mean, and shall not fall below 6.0 mg/l as an absolute minimum **(Table 21)**;

(E) For waterbodies identified by the Department as providing cool-water aquatic life, the dissolved oxygen shall not be less than 6.5 mg/l as an absolute minimum. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen shall not fall below 6.5 mg/l as a 30-day mean minimum, 5.0 mg/l as a seven-day minimum mean, and shall not fall below 4.0 mg/l as an absolute minimum **(Table 21)**;

(F) For waterbodies identified by the Department as providing warm-water aquatic life, the dissolved oxygen shall not be less than 5.5 mg/l as an absolute minimum. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen shall not fall below 5.5 mg/l as a 30-day mean minimum, and shall not fall below 4.0 mg/l as an absolute minimum **(Table 21)**;

(G) For estuarine water, the dissolved oxygen concentrations shall not be less than 6.5 mg/l (for coastal waterbodies);

(H) For marine waters, no measurable reduction in dissolved oxygen concentration shall be allowed.

(b) Temperature: The changes adopted by the Commission on January 11, 1996, become effective July 1, 1996. Until that time, the requirements of this rule that were in effect on January 10, 1996, apply. The method for measuring the numeric temperature criteria specified in this rule is defined in OAR 340-041-0006(54):

(A) To accomplish the goals identified in OAR 340-041-0120(11), unless specifically allowed under a Department-approved surface water temperature management plan as required under OAR 340-041-0026(3)(a)(D), no measurable surface water temperature increase resulting from anthropogenic activities is allowed:

(i) In a basin for which salmonid fish rearing is a designated beneficial use, and in which surface water temperatures exceed 64.0°F (17.8°C);

(ii) In the Columbia River or its associated sloughs and channels from the mouth to river mile 309 when surface water temperatures exceed 68.0°F (20.0°C);

(iii) In waters and periods of the year determined by the Department to support native salmonid spawning, egg incubation, and fry emergence from the egg and from the gravels in a basin which exceeds 55.0°F (12.8°C);

(iv) In waters determined by the Department to support or to be necessary to maintain the viability of native Oregon bull trout, when surface water temperatures exceed 50.0°F (10.0°C);

(v) In waters determined by the Department to be ecologically significant cold-water refugia;

(vi) In stream segments containing federally listed Threatened and Endangered species if the increase would impair the biological integrity of the Threatened and Endangered population;

(vii) In Oregon waters when the dissolved oxygen (DO) levels are within 0.5 mg/l or 10 percent saturation of the water column or intergravel DO criterion for a given stream reach or subbasin;

(viii) In natural lakes.

(B) An exceedance of the numeric criteria identified in subparagraphs (A)(i) through (iv) of this subsection will not be deemed a temperature standard violation if it occurs when the air temperature during the warmest seven-day period of the year exceeds the 90th percentile of the seven-day average daily maximum air temperature calculated in a yearly series over the historic record. However, during such periods, the anthropogenic sources must still continue to comply with their surface water temperature management plans developed under OAR 340-041-0026(3)(a)(D);

(C) Any source may petition the Commission for an exception to subparagraphs (A)(i) through (viii) of this subsection for discharge above the identified criteria if:

(i) The source provides the necessary scientific information to describe how the designated beneficial uses would not be adversely impacted; or

(ii) A source is implementing all reasonable management practices or measures; its activity will not significantly affect the beneficial uses; and the environmental cost of treating the parameter to the level necessary to assure full protection would outweigh the risk to the resource.

(D) Marine and estuarine waters: No significant increase above natural background temperatures shall be allowed, and water temperatures shall not be altered to a degree which creates or can reasonably be expected to create an adverse effect on fish or other aquatic life.

(c) Turbidity (Nephelometric Turbidity Units, NTU): No more than a ten percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity. However, limited duration activities necessary to address an emergency or to accommodate essential dredging, construction or other legitimate activities and which cause the standard to be exceeded may be authorized provided all practicable turbidity control techniques have been applied and one of the following has been granted:

(A) Emergency activities: Approval coordinated by DEQ with the Department of Fish and Wildlife under conditions they may prescribe to accommodate response to emergencies or to protect public health and welfare;

(B) Dredging, Construction or other Legitimate Activities: Permit or certification authorized under terms of Section 401 or 404 (Permits and Licenses, Federal Water Pollution Control Act) or OAR 141-085-0100 et seq. (Removal and Fill Permits, Division of State Lands), with limitations and conditions governing the activity set forth in the permit or certificate.

(d) pH (hydrogen ion concentration): pH values shall not fall outside the following ranges:

(A) Marine waters: 7.0 – 8.5;

(B) Estuarine and fresh waters: 6.5 – 8.5. The following exception applies: Waters impounded by dams existing on January 1, 1996, which have pHs that exceed the criteria shall not be considered in violation of the standard if the Department determines that the exceedance would not occur without the impoundment and that all practicable measures have been taken to bring the pH in the impounded waters into compliance with the criteria.

(e) Bacteria standards:

(A) Numeric Criteria: Organisms of the coliform group commonly associated with fecal sources (MPN or equivalent membrane filtration using a representative number of samples) shall not exceed the criteria described in subparagraphs (i) and (ii) of this paragraph:

(i) Freshwaters and Estuarine Waters Other than Shellfish Growing Waters:

(I) A 30-day log mean of 126 *E. coli* organisms per 100 ml, based on a minimum of five (5) samples;

(II) No single sample shall exceed 406 *E. coli* organisms per 100 ml.

(ii) Marine Waters and Estuarine Shellfish Growing Waters: A fecal coliform median concentration of 14 organisms per 100 milliliters, with not more than ten percent of the samples exceeding 43 organisms per 100 ml.

(B) Raw Sewage Prohibition: No sewage shall be discharged into or in any other manner be allowed to enter the waters of the State unless such sewage has been treated in a manner approved by the Department or otherwise allowed by these rules;

(C) Animal Waste: Runoff contaminated with domesticated animal wastes shall be minimized and treated to the maximum extent practicable before it is allowed to enter waters of the State;

(D) Effluent Limitations and Water Quality Limited Waterbodies: Effluent limitations to implement the criteria in this rule are found in OAR 340-041-0120(12) through (16). Implementation of the criteria in this rule in water quality limited waterbodies is described in OAR 340-041-0026(3)(a)(I) and OAR 340-041-0120(17).

(f) Bacterial pollution or other conditions deleterious to waters used for domestic purposes, livestock watering, irrigation, bathing, or shellfish propagation, or otherwise injurious to public health shall not be allowed;

(g) The liberation of dissolved gases, such as carbon dioxide, hydrogen sulfide, or other gases, in sufficient quantities to cause objectionable odors or to be deleterious to fish or other aquatic life, navigation, recreation, or other reasonable uses made of such waters shall not be allowed;

(h) The development of fungi or other growths having a deleterious effect on stream bottoms, fish or other aquatic life, or which are injurious to health, recreation, or industry shall not be allowed;

(i) The creation of tastes or odors or toxic or other conditions that are deleterious to fish or other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish shall not be allowed;

(j) The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry shall not be allowed;

(k) Objectionable discoloration, scum, oily sleek, or floating solids, or coating of aquatic life with oil films shall not be allowed;

(l) Aesthetic conditions offensive to the human senses of sight, taste, smell, or touch shall not be allowed;

(m) Radioisotope concentrations shall not exceed maximum permissible concentrations (MPC's) in drinking water, edible fishes or shellfishes, wildlife, irrigated crops, livestock and dairy products, or pose an external radiation hazard;

(n)(A) The concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection shall not exceed 110 percent of saturation, except when stream flow exceeds the ten-year, seven-day average flood. However, for Hatchery receiving waters and waters of less than two feet in depth, the concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection shall not exceed 105 percent of saturation;

(B) The Commission may modify the total dissolved gas criteria in the Columbia River for the purpose of allowing increased spill for salmonid migration. The Commission must find that:

(i) Failure to act would result in greater harm to salmonid stock survival through in-river migration than would occur by increased spill;

(ii) The modified total dissolved gas criteria associated with the increased spill provides a reasonable balance of the risk of impairment due to elevated total dissolved gas to both resident biological communities and other migrating fish and to migrating adult and juvenile salmonids when compared to other options for in-river migration of salmon;

(iii) Adequate data will exist to determine compliance with the standards; and

(iv) Biological monitoring is occurring to document that the migratory salmonid and resident biological communities are being protected.

(C) The Commission will give public notice and notify all known interested parties and will make provision for opportunity to be heard and comment on the evidence presented by others, except that the Director may modify the total dissolved gas criteria for emergencies for a period not exceeding 48 hours;

(D) The Commission may, at its discretion, consider alternative modes of migration.

(o) Total Dissolved Solids: Guide concentrations listed below shall not be exceeded unless otherwise specifically authorized by DEQ upon such conditions as it may deem necessary to carry out the general intent of this plan and to protect the beneficial uses set forth in OAR 340-041-0202:

(A) Columbia River -- 500.0 mg/l;

(B) All Other Fresh Water Streams and Tributaries -- 100.0 mg/l.

(p) Toxic Substances:

(A) Toxic substances shall not be introduced above natural background levels in the waters of the state in amounts, concentrations, or combinations which may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare; aquatic life; wildlife; or other designated beneficial uses;

(B) Levels of toxic substances shall not exceed the criteria listed in **Table 20** which were based on criteria established by EPA and published in **Quality Criteria for Water (1986)**, unless otherwise noted;

(C) The criteria in paragraph (B) of this subsection shall apply unless data from scientifically valid studies demonstrate that the most sensitive designated beneficial uses will not be adversely affected by exceeding a criterion or that a more restrictive criterion is warranted to protect beneficial uses, as accepted by the Department on a site specific basis. Where no published EPA criteria exist for a toxic substance, public health advisories and other published scientific literature may be considered and used, if appropriate, to set guidance values;

(D) Bio-assessment studies such as laboratory bioassays or instream measurements of indigenous biological communities, shall be conducted, as the Department deems necessary, to monitor the toxicity of complex effluents, other suspected discharges or chemical substances without numeric criteria, to aquatic life. These studies, properly conducted in accordance with standard testing procedures, may be considered as scientifically valid data for the purposes of paragraph (C) of this subsection. If toxicity occurs, the Department shall evaluate and implement measures necessary to reduce toxicity on a case-by-case basis.

(3) Where the naturally occurring quality parameters of waters of the North Coast – Lower Columbia River Basin are outside the numerical limits of the above assigned water quality standards, the naturally occurring water quality shall be the standard. However, in such cases special restrictions, described in OAR 340-041-0026(3)(a)(C)(iii), apply to discharges that affect dissolved oxygen.

(4) Mixing zones:

(a) The Department may allow a designated portion of a receiving water to serve as a zone of dilution for wastewaters and receiving waters to mix thoroughly and this zone will be defined as a mixing zone;

(b) The Department may suspend all or part of the water quality standards, or set less restrictive standards, in the defined mixing zone, provided that the following conditions are met:

(A) The water within the mixing zone shall be free of:

(i) Materials in concentrations that will cause acute toxicity to aquatic life as measured by a Department approved bioassay method. Acute toxicity is lethality to aquatic life as measured by a significant difference in lethal concentration between the control and 100 percent effluent in an acute bioassay test. Lethality in 100 percent effluent may be allowed due to ammonia and chlorine only when it is demonstrated on a case-by-case basis that immediate dilution of the effluent within the mixing zone reduces toxicity below lethal concentrations. The Department may on a case-by-case basis establish a zone of immediate dilution if appropriate for other parameters;

(ii) Materials that will settle to form objectionable deposits;

(iii) Floating debris, oil, scum, or other materials that cause nuisance conditions;

(iv) Substances in concentrations that produce deleterious amounts of fungal or bacterial growths.

(B) The water outside the boundary of the mixing zone shall:

(i) Be free of materials in concentrations that will cause chronic (sublethal) toxicity. Chronic toxicity is measured as the concentration that causes long-term sublethal effects, such as significantly impaired growth or reproduction in aquatic organisms, during a testing period based on test species life cycle. Procedures and end points will be specified by the Department in wastewater discharge permits;

(ii) Meet all other water quality standards under normal annual low flow conditions.

(c) The limits of the mixing zone shall be described in the wastewater discharge permit. In determining the location, surface area, and volume of a mixing zone area, the Department may use appropriate mixing zone guidelines to assess the biological, physical, and chemical character of receiving waters, and effluent, and the most appropriate placement of the outfall, to protect instream water quality, public health, and other beneficial uses. Based on receiving water and effluent characteristics, the Department shall define a mixing zone in the immediate area of a wastewater discharge to:

(A) Be as small as feasible;

(B) Avoid overlap with any other mixing zones to the extent possible and be less than the total stream width as necessary to allow passage of fish and other aquatic organisms;

(C) Minimize adverse effects on the indigenous biological community especially when species are present that warrant special protection for their economic importance, tribal significance, ecological uniqueness, or for other similar reasons as determined by the Department and does not block the free passage of aquatic life;

(D) Not threaten public health;

(E) Minimize adverse effects on other designated beneficial uses outside the mixing zone.

(d) The Department may request the applicant of a permitted discharge for which a mixing zone is required, to submit all information necessary to define a mixing zone, such as:

(A) Type of operation to be conducted;

(B) Characteristics of effluent flow rates and composition;

(C) Characteristics of low flows of receiving waters;

(D) Description of potential environmental effects;

(E) Proposed design for outfall structures.

(e) The Department may, as necessary, require mixing zone monitoring studies and/or bioassays to be conducted to evaluate water quality or biological status within and outside the mixing zone boundary;

(f) The Department may change mixing zone limits or require the relocation of an outfall if it determines that the water quality within the mixing zone adversely affects any existing beneficial uses in the receiving waters.

(g) **Alternate requirements for mixing zones**: For some existing or proposed discharges to some receiving streams, it may not be practicable to treat wastewater to meet instream water quality standards at the point of discharge or within a short distance from the point of discharge. Some of these discharges could be allowed without impairing the overall ecological integrity of the receiving streams, or may provide an overall benefit to the receiving stream. This section specifies the conditions and circumstances under which a mixing zone may be allowed by the Department that extends beyond the immediate area around a discharge point, or that extends across a stream width. An alternate mixing zone may be approved if the applicant demonstrates to the Department's satisfaction that the discharge (A) creates an overall environmental benefit, or (B) is to a constructed water course, or (C) is insignificant. The three circumstances under which alternate mixing zones may be established are described further below.

(A) **Overall environmental benefit**.

(i) Qualifying for alternate mixing zone based on overall environmental benefit: In order to qualify for an alternate mixing zone based on a finding of overall environmental benefit, the discharger must demonstrate to the Department's satisfaction the following:

(I) That all practical strategies have been or will be implemented to minimize the pollutant loads in the effluent; and

(II) For proposed increased discharges, the current actual discharge and mixing zone does not meet the requirements of a standard mixing zone; and

(III) Either that, on balance, an environmental benefit would be lost if the discharge did not occur, or that the discharger is prepared to undertake other actions that will mitigate the effect of the discharge to an extent resulting in a net environmental benefit to the receiving stream.

(IV) For the purposes of this rule, the term "practical" shall include environmental impact, availability of alternatives, cost of alternatives, and other relevant factors.

(ii) Studies required and evaluation of studies: In order to demonstrate that, on balance, an environmental benefit will result from the discharge, the following information shall be provided by the applicant:

(I) The effluent flow and pollutant loads that are detected or expected in the effluent, by month, both average and expected worst case discharges. The parameters to be evaluated include at a minimum temperature, biochemical oxygen demand, total suspended solids, total dissolved solids, pH, settleable solids, e. coli bacteria, oil and grease, any pollutants listed in Table 20 of this rule division, and any pollutant for which the receiving stream has been designated by the Department as water quality limited; and

(II) Receiving stream flow, by month; and

(III) The expected impact of the discharge, by month, on the receiving stream for the entire proposed mixing zone area for all of the pollutants listed above. Included in this analysis shall be a comparison of the receiving stream water quality with the discharge and without the discharge; and

(IV) A description of fish, other vertebrate populations, and macroinvertebrates that reside in or are likely to pass through the proposed mixing zone, including expected location (if known), species identification, stage of development, and time of year when their presence is expected. For existing discharges, the applicant shall provide the same information for similar nearby streams that are unaffected by wastewater discharges. In addition, any threatened or endangered species in the immediate vicinity of the receiving stream shall be identified; and

(V) The expected impact of the discharge on aquatic organisms and/or fish passage, including any expected negative impacts from the effluent attracting fish where that is not desirable; and

(VI) A description of the expected environmental benefits to be derived from the discharge or other mitigation measures proposed by the applicant, including but not limited to improvements in water quality, improvements in fish passage, and improvements in aquatic habitat. If the applicant proposes to undertake mitigation measures designed to provide environmental benefits (e.g., purchasing water or water conservation rights to increase stream flows or establishing stream cover to decrease temperature), the applicant shall describe the mitigation measures in detail, including a description of the steps it will take to ensure that the benefits of the mitigation measures are attained and are not lost or diminished over time.

(VII) Some or all of the above study requirements may be waived by the Department, if the Department determines that the information is not needed. In the event that the Department does waive some or all of the above study requirements, the basis for waiving the requirements will be included in the permit evaluation report upon the next permit renewal or modification relating to the mixing zone.

(VIII) Upon request of the Department, the applicant shall conduct additional studies to further evaluate the impact of the discharge, which may include whole effluent toxicity testing, stream surveys for water quality, stream surveys for fish and other aquatic organisms, or other studies as specified by the Department.

(IX) In evaluating whether an existing or proposed increase in an existing discharge would result in a net environmental benefit, the applicant shall use the native biological community in a nearby, similar stream that is unaffected by wastewater discharges. The Department shall consider all information generated as required in this rule and other relevant information. The evaluation shall consider benefits to the native aquatic biological community only.

(iii) Permit conditions: Upon determination by the Department that the discharge and mitigation measures (if any) will likely result in an overall environmental benefit, the Department shall include appropriate permit conditions to insure that the environmental benefits are attained and continue. Such permit conditions may include but not be limited to:

(I) Maximum allowed effluent flows and pollutant loads;

(II) Requirements to maintain land ownership, easements, contracts, or other legally binding measures necessary to assure that mitigation measures, if any, remain in place and effective;

(III) Special operating conditions;

(IV) Monitoring and reporting requirements; and

(V) Studies to evaluate the effectiveness of mitigation measures.

(B) **Constructed water course**: A mixing zone may be extended through a constructed water course and into a natural water course. For the purposes of this rule, a constructed water course is one that was constructed for irrigation, site drainage, or wastewater conveyance, and has the following characteristics:

(i) Irrigation flows, stormwater runoff, or wastewater flows have replaced natural streamflow regimes; and

(ii) The channel form is greatly simplified in lengthwise and cross sectional profiles; and

(iii) Physical and biological characteristics that differ significantly from nearby natural streams; and

(iv) A much lower diversity of aquatic species than found in nearby natural streams; and

(v) If the constructed water course is an irrigation canal, then it must have effective fish screens in place to qualify as a constructed water course.

(C) **Insignificant discharges**: Insignificant discharges are those that either by volume, pollutant characteristics, and/or temporary nature are expected to have little if any impact on beneficial uses in the receiving stream, and for which the extensive evaluations required for discharges to smaller streams are not warranted. For the purposes of this rule, only filter backwash discharges and underground storage tank cleanups are considered insignificant discharges.

(D) **Other requirements for alternate mixing zones**: The following are additional requirements for dischargers requesting an alternate mixing zone:

(i) Most discharges that qualify for an alternate mixing zone will extend through the receiving stream until a larger stream is reached, where thorough mixing of the effluent can occur and where the edge of the allowed mixing zone will be located. The portion of the mixing zone in the larger stream must meet all of the requirements of the standard mixing zone, including not blocking aquatic life passage; and

(ii) An alternate mixing zone shall not be granted if a municipal drinking water intake is located within the proposed mixing zone, and the discharge has a significant adverse impact on the drinking water source; and

(iii) The discharge will not pose an unreasonable hazard to the environment or pose a significant health risk, considering the likely pathways of exposure; and

(iv) The discharge shall not be acutely toxic to organisms passing through the mixing zone; and

(v) An alternate mixing zone shall not be granted if the substances discharged may accumulate in the sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare; aquatic life; wildlife; or other designated beneficial uses; and

(vi) In the event that the receiving stream is water quality limited, the requirements for discharges to water quality limited streams supersede this rule.

(5) Testing methods: The analytical testing methods for determining compliance with the water quality standards contained in this rule shall be in accordance with the most recent edition of **Standard Methods for the Examination of Water and Waste Water published jointly by the American Public Health Association, American Water Works Association, and Water Pollution Control Federation**, unless the Department has published an applicable superseding method, in which case testing shall be in accordance with the superseding method; provided, however, that testing in accordance with an alternative method shall comply with this rule if the Department has published the method or has approved the method in writing.

[ED. NOTE: The Table(s) referenced in this rule is not printed in the OAR Compilation. Copies are available from the agency.]

[Publications: The publication(s) referred to or incorporated by reference in this rule are available from the office of the agency.]

Stat. Auth.: ORS 468.735, ORS 468B.035 & ORS 468B.048
Stats. Implemented: ORS 468B.048
Hist.: DEQ 128, f. & ef. 1-21-77; DEQ 1-1980, f. & ef. 1-9-80; DEQ 18-1987, f. & ef. 9-4-87; DEQ 14-1991, f. & cert. ef. 8-13-91; DEQ 17-1992, f. & cert. ef. 8-7-92 (and corrected 8-13-92); DEQ 6-1995, f. & cert. ef. 2-28-95; DEQ 21-1995(Temp), f. & cert. ef. 9-21-95; DEQ 5-1995, f. & cert. ef. 3-7-96; DEQ 22-1997, f. & cert. ef. 10-24-97

340-041-0215

Minimum Design Criteria for Treatment and Control of Wastes

Subject to the implementation program set forth in OAR 340-041-0120, prior to discharge of any wastes from any new or modified facility to any waters of the North Coast -- Lower Columbia River Basin, such wastes shall be treated and controlled in facilities designed in accordance with the following minimum criteria. (In designing treatment facilities, average conditions and a normal range of variability are generally used in establishing design criteria. A facility once completed and placed in operation should operate at or near the design limit most of the time but may operate below the design criteria limit at times due to variables which are unpredictable or uncontrollable. This is particularly true for biological treatment facilities. The actual operating limits are intended to be established by permit pursuant to ORS 468.740 and recognize that the actual performance level may at times be less than the design criteria.):

(1) Sewage wastes:

(a) During periods of low stream flows (approximately May 1 to October 31): Treatment resulting in monthly average effluent concentrations not to exceed 20 mg/l of BOD and 20 mg/l of SS or equivalent control;

(b) During the period of high stream flows (approximately November 1 to April 30) and for direct ocean discharges: A minimum of secondary treatment or equivalent control and unless otherwise specifically authorized by the Department, operation of all waste treatment and control facilities at maximum practicable efficiency and effectiveness so as to minimize waste discharges to public waters;

(c) Effluent BOD concentrations in mg/l, divided by the dilution factor (ratio of receiving stream flow to effluent flow) shall not exceed one unless otherwise approved by the EQC;

(d) Sewage wastes shall be disinfected, after treatment, equivalent to thorough mixing with sufficient chlorine to provide a residual of at least 1 part per million after 60 minutes of contact time unless otherwise specifically authorized by permit;

(e) Positive protection shall be provided to prevent bypassing raw or inadequately treated sewage to public waters unless otherwise approved by the Department where elimination of inflow and infiltration would be necessary but not presently practicable;

(f) More stringent waste treatment and control requirements may be imposed where special conditions may require.

(2) Industrial wastes:

(a) After maximum practicable inplant control, a minimum of secondary treatment or equivalent control (reduction of suspended solids and organic material where present in significant quantities, effective disinfection where bacterial organisms of public health significance are present, and control of toxic or other deleterious substances);

(b) Specific industrial waste treatment requirements shall be determined on an individual basis in accordance with the provisions of this plan, applicable federal requirements, and the following:

(A) The uses which are or may likely be made of the receiving stream;

(B) The size and nature of flow of the receiving stream;

(C) The quantity and quality of wastes to be treated; and

(D) The presence or absence of other sources of pollution on the same watershed.

(c) Where industrial, commercial, or agricultural effluents contain significant quantities of potentially toxic elements, treatment requirements shall be determined utilizing appropriate bioassays;

(d) Industrial cooling waters containing significant heat loads shall be subjected to offstream cooling or heat recovery prior to discharge to public waters;

(e) Positive protection shall be provided to prevent bypassing of raw or inadequately treated industrial wastes to any public waters;

(f) Facilities shall be provided to prevent and contain spills of potentially toxic or hazardous materials and a positive program for containment and cleanup of such spills should they occur shall be developed and maintained.

Stat. Auth.: ORS 468
Stats. Implemented: ORS 468B.030
Hist.: DEQ 128, f. & ef. 1-21-77

Mid Coast Basin

340-041-0242

Beneficial Water Uses to be Protected

Water quality in the Mid Coast Basin (see **Figures 1** and **3**) shall be managed to protect the recognized beneficial uses as indicated in **Table 2**.

[ED. NOTE: The Figure(s) and Table referenced in this rule are not printed in the OAR Compilation. Copies are available from the agency.]

Stat. Auth.: ORS 468
Stats. Implemented: ORS 468B.048
Hist.: DEQ 128, f. & ef. 1-21-77; DEQ 9-1985, f. & ef. 8-6-85

340-041-0245

Water Quality Standards Not to be Exceeded (To be Adopted Pursuant to ORS 468.735 and Enforceable Pursuant to ORS 468.720, 468.990, and 468.992)

(1) Notwithstanding the water quality standards contained below, the highest and best practicable treatment and/or control of wastes, activities, and flows shall in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor, and other deleterious factors at the lowest possible levels.

(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Mid Coast Basin:

(a) Dissolved oxygen (DO): The changes adopted by the Commission on January 11, 1996, become effective July 1, 1996. Until that time, the requirements of this rule that were in effect on January 10, 1996, apply:

(A) For waterbodies identified by the Department as providing salmonid spawning, during the periods from spawning until fry emergence from the gravels, the following criteria apply:

(i) The dissolved oxygen shall not be less than 11.0 mg/l. However, if the minimum intergravel dissolved oxygen, measured as a spatial median, is 8.0 mg/l or greater, then the DO criterion is 9.0 mg/l;

(ii) Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 11.0 mg/l or 9.0 mg/l criteria, dissolved oxygen levels shall not be less than 95 percent of saturation.

(B) For waterbodies identified by the Department as providing salmonid spawning during the period from spawning until fry emergence from the gravels, the spatial median intergravel dissolved oxygen concentration shall not fall below 6.0 mg/l;

(C) A spatial median of 8.0 mg/l intergravel dissolved oxygen level shall be used to identify areas where the recognized beneficial use of salmonid spawning, egg incubation and fry emergence from the egg and from the gravels may be impaired and therefore require action by the Department. Upon determination that the spatial median intergravel dissolved oxygen concentration is below 8.0 mg/l, the Department may, in accordance with priorities established by the Department for evaluating water quality impaired waterbodies, determine whether to list the waterbody as water quality limited under the Section 303(d) of the Clean Water Act, initiate pollution control strategies as warranted, and where needed cooperate with appropriate designated management agencies to evaluate and implement necessary best management practices for nonpoint source pollution control;

(D) For waterbodies identified by the Department as providing cold-water aquatic life, the dissolved oxygen shall not be less than 8.0 mg/l as an absolute minimum. Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 8.0 mg/l, dissolved oxygen shall not be less than 90 percent of saturation. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen shall not fall below 8.0 mg/l as a 30-day mean minimum, 6.5 mg/l as a seven-day minimum mean, and shall not fall below 6.0 mg/l as an absolute minimum **(Table 21)**;

APPENDIX – J

(Biosolids Management Plan and Biosolids Site Authorization)

CITY OF WARRENTON

BIOSOLIDS MANAGEMENT PLAN

January 2002

Prepared by:
LEE ENGINEERING, INC.
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Oregon City, OR 97045
(503) 655-1342

CITY OF WARRENTON

BIOSOLIDS MANAGEMENT PLAN

REGISTERED PROFESSIONAL
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61321PE
Michael J. Dees
OREGON
JULY 13, 1999
MICHAEL J. DEES
Expires: 12/31/03

January 2002

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CITY OF WARRENTON
BIOSOLIDS MANAGEMENT PLAN

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The City of Warrenton owns and operates a lagoon wastewater treatment facility with an average annual flow of just over 1.0 MGD. The facility has been accumulating solids since its construction in 1969. Sludge removal is overdue. Sludge or biosolids have accumulated to unacceptable levels, contributing to overloading problems. The City was directed to develop a Biosolids Management Plan to be submitted to the Department of Environmental Quality (DEQ) for approval.

The purpose of this Biosolids Management Plan is to outline in detail how the biosolids will be removed, transported, and land applied in accordance with OAR 340-050-0031 and Federal 503 regulations. The City considers it a high priority to remove the solids from the lagoon in one application season in order to expedite proposed interim improvements to the wastewater facility. Nitrogen concentration, total solids percentage, and volume of the sludge will generally determine the area of land required for land application. Lee Engineering obtained representative samples of the biosolids for analysis of total solids and total nitrogen concentrations. Volume was determined using survey information from the Coast Survey. Biosolids Site Submittals for the proposed land application sites will be submitted concurrently with this report.

This plan is being submitted for DEQ approval so that dredging may start in June 2002. The plan also includes an alternative that is currently being considered by the City to transfer solids into the east half of the primary cell following construction of a levy that will divide the cell. This second alternative would coordinate smoothly with proposed interim plant improvements.

1.2 SCOPE

Development of a DEQ-approved Biosolids Management Plan must be in accordance with OAR 340-050-0031 and Federal 503 regulations. This plan includes:

1. A detailed description of the wastewater processing facility, including unit processes used in wastewater treatment; source design flow (gpd); and wastewater flow origin (e.g., percent domestic, industrial, commercial, and domestic septage);

2. A description of how the sludge is to be removed and transferred to transport;

3. A description of the quantities of solids volumes generated annually;

4. The means used to attain pathogen reduction and data confirming that pathogen reduction has been accomplished;

5. The method(s) for determining the degree of solids stability, and data supporting the means of stabilization;

6. A description of the means used to transport, temporarily store (if applicable), and apply biosolids at DEQ- authorized land spreading site(s);

7. A description of biosolids monitoring and sampling program and biosolids analysis, including but not limited to nitrate-nitrogen, ammonia nitrogen, total Kjeldahl nitrogen (TKN), phosphorus, potassium, total solids, volatile solids, arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, and pH;

8. Delineation of the land application site selection criteria, crops and crop capacity for assimilating nitrogen, and site management practices, including but not limited to annual and long-term application rates, and testing and sampling;

9. The identification of all DEQ-authorized biosolids or domestic septage land application sites;

10. A description of biosolids or domestic septage land application site monitoring, record keeping and reporting procedures; and

11. A description of remedial procedures that would be implemented in the event of a solids treatment process failure or biosolids spill between the generating source and the land application site

1.3 AUTHORIZATION

Lee Engineering entered into a contract with the City of Warrenton on October 22, 2001 for completion of a Biosolids Management Plan for the City of Warrenton.

1.4 ACKNOWLEDGMENTS

City Staff

Mr. Alan Johansson, Public Works Supervisor

Department of Environmental Quality

Bruce Henderson

Lee Engineering, Inc.

Michael Dees, PE, Project Manager
Susan Foreman, Engineer Intern
Nancy Jelinek, Secretary

CHAPTER 2

SYSTEM DESCRIPTION

2.1 PLANT SIZE AND SERVICE POPULATION

The City of Warrenton owns and operates a lagoon wastewater treatment facility that processes sewage from a municipal population of 4,096 and from other sources. The wastewater is pumped to the lagoon. Loadings are summarized in Table 2-1.

TABLE 2-1

CURRENT DESIGN DATA			
	Flows MGD	Loading Lbs BOD	Lbs TSS
Annual Ave.	1.10	1200	1700
Maximum Month WW Avg.	1.70	1700	2400
Maximum Day	2.83		
Peak Instantaneous (PIF)	5.0		

A significant percentage of the flow and loadings come from sources other than the City. These sources including Fort Stevens State Park, several RV parks, and numerous restaurants and delis. The increased loadings results in a population equivalent of 6,700, based upon average wastewater loadings of 0.18 lbs BOD/5 persons/day.[1]

The sewage treatment lagoons are currently overloaded. Based on a loading limit of 30 lbs/acre/day BOD and a total surface area of 25.7 acres, loading should be limited to 770 lbs. per day. The current maximum monthly average loading is 1,700 lbs. per day.

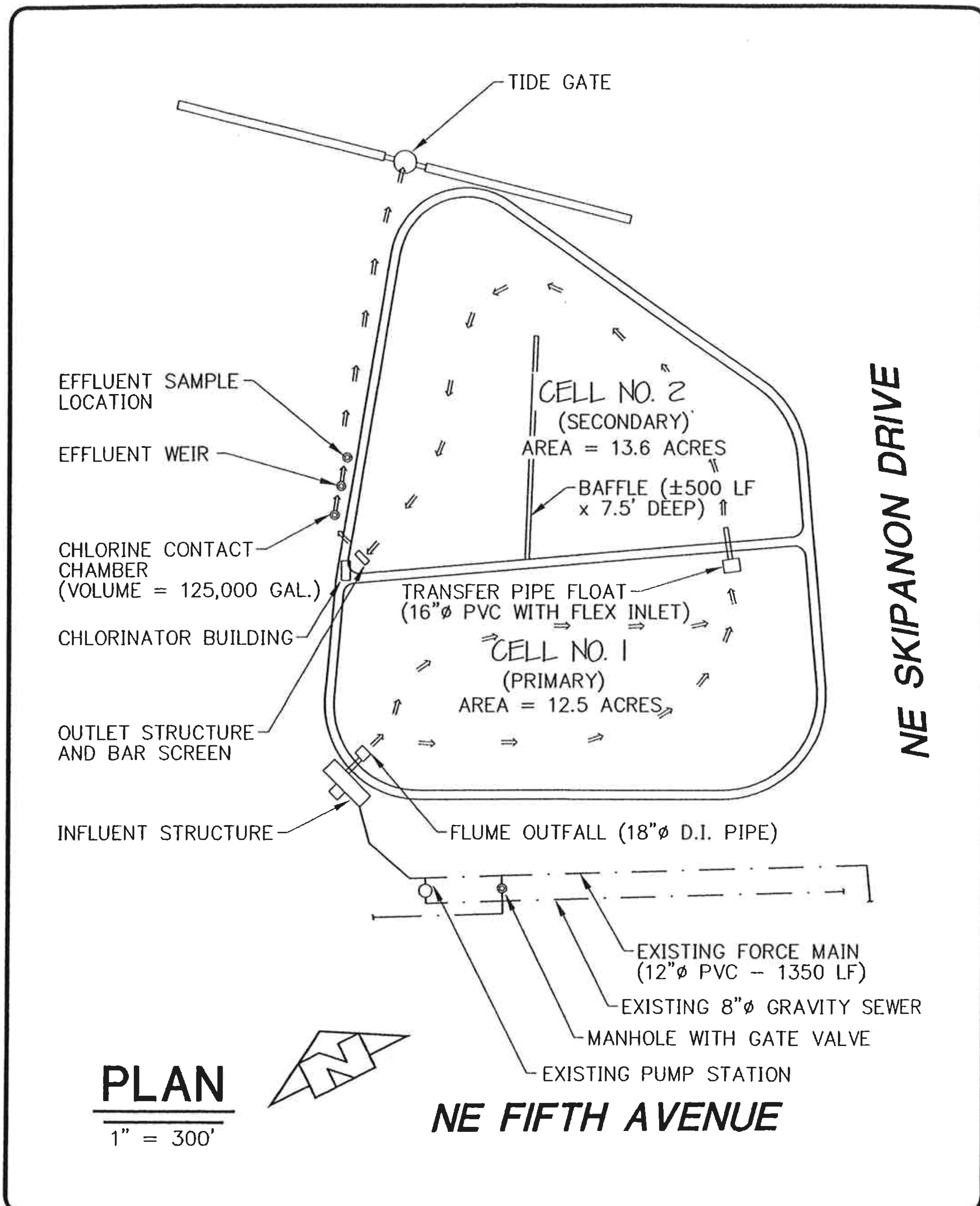
An earlier analysis of the lagoons yielded a similar conclusion. In the *Technical Memorandum for Sewer Lagoons Improvement Study, City of Warrenton*, CH2M Hill, June 23, 1995: March 21,1995 memorandum determined that at a projected loading of 1,540 lbs. of BOD per day the primary cell would be loaded with double the loading limit of 70 kg/hc/day (62 lbs/acre /day on 12.5 acres or 775 lbs per day).

2.2 TREATMENT PROCESS

The flow into the treatment facility is monitored with a Parshall flume in the influent channel. The flow across the primary cell is from the southwest corner to a floating effluent structure near the northeast corner. In the secondary cell, flow proceeds around a north-south baffle to the effluent weir in the southeast corner.

[1] H.R. Esvelt Engineering, April 18, 2001 *Wastewater Treatment Facilities Analysis*

The treated effluent is chlorinated prior to discharge into chlorine contact pipe and subsequent flow through a tidal slough to the Columbia River. The flow pattern and component volumes are as indicated in Figure 2-1.



OWNER: CITY OF WARRENTON		LEE ENGINEERING, INC. 1300 JOHN ADAMS ST. OREGON CITY, OR, 97045	
DWG TITLE: EXISTING LAGOON SYSTEM AND PIPING LAYOUT	DATE: JAN 2002 FILE NO: 2873FG2-1	REVISED:	FIGURE 2-1

2873FG2–1.DWG 02/22/02 13:07:10

CHAPTER 3

BIOSOLIDS CHARACTERISTICS

3.1 MONITORING PROGRAM

3.1.1 Volume of Sludge in Primary Lagoon

The facility has been accumulating solids since its construction in 1969. Sludge removal is overdue and has accumulated to unacceptable levels, which are contributing to the overloading problems. The City plans to remove the sludge in the primary cell for land application, beginning as soon as June 2002.

Coast Surveying completed a measurement of the volume of sludge in Cell 1 on January 31, 2000. The survey results include profiles of the sludge levels and the elevation of the bottom of the lagoon. The survey results were used to create an electronic representation of the sludge blanket from which the volume could be accurately estimated The original survey results and the points used to create the electronic surfaces are included in Appendix C.

The volume of the biosolids in Cell 1 was estimated to be 26,200 cubic yards (C.Y.). The average depth of sludge in Cell 1 was determined to be 1.6 ft. Profiles of the cell indicate that the sludge has accumulated to a depth of 3 ft. in the center of the cell where the influent was previously located. (The new influent channel at the southwest corner of the primary lagoon was installed in March of 2000).

3.1.2 Ongoing Monitoring Program

Since the sludge has been accumulating over a period of 31 years, the best estimate of annual accumulation is 997 C.Y. per year, or approximately 0.6 inches per year. Following the sludge removal program, the Public Works Department will determine solids levels in each of the City's lagoons at least once every five years.

The average depth in the primary cell is 7 ft. A minimum depth of 5 ft. should be maintained. If there is a significant accumulation of biosolids near the influent of the lagoon, then biosolids may be moved to other areas of the lagoon to enable even filling of the lagoon.

Sludge accumulation in the secondary cell is expected to be much less than in the primary cell. A survey of solids levels should be made and monitored at the same frequency as the levels in the primary cell if the secondary cell remains in service. However, it is our understanding that proposed improvements to the facility may eliminate usage of the secondary cell.

3.2 SAMPLING PROGRAM

3.2.1. Required Sampling Frequency

The sampling frequency required by DEQ is based upon the amount of bulk dry weight sewage sludge applied to the land. According to Federal Regulation CFR 40-503.16, when between 290 metric tons and 1,500 metric tons is to be applied in a year, then the minimum sampling frequency is four times per year. If over 1,500 metric tons are applied in a year, the sampling frequency increases to six times per year. For biosolids from a sewage treatment lagoon, DEQ has interpreted this rule to mean that the monitoring frequency applies over the period the sludge will be land applied.

Table 1 from CFR-40-503.16 is reproduced below.

TABLE 1 OF §503.16. - Frequency of Monitoring – Land Application

Amount of Sewage Sludge[1] (Metric Tons per 365 Day Period)	Frequency
Greater than zero but less than 290	Once per year.
Equal to or greater than 290 but less than 1,500	Once per quarter (4 times / year).
Equal to or greater than 1,500 but less than 15,000	Once per 60 days (6 times / year).
Equal to or greater than 15,000	Once per month (12 times / year)

3.2.2 Preliminary Sampling

Preliminary sampling on January 26, 2000 consisted of a composite sample that was taken from the four corners of the primary cell. The complete results of the analysis on this sample, including the concentration of all metals classified as pollutants, total solids, volatile solids and nutrients, are included in Appendix B.

The solids concentration of the original sample was unrealistically high compared to most municipal sludges. Because of the importance of having an accurate estimate of the average concentration in order to determine the total mass of the biosolids in the lagoon, additional samples were obtained by Lee Engineering on December 20, 2001. These samples were analyzed for Total Solids (TS), Total Nitrogen (TKN), Ammonia Nitrogen (NH_4-N), and Nitrate Nitrite (NO_3-N, $N0_2$-N). Complete lab results are also included in Appendix A.

A small boat was used to obtain biosolids samples that were representative of the entire lagoon. Seven sample sites were defined at the center of six sampling regions of equal volume. A diagram is included in Appendix A that indicates the sampling locations.

The samples were obtained with a sludge judge, which is a narrow tube sampling device made of clear plastic material. The bottom of the tube was sealed with a small plastic ball that allowed the person obtaining the samples to control what was placed in the sample container. Care was taken to ensure that the sample contained bisolids from the entire sludge blanket and to exclude excess water. The average concentration of the biosolids was 5%.

3.2.3 Sampling Areas, Insitu Solids

Based on an estimated volume of 26,200 C.Y. and an average concentration of 5% total solids, the primary lagoon contains an estimated 1,050 metric tons (dry weight) of biosolids. It is important to the City that the sludge be removed in one year. Because the dry weight mass of biosolids is greater than 290 metric tons and less than 1,500 metric tons, DEQ requires that the lagoon be divided into four sampling quadrants of equal volume.

An additional consideration, which was taken into account in defining the four sampling areas, was the likelihood of high fecal coliform counts immediately adjacent to the influent of the primary lagoon. To reduce the possibility of this area failing the analytical criteria for pathogen reduction, sludge will be moved from the area surrounding the influent to the adjacent sampling area as early in the year as possible. The biosolids will have some additional treatment time before being sampled and will be subsequently removed with Quadrant No. 4 solids.

Figure 3-1 shows the division of the primary cell into four sampling areas of equal volumes based upon the sludge survey. Each quadrant will contain approximately 6,650 C.Y. after the biosolids surrounding the influent are moved to Quadrant 4. Seven sample sites are defined for each area to ensure representative coverage of the sample area and to provide the samples necessary to fulfill the requirement for pathogen reduction verification test procedure.

3.2.4. Removal Alternative

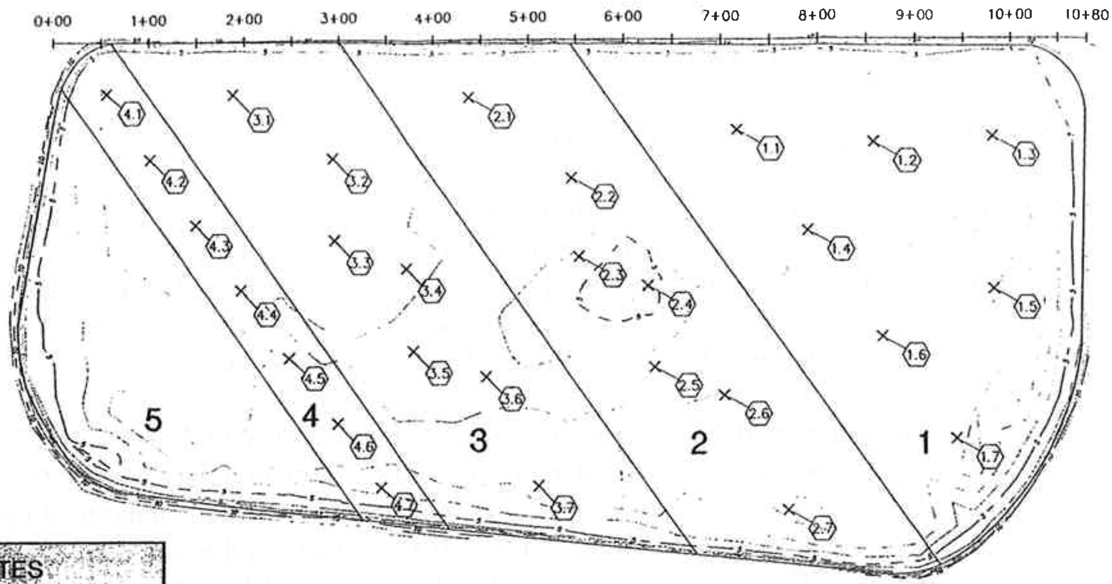
The City is currently considering a second alternative for sludge removal. Proposed improvements to the treatment system call for construction of a new levy that divides the primary lagoon into two separate cells. If the levy is constructed prior to sludge removal, then all of the primary sludge would be pumped into the new storage cell to the east. The solids in this lagoon would be allowed to settle and the excess water pumped or displaced back into the remaining active primary cell.

The sludge transfer alternative was suggested to the City by David Mann of DEQ in a technical memorandum dated September 25, 2001 in which he suggested that if the sludge remained stored in the constructed eastern storage cell, the City could address disposal over a longer period. The phased implementation of the proposed improvements will be subject to DEQ approval.

If all of the biosolids are stored in the constructed storage area, then this cell will need to be divided into four sampling quadrants prior to sludge removal. Figure 3-2 shows the formation of this storage area within Cell 1 and the proposed sampling quandrant boundaries.

3.2.5. Sampling Schedule

Samples must be taken as close to the time of application period as possible. The bench scale test for volatile solids reduction, which will be used to satisfy the requirements for vector attraction reduction, requires a minimum of 40 days to complete. The documentation and delivery of lab results from the test will require approximately two more weeks and there must be some



REPORTING AREAS

AREA	VOLUME
1	6558cy
2	6551cy
3	6550cy
4	2831cy
5	3703cy
TOTAL	26,193cy

SAMPLING SITES

SITE	LOCATION	SITE	LOCATION
1.1	7+16 94'-R	3.1	1+88 55'-R
1.2	8+57 106'-R	3.2	2+94 122'-R
1.3	9+81 101'-R	3.3	2+95 206'-R
1.4	7+89 198'-R	3.4	3+71 235'-R
1.5	9+82 259'-R	3.5	3+79 321'-R
1.6	8+66 308'-R	3.6	4+55 348'-R
1.7	9+42 414'-R	3.7	5+09 460'-R
2.1	4+37 59'-R	4.1	0+56 53'-R
2.2	5+46 143'-R	4.2	1+01 121'-R
2.3	5+53 224'-R	4.3	1+49 189'-R
2.4	6+25 254'-R	4.4	1+96 257'-R
2.5	6+31 338'-R	4.5	2+47 328'-R
2.6	7+03 368'-R	4.6	2+98 396'-R
2.7	7+68 487'-R	4.7	3+43 462'-R

SAMPLING SITES

1"=100'

OWNER: CITY OF WARRENTON

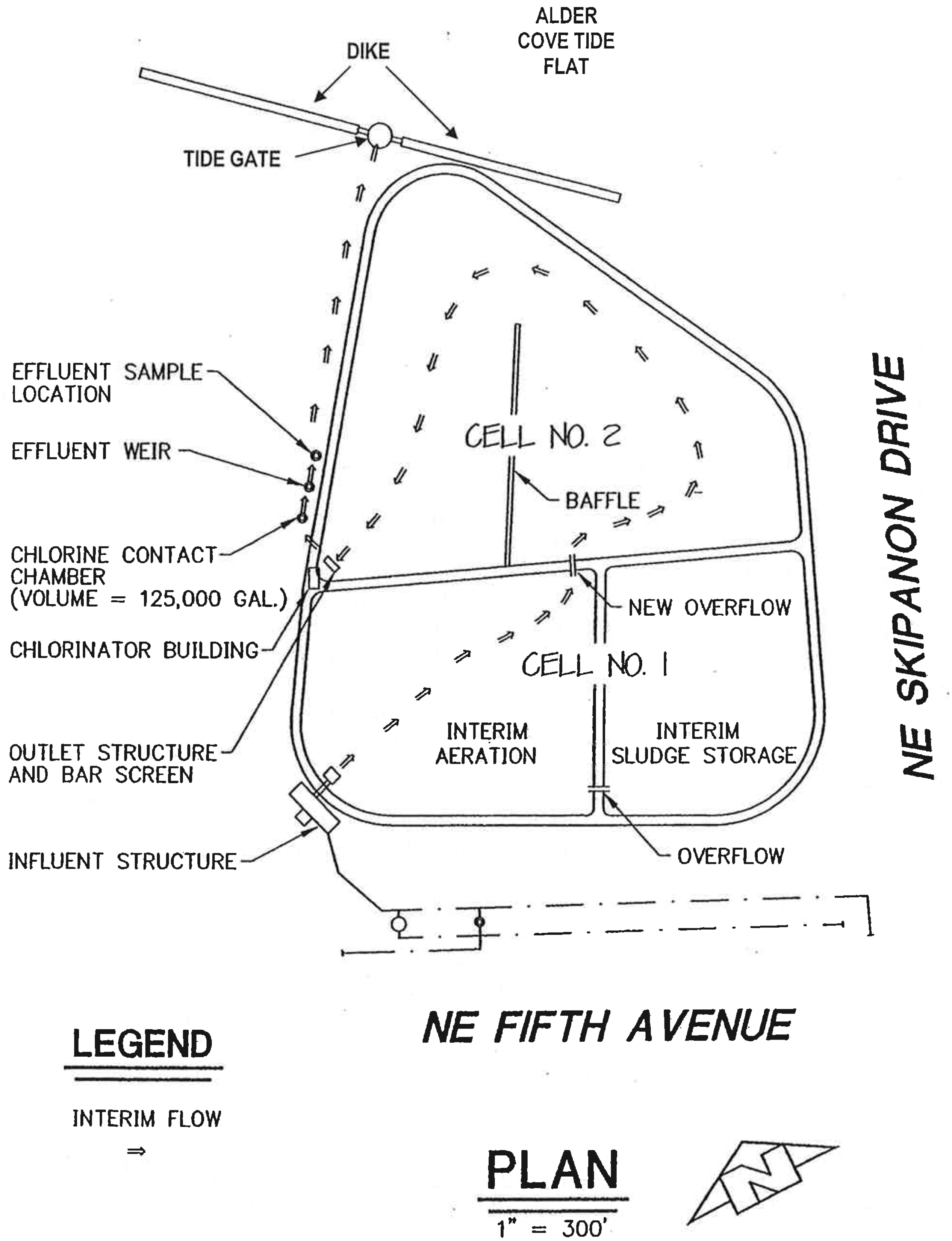
DWG TITLE: REPORTING AREAS

LEE ENGINEERING, INC.
1300 JOHN ADAMS ST.
OREGON CITY, OR. 97045

DATE: 1/17/02
FILE NO: 2973FC3-1

REVISED:

FIGURE 3-1



OWNER: CITY OF WARRENTON		LEE ENGINEERING, INC. 1300 JOHN ADAMS ST. OREGON CITY, OR, 97045
DWG TITLE: INTERIM LAGOON SYSTEM AND PIPING LAYOUT	DATE: JAN 2002 FILE NO: 2873FG3-2	REVISED:	FIGURE 3-2

allowance for contingencies such as weather. According to DEQ, it is reasonable to specify that land application will proceed within 70 days of when the samples are obtained.

3.2.6 Sampling Methodology

Within each sampling quadrant area, a minimum of seven discrete samples must be taken to fulfill the requirements for pathogen reduction testing. Lab analysis for metals, solids concentrations, and nutrients will be based on composite samples taken from the sampling sites, which are defined for the discrete samples. The bench scale test for volatile solids reduction will also be based on the composite sample. Samples will be taken with a sludge judge, as previously described, which are representative of the entire sludge blanket.

For each quadrant, a single one-liter composite sample provides sufficient volume for analysis of pH, percent total solids (%TS), percent total volatile solids (%TVS), total Kjeidahl nitrogen (TKN), Ammonia Nitrogen (NH4), Nitrate (NO3), Phosphate (PO4-P), Pottassium (K), all the metals included in CFR 503.13 and listed in Table 3-1, and the test to show vector attraction reduction. The one-liter composite sample shall be taken from the mixed results of the seven sample locations within each quadrant. Where the sludge blanket is thicker, a larger amount of sample will fill the "sludge judge" tube sampler. This will provide a proportional and representative sludge volume within each quadrant. After mixing thoroughly, the one-liter sample will be poured into a container for laboratory analysis. Sample volumes of 100 ml are required for the seven (7) discrete samples for fecal coliform analysis.

Coffey Laboratories will provide plastic sampling containers (one liter for the composite sample and seven 125 ml containers for the fecal coliform test). Styrofoam shipping containers will also be provided with cold packs to keep the samples below 4°C (38°F).

It is estimated that laboratory analysis for the samples will cost approximately $550 for each quadrant. Price quotes for the required tests are included in Appendix A.

3.3 METALS

Section CFR 40-503.13 defines the pollutant limits for the application of biosolids. If bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site, either: (i) the cumulative loading rate for each pollutant shall not exceed the cumulative pollutant loading rate for the pollutant in Table 2 of §503.13; or (ii) the concentration of each pollutant in the sewage sludge shall not exceed the concentration for the pollutant in Table 3 of §503.13.

Preliminary analysis of biosolids from the Warrenton Sewage Treatment lagoon indicate that the concentrations for all of the regulated metals are less than pollutant concentration limits in Table 3 of the Federal Regulations. These concentration limits are reproduced in Table 3-1.

Because the concentrations of the biosolids are well below the average concentration limits set in 503.13(b)(3), it is not necessary to report cumulative loading rates. No bulk sewage sludge has ever been applied to the proposed sites. Based on the metals concentrations in the sludge from the primary lagoon, the total metal pollutant loading on the proposed site will not approach the cumulative loading limits set by 503.13(b)(2).

TABLE 3-1

	POLLUTANT CONCENTRATIONS		
Pollutant	**Table 1 of §503.13 Ceiling Concentration Mg/ Kg[1]**	**Table 3 of §503.13 Concentration Limit Mg/ Kg[1]**	**Lagoon #1 01/26/00 Mg/ Kg[1]**
Arsenic	75	41	<1.7
Cadmium	85	39	.08
Copper	4300	1500	147
Lead	840	300	31.2
Mercury	57	17	<.33
Molybdenum	75		1.5
Nickel	420	420	4.2
Selenium	100	100	0.83
Zinc	7500	2800	183

[1]Dry weight basis.

3.4 PATHOGEN/VECTOR ATTRACTION REDUCTION

Part 503 Biosolids Rules define three alternatives for meeting Class B pathogen requirements. Class B - Alternative 1 (§503.32(b)(2)) is defined as follows:

> "Seven samples of the sewage sludge shall be collected at the time the sewage sludge is used or disposed. The geometric mean of the density of fecal coliform in the samples collected shall be less than either 2,000,000 Most Probable Number per gram of total solids (dry weight basis) or 2,000,000 Colony Forming Units per gram of total solids (dry weight basis)."

The fecal coliform analysis provides an indication of the presence of bacteria in the biosolids. If the fecal coliform count is higher than 2,000,000 MPN/dry g., then alternatives to significantly reduce pathogens must be used to meet the pathogen requirement.

The only area where it is expected that the fecal coliform count may be high is adjacent to the influent where new solids settle out. As discussed in Section 4.2.2, it is proposed that the solids that have settled near the influent be moved to adjacent sampling areas where they will sit for at least several months before removal. This should eliminate the problem of new and relatively untreated sludge causing a high fecal coliform count in the samples.

It is also necessary to demonstrate that the biosolids in the lagoon have undergone sufficient biological reduction to reduce their attractiveness to vectors such as flies, mosquitoes, fleas, rodents, and birds. The Part 503 Rule contains 12 options for demonstrating vector attraction reduction (VAR). Of these, Option 2 is considered the most suitable for biosolids from the sewage treatment lagoon. This method demonstrates vector attraction reduction with additional anaerobic digestion in a bench scale test. The method is described below:

> §503.33(b)(2): "Vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge anaerobically in the laboratory in a bench-scale unit for 40 additional days at a temperature between 30 and 37 degrees Celsius. When at the end of the 40 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 17 percent, vector attraction reduction is achieved."

CHAPTER 4

BIOSOLIDS UTILIZATION PROGRAM

4.1 LAND APPLICATION

4.1.1 Dredging

The sludge will be pumped from the cell via an auger head dredge to a screening tank, which is located on the shore of the lagoon. On top of the screening tank two vibrating deck screens will receive the pumped sludge from the dredge and screen out any particulate greater than one-half inch. All screenings must be separated into a dumpster and hauled to the landfill for disposal.

From the screening tank, the sludge is pumped through a grinder pump into temporary storage tanks. The temporary storage tanks will have a volume of 10,000 to 25,000 gallons and are equipped with a mixing system to keep the solids in suspension until they are drawn out and loaded into tankers.

It can be assumed that some rehydration will occur during the dredging operation. Experienced sludge removal contractors have indicated that they assume a reduction of insitu concentration of 60 %, which results in a volume increase of 66%. Based on the January 20, 2002 sampling, the average insitu concentration of the biosolids in the primary treatment lagoon is 5%. It is conservative to assume that rehydration during dredging will reduce the concentration to 3%.

The City is considering a second alternative for sludge removal. As outlined briefly in Section 3.2, it has been proposed that following construction of the primary cell division levy, all of the sludge be pumped into the new east storage cell. The solids in this cell would be allowed to settle and the excess water siphoned or pumped back into the primary cell, which would be left in service as the primary treatment cell.

The concentration that can be achieved by gravity settling in the storage cell is probably 6% -8%. If excess water is removed prior to dredging, then rehydration will be minimized. Therefore, using the storage lagoon could therefore result in a 50% reduction in the volume hauled, compared with in-place dredging and hauling.

As the sludge becomes thicker it will become more difficult to work with. As noted above, the sludge would be pumped from the lagoon via auger head dredge to a screening tank. From the screening tank, the sludge would be pumped through a grinder pump into temporary storage tanks that have a mixing system to keep the solids in suspension until drawn out and loaded into tankers. A concentration of 8% is the maximum that can be specified for typical grinder or chopper pumps. Since the sludge does not flow freely at this concentration, it will need to be pumped from the day tank into the tanker trucks.

4.1.2 Hauling and Land Application

Liquid biosolids are transported in tanker trailers or trucks to the land application site. Some liquid sludge hauling contractors own large tankers that carry up to 6,000 gallons and are equipped with a pressurized spray bar for direct surface application. Alternatively, one or more tankers may transport the biosolids from the treatment site to the land application site and transfer the biosolids to a field applicator.

The volume of biosolids to be hauled will depend upon whether the insitu solids are dredged directly or if the solids are allowed to settle in a second storage cell following construction of a levy. Table 4-1 summarizes the change in the total volume of biosolids.

TABLE 4-1

COMPARISON OF HAULING COSTS				
	%	Gallons	#Trips	Hauling Cost
Rehydrated	3	8,919,551	1,487	$312,184
Insitu	5	5,351,731	892	$187,311
Gravity Thickened	6	4,459,776	743	$156,092
	8	3,344,832	557	$117,069

- Based on an estimated mass of 1150 DT (1043 MT)
- Hauling cost estimated as $0.035/gallon and 6,000 gallons per trip

4.1.3 Dewatering as an Alternative

Alternatively, the liquid biosolids can be dewatered to a semi-solid or cake product. Due to the relatively high cost of reducing moisture, biosolids are often handled as a fluid, especially when land application sites are close to the treatment site. In Warrenton's case, allowing the City to take advantage of available equipment and trucks may offset the cost of dewatering the biosolids.

Dewatering requires the use of mechanical equipment such as a belt filter press, usually with the addition of chemicals. Since the cost of dewatering equipment for a one-time operation would be prohibitive, the City would need to hire a dewatering contractor with a mobile belt filter press.

To make handling the dewatered product practical, the cake must be solid enough to be moved around with a front-end loader. The trucks need to be equipped with removable tarps and safety seals to transport the biosolids cake on public roads.

Dewatered biosolids can be land applied with mechanical spreaders. Common farm-type manure spreaders pulled by a tractor may be used, or spreaders can be mounted directly on a truck chassis to increase hauling efficiency.

4.1.4 Estimated Cost

An estimate of the cost of dredging transport and land application of biosolids is presented in Table 4-2. This estimate of cost is based upon the assumption that the City will hire independent contractors for all facets of the operation.

TABLE 4-2

ESTIMATED COST FOR DREDGING AND HAULING	
Dredging and Screening estimate by Trimax Residuals Management	$165,000
*Hauling and land application $0.035/ gallon estimate by Agri-Tech	$315,000
Total Estimated Cost for biosolids removal, transportation, and land application	$480,000

*Volume Assumes 3% concentration

Mr. Martin Nygaard, President of Warrenton Fiber Company and the owner of the property on which the City plans to apply the biosolids, has indicated an interest in hauling and land applying the biosolids with his own equipment and labor. In this case, the City would not need to hire an independent contractor(s). In cooperation with the City, Mr. Nygaard may also take some responsibility for the removal of sludge from the lagoon. Since Mr. Nygaard has some equipment that he has offered to use on behalf of the City, alternatives for sludge removal hauling and application discussed in the previous section are being considered.

4.2 CONTINGENCY OPTIONS

A spill contingency plan must be submitted to DEQ to document the actions that will be taken in the event of a spill. If a contractor is hired to handle the biosolids, the contractor will supply the spill contingency plan; however, the City will be responsible for oversight of the plan. The goal of the plan will be to minimize public contact and damage to the environment.

Spillage that is not completely cleaned up must be covered with lime. It is necessary to notify the Oregon Emergency Response System within one hour of a spill.

It is also necessary to have a contingency plan in the event that the biosolids are not suitable for land application. If any of the chemical or biological parameters are above allowable limits, dredging operations will cease, until other feasible alternatives are considered.

As discussed in Section 3-3, preliminary sampling indicates that the concentrations of regulated metals are well below allowable limits. Preliminary sampling indicates that coliform counts were also well below allowable limits for fulfilling the pathogen reduction requirement. The added precaution of moving biosolids from the area near the influent should ensure that the pathogen reduction requirement is met.

The biosolids in the lagoon are relatively inert, and it is expected that they will pass the test for vector attraction reduction. If the composite sample from a quadrant does not meet the requirement for vector attraction reduction as defined in Section 3.4, it will be necessary to meet another of the reduction options. Several contingency options that would be suitable for the Warrenton biosolids are listed below.

- Option 6: Addition of lime to raise the pH and maintain a pH of 12 for two hours, and 11.5 for an additional 22 hours

- Option 9: Biosolids injection below ground

- Option 10: Incorporation of biosolids into the soil within 6 hrs of operation

- Option 11: Cover the biosolids with soil or other material at the end of each day

4.3 SITE SELECTION

This section describes the general criteria used to evaluate the suitability of sites for land application of biosolids, as described in the Oregon Administrative Rules, OAR 340-50-030. The DEQ must give written authorization for a specific site prior to the application of biosolids. An authorized representative from DEQ bases this authorization on detailed Biosolids Site Submittals and a visit to each site. Following site visits on January 24, 2002 and February 1, 2002 with Bruce Henderson of the DEQ, site submittals for four sites with a net available area of 196 acres were prepared by Lee Engineering. Detailed information regarding these sites is included in the section on site management, Section 4-4.

4.3.1 Topography and Soils

Normally, tillable agricultural land is suitable for the land application of biosolids. Sites should be on a stable geologic formation not subject to flooding or excessive runoff from adjacent land. If periodic flooding cannot be avoided, the period of application should be restricted, and soil incorporation is recommended.

At the time when liquid biosolids are applied, the minimum depth to permanent groundwater should be four feet and the minimum depth to temporary groundwater should be one foot. Sites approved for year-round application should be evaluated carefully to ensure that groundwater separation distances conform to these requirements. Soil should have a minimum rooting depth of 24 inches. The underlying substratum to at least 24 inches should not be rapidly draining so that leachate will not be short circuited to groundwater. Sites with saline and/or sodic soils should be avoided

Topography of the site should be suitable to allow normal agricultural operations. Where needed, runoff and erosion control measures should be constructed. In general, liquid biosolids should not be surface applied on bare soils where the ground slope exceeds 12 percent. Well-vegetated sites with slopes up to 30 percent may be used for dewatered or dried biosolids, or for liquid biosolids application with appropriate management to prevent runoff.

4.3.2. Buffers

Land application of biosolids in close proximity to residential areas should be avoided. A buffer strip large enough to prevent nuisance odors or wind drift is needed. Size of the buffer strip will be determined by the DEQ on a case-by-case basis, and for truck spreading of a liquid will vary from 0 to 200 feet. Buffer strips should also be provided along well traveled highways. The size of the buffer strip will vary with local conditions and should be left to the discretion of the Department field representative.

No bulk Class B biosolids should be spread at the site closer than 50 feet to any ditch, channel, pond or waterway or within 200 feet of a domestic water source or well

4.3.3. Public Notice

Public notice is required for the site authorization of proposed new biosolids land application sites. All property owners or occupants adjacent to the proposed sites will be notified by the City of the proposed land application of biosolids. Public notice does not require that the adjacent property owner/occupant approve of the biosolids land application proposal.

The Biosolids Management Plan must be submitted a minimum of 60 days before biosolids application commence. Provisions established in the Department of Environmental Quality (DEQ) are considered NPDES permit conditions Prior to approving the Biosolids Management Plan the Department shall ensure that an opportunity is provided for public comment. If, during the public comment period, at least 10 people, or an organization representing at least 10 people, indicate concerns about the proposed action, then opportunity shall be provided for public hearing. The Department shall take final action within 30 days of the closure of the public comment period, or 30 days of the closure of the hearing record.

Public access to land with a low potential for public exposure shall be restricted for 30 days after application of sewage sludge OAR 340-050-33.32(b). It is recommended that to comply with this requirement the land application site be posted with signs that state: "Warning – Do Not Enter – Biosolids Application Site." The signs shall be in English and Spanish.

4.4 SITE MANAGEMENT AND APPLICATION RATES

The annual whole sludge application rate is based on the maximum amount of sewage sludge (dry weight basis) that can be applied to a unit area of land during a 365-day period. With regard to biosolids from the sewage treatment lagoon, the amount of available nitrogen in the biosolids is anticipated to be the limiting factor and the application rate will be defined by the agronomic rate.

The agronomic rate is the whole sludge application rate (dry weight basis) designed to provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land. The agronomic rate is also designed to minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.

Agronomic rates used by DEQ are based on fertilizer rates published by the Oregon State University Extension office. The agronomic rates for pasture or hay in coastal areas are summarized in Table 4-3.

TABLE 4-3

AGRONOMIC LOADING RATES

Application	Nitrogen Lbs /Acre/Yr	Biosolids *DT/Acre/Yr
Pasture	120	7.23
Non-Irrigated Pasture	140	8.43
Non-Irrigated Hay	140	8.43
Irrigated Hay	160	9.63

* Mass is based on 16.605 lbs. N/DT See calculations Appendix B.

The City has several sites available for land application of its biosolids that are 4-6 miles from the sewage treatment lagoon. These sites consist of land that was previously forested and is currently used for pasture and hay. All of the sites are mowed annually or bi-annually. The agronomic rate of 140 lbs nitrogen/acre/year for non-irrigated hay is considered appropriate for these sites.

Based upon lab results from the sampling conducted on November 20, 2001, the average available nitrogen in biosolids from the Warrenton sewage treatment lagoon content is estimated to be 16.605 lbs./DT. These calculations are included in Appendix B. Assuming an agronomic rate of 140 lbs. nitrogen/acre/year for non-irrigated hay, the forecasted application rate is 8.43 dry tons of biosolids per acre per year, and a total net area of 136 acres is required.

Biosolids Site Submittals have been prepared for the site(s) listed in Table 4-4 and are being submitted to DEQ for authorization concurrently with this report. The biosolids application rates are based on the results of the preliminary sampling. The application rate in dry tons /acre/yr. is based on the available nitrogen in the sludge and will be readjusted following the sampling for each quadrant.

Solids concentrations may vary due to dredging techniques and rehydration and the person responsible for land application should make adjustment to the rate at which solids are applied. Centrifuging is an accepted method of estimating the suspended solids concentrations.[1]
A simple settleometer test may also be used, if the volume of settled sludge is compared to the volume at a known solids concentration.

[1] Page 531"Operation of Municipal Wastewater Treatment Plants MOP 11" Water Environment Federation

TABLE 4-4

BIOSOLIDS SITE MANAGEMENT				
	Site 1	Site 2	Site 3	Site 4
Net Area	82 Acres	38	15	61
Crop	Un-irrigated Hay	Un-irrigated Hay	Un-irrigated Hay	Un-irrigated Hay
Application	6/1-9/ 30	6/1-9/ 30	6/1-9/ 30	6/1-9/ 30
	Spreading/Truck	Spreading/Truck	Spreading/Truck	Spreading/Truck
Agronomic Loading	140 lbs. N/acre/yr.	140 lbs. N/acre/yr.	140 lbs. N/acre/yr.	140 lbs N/acre/yr
	11,480 lbs. N/yr.	5,320 lbs. N/yr.	2,100 lbs. N/yr.	8,540 lbs N/yr
Biosolids Mass	8.43 DT/acre/yr.	8.43 DT/acre/yr.	8.43 DT/acre/yr.	8.43 Dt/acre/yr
	691 DT/yr.	320 DT/yr.	127 DT/yr.	514 DT/yr
Biosolids Volume@3%	65,834 gal/acre/yr.	65,834 gal/acre/yr.	65,834 gal/acre/yr.	65,834 gal/acre/yr
	5.4 MG/yr.	2.50 MG/yr.	0.99 MG/yr.	4.01 MG/yr
Biosolids Volume @6%	32,693 gal/acre/yr.	32,693 gal/acre/yr.	32,693 gal/acre/yr.	32,693 gal/acre/yr
	2.7 MG/yr.	1.24 MG/yr.	490,395	1.99 MG/yr

4.5 RECORD KEEPING/ REPORTING

The City of Warrenton shall provide DEQ with the biosolids analyses and maintain a log indicating the quantity, quality and location of biosolids applied to the DEQ-approved sites. As discussed in the previous section, application rates in dry tons per acre and gallons per acre shall be calculated based on agronomic rates. Application rates will need to be adjusted following sampling from each quadrant based on the total available nitrogen and the total solids concentration.

The City is required by federal law to file an annual report. It is recommended that DEQ be provided with the biosolids analyses as they are completed, so that conformance with pollutant concentrations, pathogen reduction requirements, and vector attraction reduction requirements can be verified and it can be shown that the application rate have been calculated correctly.

Federal regulations are specific in regard to record keeping and reporting, requiring signed statements from the person or persons who prepare the sludge, the wastewater treatment system operator, and the person(s) responsible for land application. These certification statements and supporting documentation must be on file at the generation site, while copies should be sent to DEQ. The text from the regulations is as follows:

503.17(4) The person who prepares the bulk sewage sludge shall develop the following information and shall retain the information for five years:

A. The concentration of each pollutant listed in Table 3 of §503.13 in the bulk sewage sludge.

B. The following certification statement:

"I certify under, penalty of law, that the Class B pathogen requirements in §503.32(b)(2) and the vector attraction reduction requirement in §503.33 (b)(2) have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements and vector attraction reduction requirements if applicable have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

C. A description of how the Class B pathogen requirements in §503.32(b) are met. (Section 3-4)

D. A description of how the vector attraction reduction requirement in 503.33 (b)(2) is met (Section 3-4).

The person who applies the bulk sewage sludge shall develop the following information and shall retain the information for five years:

A. The following certification statement:

"I certify, under penalty of law, that the management practices in §503.14, and the site restrictions in §503.32(b)(5), have been met for each site on which bulk sewage sludge is applied. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practices and site restrictions have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

B. Descriptions of how the management practices in §503.14 are met for each site on which bulk sewage sludge is applied.

Note that section §503.14 on management practices includes the requirement that the bulk sewage sludge shall be applied at a whole sludge application rate that is equal to or less than the agronomic rate for the bulk sewage sludge §503.14(d). If a private party is responsible for land application the City will be responsible for providing them with the required application rate and "written notification of the concentration of total nitrogen (as N on a dry weight basis) in the bulk sewage sludge" §503.12(b). Specific requirements regarding site management will be part of the site permit.

C. A description of how the site restrictions in §503.32(b)(5) are met for each site on which bulk sewage sludge is applied.

Animals shall not be allowed to graze on the land for 30 days after application of sewage sludge 503.32(b)(5)(v). The property owner must therefore be notified of the dates and location of biosolids application on his property so that he can keep livestock off of it.

4.6 LAND APPLICATION PLAN

A land application plan is required to describe new land application sites that will be used over the life of the permit, OAR 340-050-0031-7. The City plans to remove all of the biosolids from the sewage treatment lagoon and apply the biosolids to land application sites for which it is currently seeking authorization. Once this is complete it is expected that sludge will not need to be removed until at least the next permit cycle. Therefore a sludge management plan is not necessary.

APPENDIX A

Lab Analyses

ANALYSIS REPORT

AMTEST OREGON L.L.C.
Professional Laboratory Services
13035 S.W. Pacific Hwy.
Tigard, OR 97223
Tel 503 639 9311
Fax 503 684 1588
Analysis by: Oregon Certified Lab #OR031

C L I E N T

City of Warrenton
Attn: Terry Ager
P.O. Box 250
Warrenton, OR 97146

SLUDGE SAMPLE

Date Sampled: 1/26/00
Date Received: 1/27/00
Date Reported: 2/22/00
Lab Number: 028/09

Project Name: Wastewater Lagoon
Sample Type: Composite of 4 corners of primary cell

Laboratory Sample #		028/09	
		wet	dry
Contaminant	Method	ppm	mg/Kg
Arsenic	7060	< 0.2	< 1.7
Cadmium	7130	0.01	0.08
Chromium	7190	0.7	6
Copper	7210	17.6	147
Lead	7421	3.8	31.2
Mercury	7471	< 0.04	< 0.33
Molybdenum	6010	0.2	1.5
Nickel	7520	0.5	4.2
Selenium	7740	0.10	0.83
Zinc	7950	22	183
pH	150.1	6.7	pH units
Total Solids	160.0	12.0%	
Volatile Solids	160.4	27.0%	
Total Kjeldahl Nitrogen	351.3	1,500	1.25%
Ammonia Nitrogen	350.1	96	0.080%
Nitrate	4500NO3-D	< 5	< 0.004%
Phosphate (PO4-P)	365.3	2,300	1.92%
Potassium	7610	36	0.030%

Reviewed By
Scott Dickman

Warrenton 2/22/00

ANALYSIS REPORT

AMTEST OREGON L.L.C.
Professional Laboratory Services
13035 S.W. Pacific Hwy.
Tigard, OR 97223
Tel 503 639 9311
Fax 503 684 1588

Analysis by: Oregon Certified Lab #OR031

CLIENT

City of Warrenton
Attn: Terry Ager
P.O. Box 250
Warrenton, OR 97146

Date Sampled: 3/2/00
Date Received: 3/3/00
Date Reported: 3/20/00
Lab Number: 288863-869

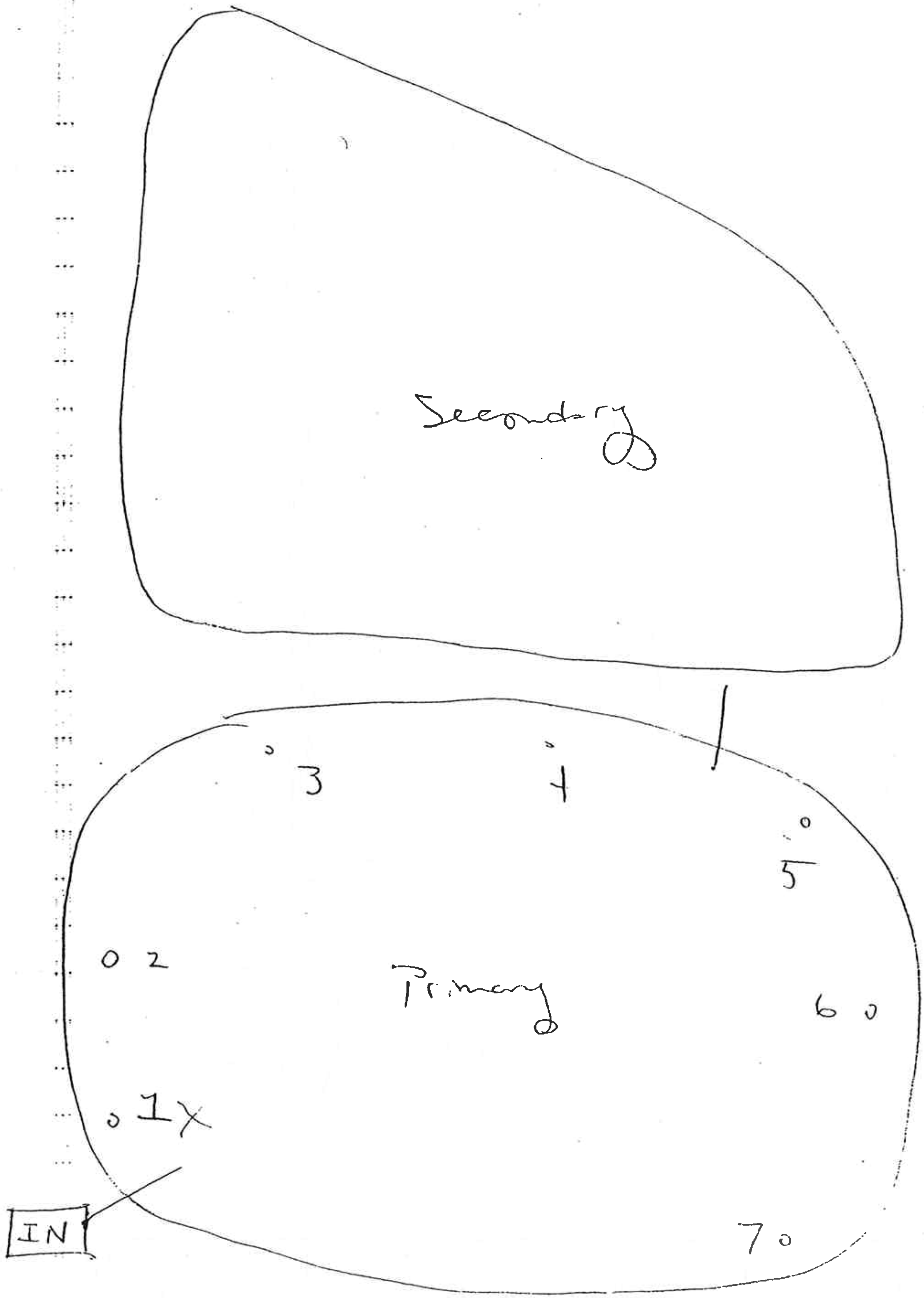
Project Name: Lagoon Sludge
Sample Type: Sludge
Analysis: Fecal Coliform

Client Sample ID	Lab ID #	MPN FC (100g wet wt)	gTS (100g wet wt)	MPN FC (gTS dry wt)
1	288863	300	0.217	1400
2	288864	500	0.197	2500
3	288866	80	0.178	450
4	288868	30	0.177	170
Primary	288867	30	0.168	180
6	288865	80	0.194	410
7	288869	22	0.228	100

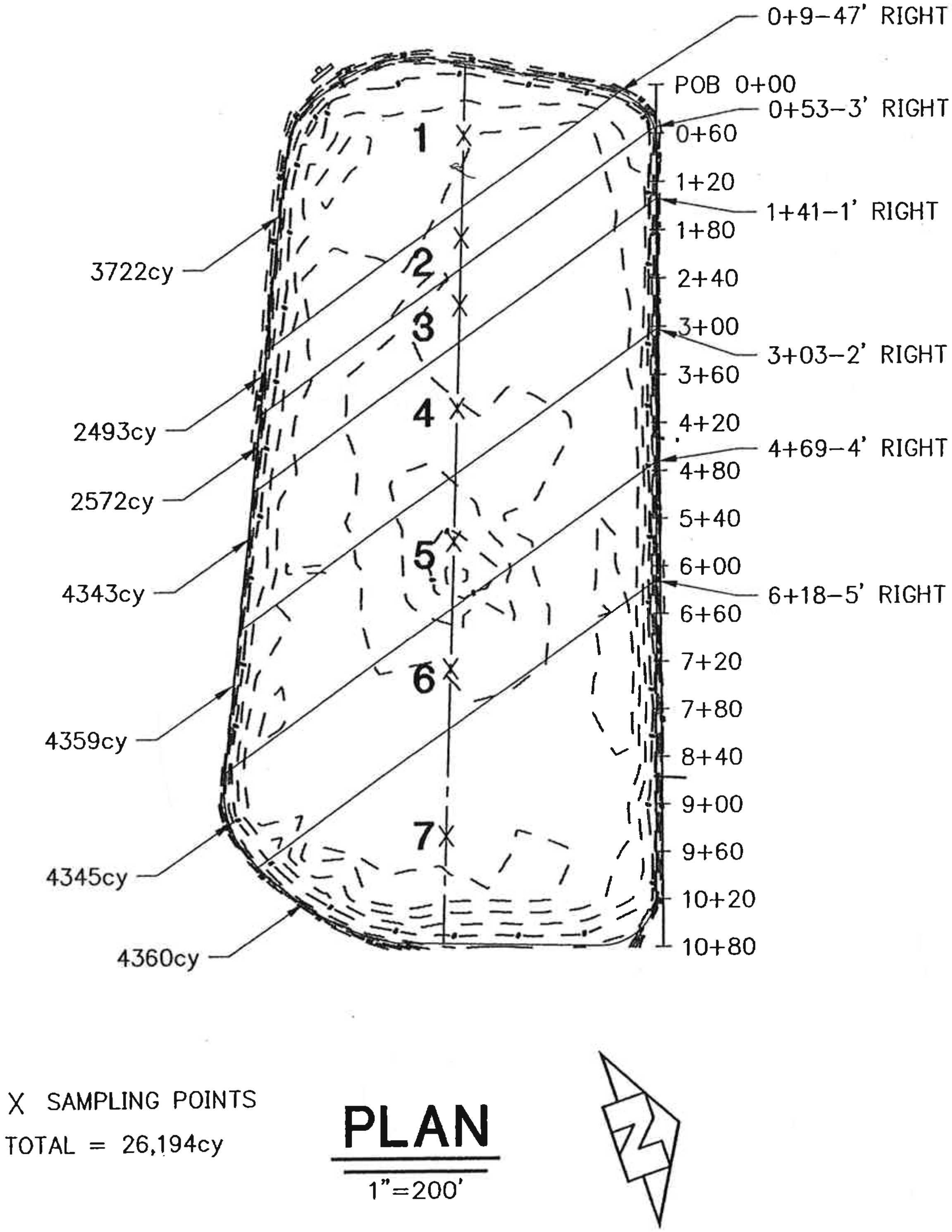
Geometric Mean (7 samples) = 411 bacteria/gram dry wt.

Method: SM9221E
Laboratory Reporting Limit: 2/100 mls

John Scholz
Reviewed By
John Scholz



Sample Locations-
3-2-2000 — Terry Hg SR.



OWNER:
CITY OF WARRENTON

LEE ENGINEERING, INC.
1300 JOHN ADAMS ST.
OREGON CITY, OR, 97045

DWG TITLE:
PRELIMINARY SAMPLING 12/20/02

DATE: JAN 2002
FILE NO: 2873FG3-X
REVISED:

FIGURE A-1

Report Date: January 14, 2002
Job Number: A11220BQ
PO Number: None Provided
Project No: None Provided
Project Name: None Provided

Susan Foreman
Lee Engineering Inc
1300 John Adams St
Oregon City, OR 97045

Analytical Narrative

The sample was received on 12/20/01 by Coffey Laboratories, Inc. (CLI) Sample Reception personnel under strict chain of custody protocol. The following information was provided at the time of sample reception:

Laboratory Sample ID	Field Identification	Matrix	Collection Date	Collection Time
A11220BQ-1	Q-1	Sludge	12/20/01	1245
A11220BQ-2	Q-2	Sludge	12/20/01	1245
A11220BQ-3	Q-3	Sludge	12/20/01	1245
A11220BQ-4	Q-4	Sludge	12/20/01	1245
A11220BQ-5	Q-5	Sludge	12/20/01	1245
A11220BQ-6	Q-6	Sludge	12/20/01	1245
A11220BQ-7	Q-7	Sludge	12/20/01	1245

Analytical Data

Lee Engineering Inc

Job Number: A11220BQ

Lab Sample ID: A11220BQ-1
Field ID: Q-1
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Microbiological

Parameter	Method	Analytical Result	Dry Weight	Units
Fecal Coliform	SM 9222-D	1410.	32,000.	/g solid

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.023	0.52	%
Total Solids	EPA 160.3	4.4	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.008	0.18	%
Total Kjeldahl Nitrogen	SM 4500-Norg-B	0.11	2.5	%

Analytical Data

Lee Engineering Inc

Job Number: A11220BQ

Lab Sample ID: A11220BQ-2
Field ID: Q-2
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.015	0.39	%
Total Solids	EPA 160.3	3.8	—	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.008	0.21	%
Total Kjeldahl Nitrogen	SM 4500-Norg-B	0.08	2.1	%

Coffey Laboratories, Inc.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

Analytical Data

Lee Engineering Inc

Job Number: A11220BQ

Lab Sample ID: A11220BQ-3
Field ID: Q-3
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.018	0.34	%
Total Solids	EPA 160.3	5.3	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.015	0.28	%
Total Kjeldahl Nitrogen	SM 4500-Norg-B	0.15	2.8	%

Analytical Data

Lee Engineering Inc

Job Number: A11220BQ

Lab Sample ID: A11220BQ-4
Field ID: Q-4
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.02	0.22	%
Total Solids	EPA 160.3	9.3	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.011	0.12	%
Total Kjeldahl Nitrogen	SM 4500-Norg-B	0.13	1.4	%

Coffey Laboratories, Inc.
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Analytical Data

Lee Engineering Inc

Job Number: A11220BQ

Lab Sample ID: A11220BQ-5
Field ID: Q-5
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.014	0.41	%
Total Solids	EPA 160.3	3.4	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.011	0.32	%
Total Kjeldahl Nitrogen	SM 4500-Norg-B	0.09	2.6	%

Analytical Data

Lee Engineering Inc

Job Number: A11220BQ

Lab Sample ID: A11220BQ-6
Field ID: Q-6
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.017	0.37	%
Total Solids	EPA 160.3	4.6	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.005	0.1	%
Total Kjeldahl Nitrogen	SM 4500-Norg-B	0.1	2.2	%

Analytical Data

Lee Engineering Inc

Lab Sample ID: A11220BQ-7
Field ID: Q-7
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.015	0.33	%
Total Solids	EPA 160.3	4.6	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.015	0.33	%
Total Kjeldahl Nitrogen	SM 4500-Nor g-B	0.1	2.2	%

Coffey Laboratories, Inc.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

Profile Management

1171 12 Assigned Tests. Total: $300

Expired: 01/31/1997 Rushcode: STANDARD Type: Kit
PName50: Expanded Sludge Profile
PName35: Expanded Sludge Profile
Kit Instructions:

Test		Methodno	Test Days	Price ($300)	Working Branch	Delete
36	Nitrogen: NH4-N	SM4500NH3BC	8	20.00	Port	
66	Nitrogen: Total Kjeldahl (TKN)	SM 4500-Norg-B	8	35.00	Port	
221	pH: Non Aqueous Samples	EPA 9045	1	10.00	Port	
311	Mercury-CV: Total Hg solid/sludge	EPA 7471	8	25.00	Port	
461	Solids: VS	EPA 160.4	5	20.00	Port	
503	Solids: TS	EPA 160.3	5	20.00	Port	
504	Nitrate-Nitrite: Solids & Sludges	SM 418-E	5	20.00	Port	
684	Digestion Fee: ICP-solid matrix	EPA 3050	8	15.00	Port	
3184	ICP-Total Ag	EPA 6010b	8	10.00	Port	
3299	ICP-Total AsCdCrCuKMoNiPSeZn	EPA 6010b	8	90.00	Port	
3352	ICP-Total Pb	EPA 6010b	8	10.00	Port	
4961	Fecal Coliform: MF Count (Liquid)	SM 9222-D	2	25.00	Port	

Add Test to Profile: 9

APPENDIX B

Calculations

DATA FROM SAMPLING 12/20/02								
SAMPLE	DEPTH	SLUDGE	CONC.		MASS	TKN	NH4	NO3-NO2
#	Ft	Ft.	%	CY	tons	%	%	%
1	8	2	4.4	3722	142.16	2.5	0.52	0.18
2	7.6	2	3.8	2492	82.20	2.1	0.39	0.21
3	7.1	1.3	5.3	2572	118.33	2.8	0.34	0.28
4	6.4	1.5	9.3	4343	350.61	1.4	0.22	0.12
5	6.1	1.5	3.4	4359	128.65	2.6	0.41	0.32
6	6	1	4.6	4345	173.50	2.2	0.37	0.1
7	8	1.7	4.6	4360	174.10	2.2	0.33	0.33
Ave Depth		1.57	5.06		1169.57	2.26	0.37	0.22

CALCULATIONS FOR DETERMINING
AGRONOMIC RATE

TKN Biosolids Total Organic Nitrogen (% dry wt)
AN Biosolids Ammonium (% dry wt)
NN Biosolids Nitrate-Nitrite (% dry wt)

AVAILABLE NITROGEN
$[(TKN - AN)M + AN \cdot R + NN]C$
R = Ammonium Retained use 0.5
M = Mineralization use 0.225
C = Conversion from % to lbs/dry ton use 20

Available Nitrogen =
$[(2.26 - 0.37)0.225 + 0.5(0.37) + 0.22]20$
= 16.605 lbs N / DT

APPLICATION RATE

140 lbs N/Acre/Yr / 16.605
= 8.43 DT/Acre/Yr
120 lbs N/Acre/Yr / 16.605
≈ 7.23 DT/Acre/Yr

MASS OF BIOSOLIDS AT 5.06% TS
$(26,200 \text{ CY} (27)(5.06/100)(8.345)(7.481)1.03 \left(\frac{1}{2000}\right)$
= 1150 DT = 1044 MT

AGRONOMIC APPLICATION RATE
at 140 lbs N/Acre/Yr = 1150 DT / 8.43 DT/Acre/Yr
= 136 Acres
at 120 lbs N/Acre/Yr = 1150 DT / 7.23 DT/Acre/Yr
≈ 159 Acres

LEE ENGINEERING, INC.
1300 JOHN ADAMS ST.
OREGON CITY, OR 97045
(503) 655-1342 FAX (503) 655-1360

MADE BY ______ DATE ______ SHEET NO. ______
CLIENT ______ FILE NO. ______
PROJECT ______

AGRONOMIC APPLICATION RATES

Assuming 3% TS Concentration after rehydration

140 lbs N/ Acre/ Yr → $(8.43 \text{ DT/Acre/Yr})(2000)(\frac{100}{3})(\frac{1}{8.345})(\frac{1}{1.03})$

= 65,384 gal /Acre/ Yr.

120 lbs N/ Acre/ Yr → $(7.23 \text{ DT/Acre/Yr})(2{,}000)(\frac{100}{3})(\frac{1}{8.345})(\frac{1}{1.03})$

= 56,076 gal /Acre/ Yr

Assuming 6% TS

140 lbs N/ Acre/ Yr → $(8.43 \text{ DT/Acre/Yr})(2{,}000)(\frac{100}{6})(\frac{1}{8.345})(\frac{1}{1.0})$

= 32 642 gal /Acre/ Yr

120 lbs N/ Acre/ Yr → $(7.23 \text{ DT/Acre/Yr})(2{,}000)(\frac{100}{6})(\frac{1}{8.345})(\frac{1}{1.03})$

= 28,038 gal /Acre / Yr

LEE ENGINEERING, INC.
1300 JOHN ADAMS ST.
OREGON CITY, OR 97045
(503) 655-1342 FAX (503) 655-1360

MADE BY ________ DATE ________ SHEET NO. ________
CLIENT ________ FILE NO. ________
PROJECT ________

APPENDIX C

Sludge Survey

COAST SURVEYING

KARL F. FOESTE

P.O. BOX 807
361 S.W. MAIN CT.
WARRENTON, OR 97146
(503) 861-2569

RECEIVED
DEC - 3 2001
Lee Engineering Inc.

November 30, 2001

Susan Foreman
Lee Engineering
1300 John Adams Street
Oregon City, OR 97045

Dear Susan,

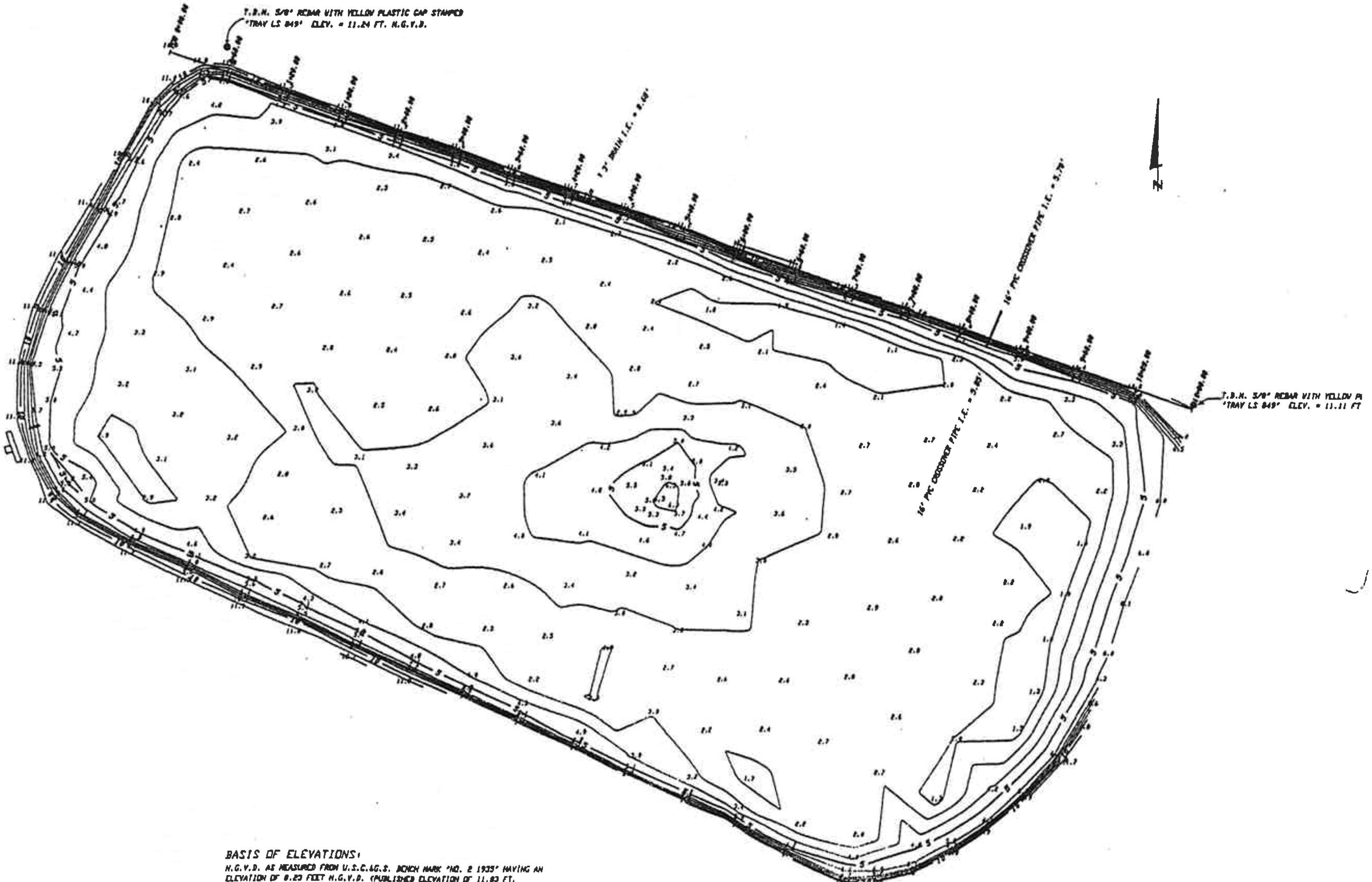
Enclosed is a copy of our cross-sections in the City of Warrenton's southern sewer lagoon showing sludge depths. Also enclosed is a copy of a letter to Alan Johansson, City Engineer, dated January 31, 2000, reporting sludge volumes. Accompanying the letter are computer printouts showing volumes of sludge using T-Net solution and average end area solution.

Please call me if you have any questions.

Sincerely,

Karl F. Foeste

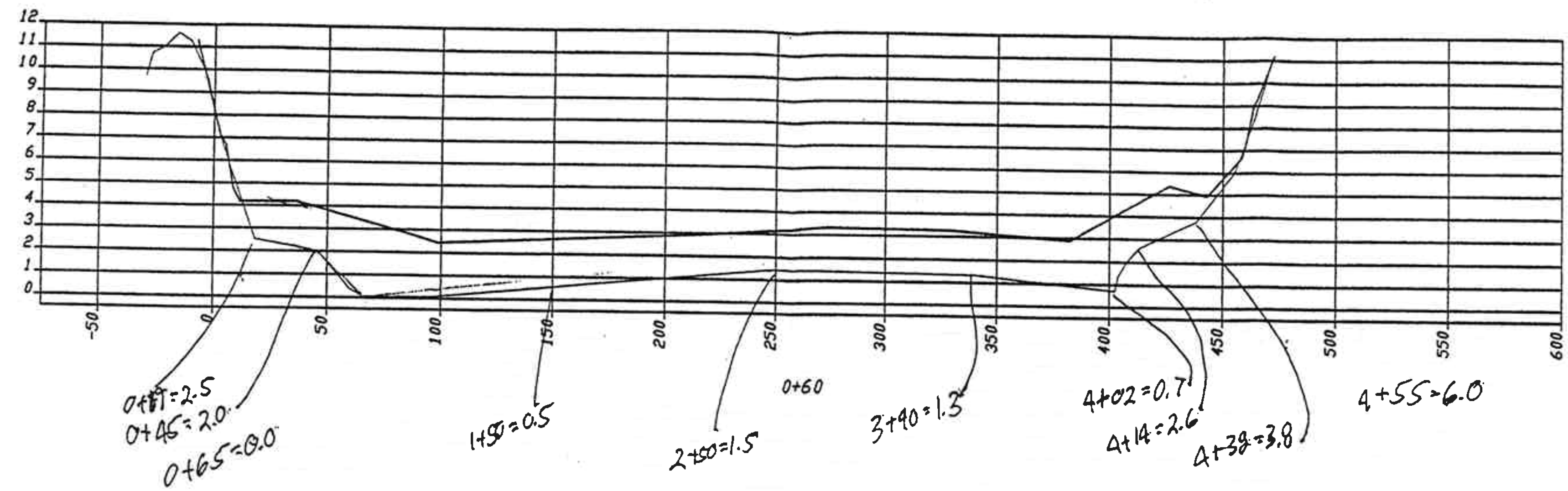
Karl F. Foeste

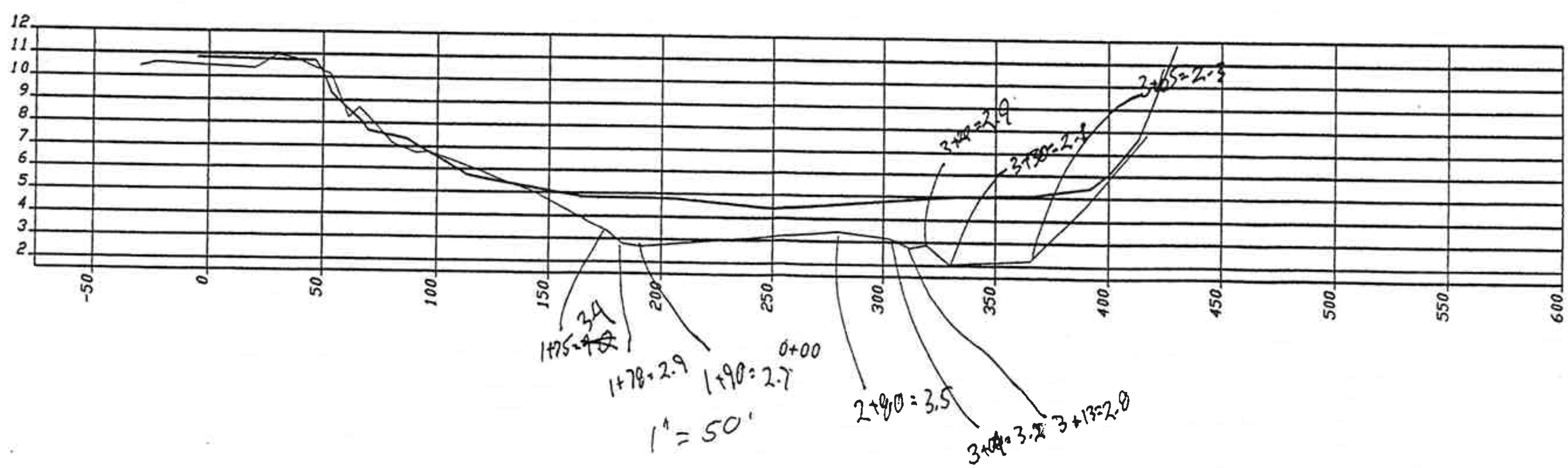


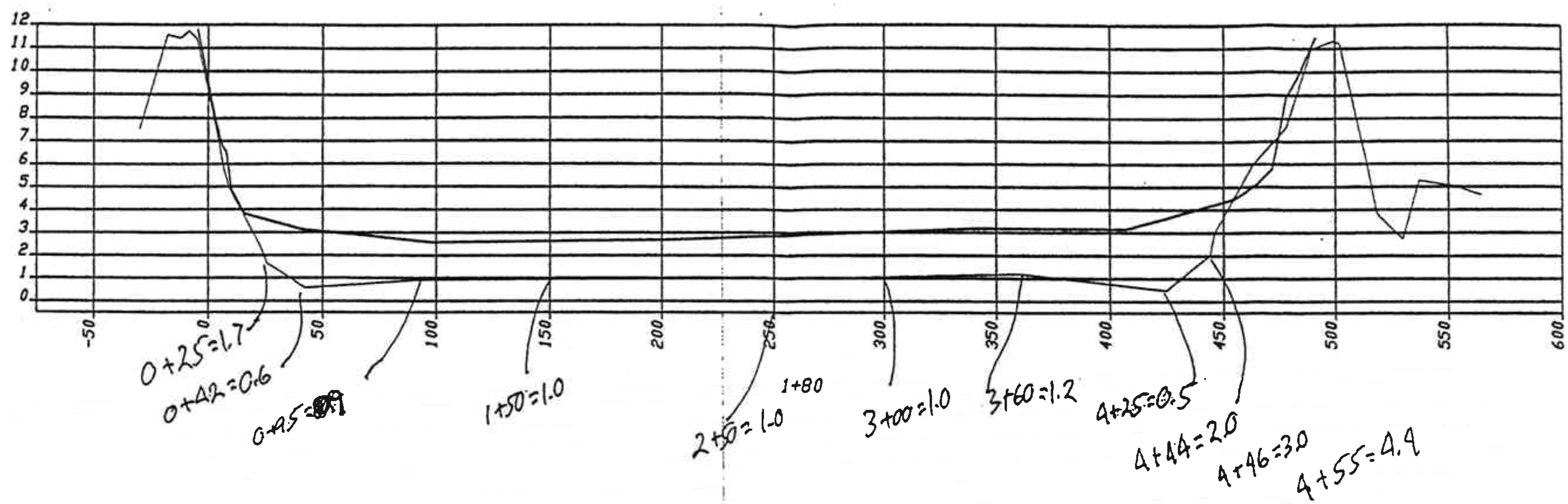
BASIS OF ELEVATIONS:
N.G.V.D. AS MEASURED FROM U.S.C.&G.S. BENCH MARK "NO. 2 1935" HAVING AN ELEVATION OF 8.23 FEET N.G.V.D. (PUBLISHED ELEVATION OF 11.83 FT. M.L.L.W.)

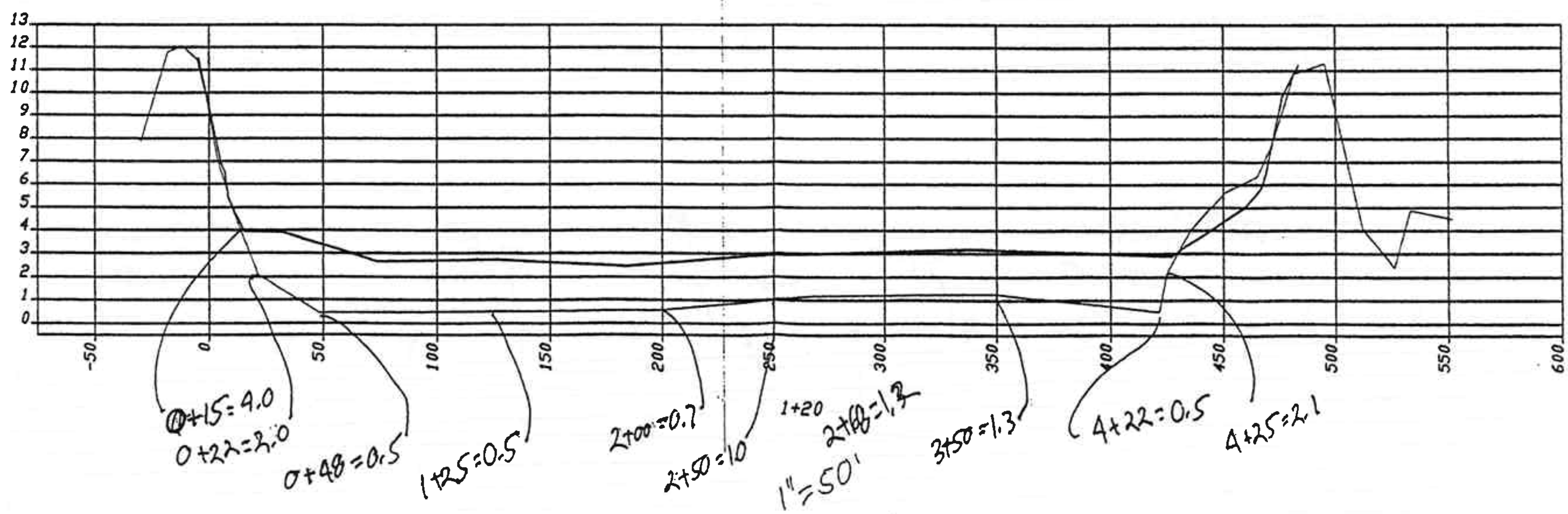
1" = 100'

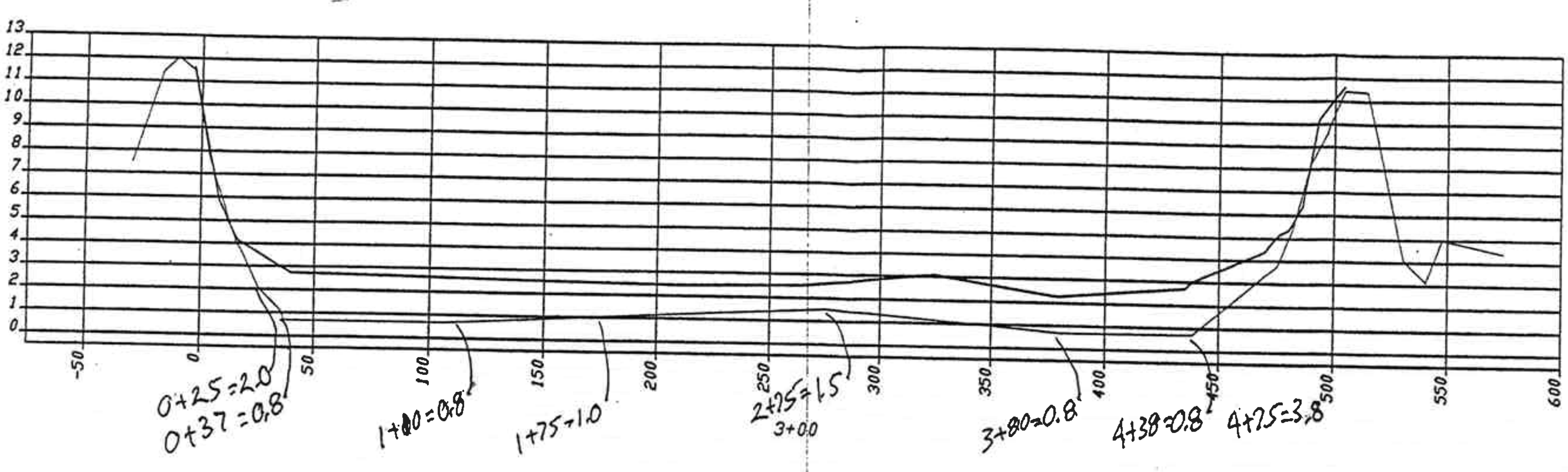
TOPOGRAPHIC MAP SHOWING ELEVATION OF
SLUDGE IN CITY OF WARRENTON SEWER

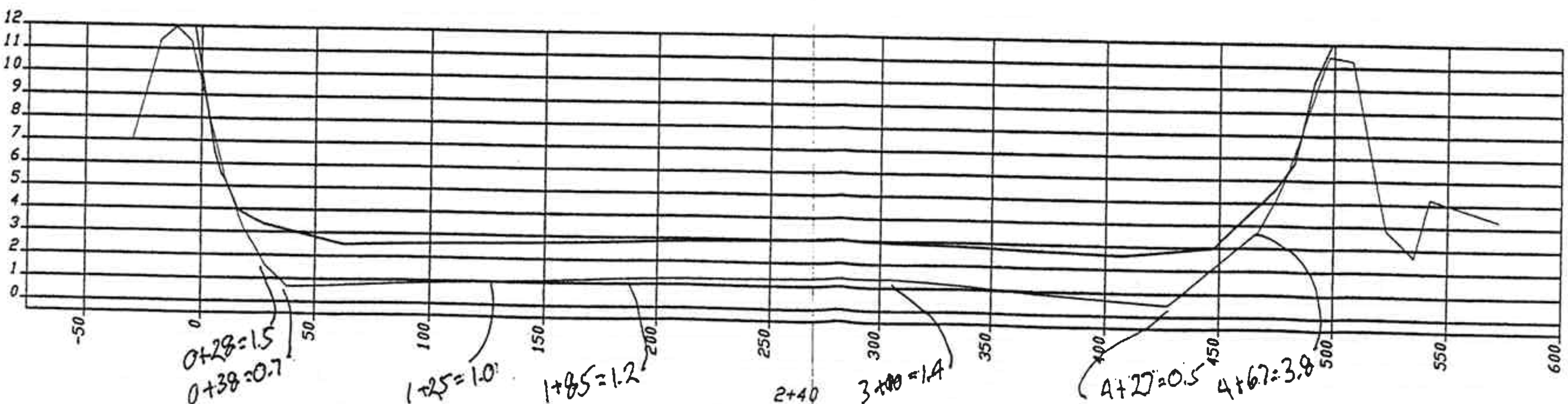

0+17 = 2.5
0+46 = 2.0
0+65 = 0.0
1+50 = 0.5
2+50 = 1.5
0+60
3+90 = 1.3
4+02 = 0.7
4+14 = 2.6
4+38 = 3.8
4+55 = 6.0


1+75 = 3.9
1+78 = 2.9
1+90 = 2.7
0+00
1" = 50'
2+80 = 3.5
3+13 = 2.0
3+40 = 2.9
3+80 = 2.8
3+65 = 2.3


0+25=1.7
0+42=0.6
1+50=1.0
2+50=1.0
1+80
3+00=1.0
3+60=1.2
4+25=0.5
4+44=2.0
4+46=3.0
4+55=4.4

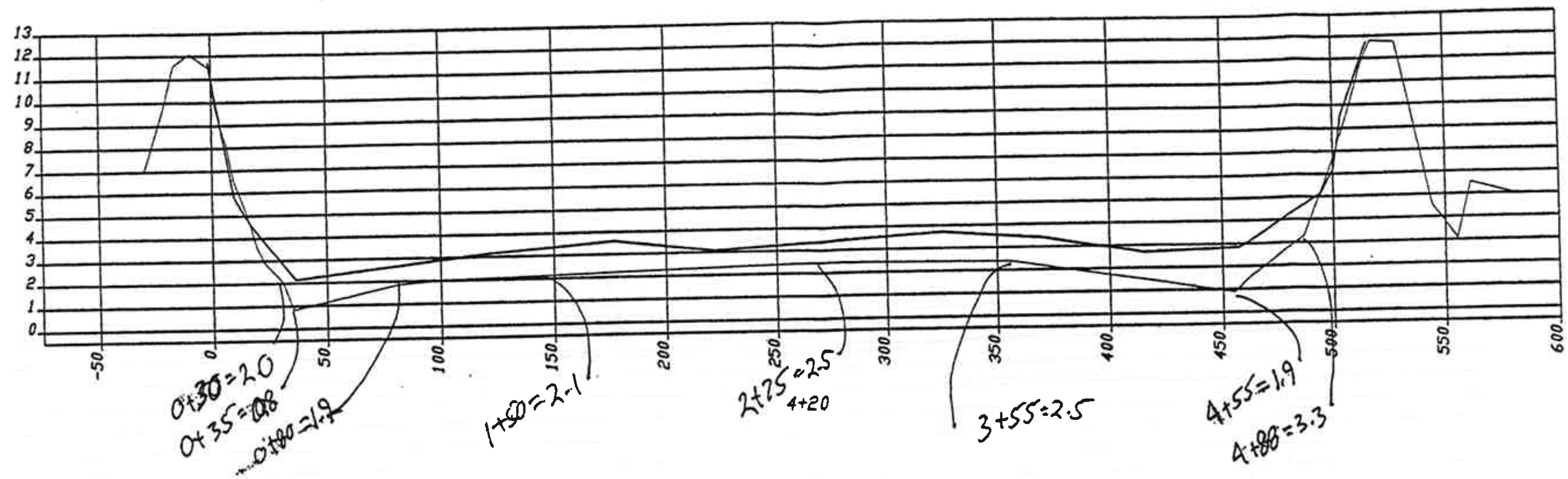

0+22=2.0
0+48=0.5
1+25=0.5
2+00=0.7
2+50=10
1+20
1"=50'
3+50=1.3
4+22=0.5
4+25=2.1


0+25=2.0
0+37=0.8
1+80=0.8
1+75=1.0
2+75=1.5
3+00
3+80=0.8
4+38=0.8
4+75=3.8

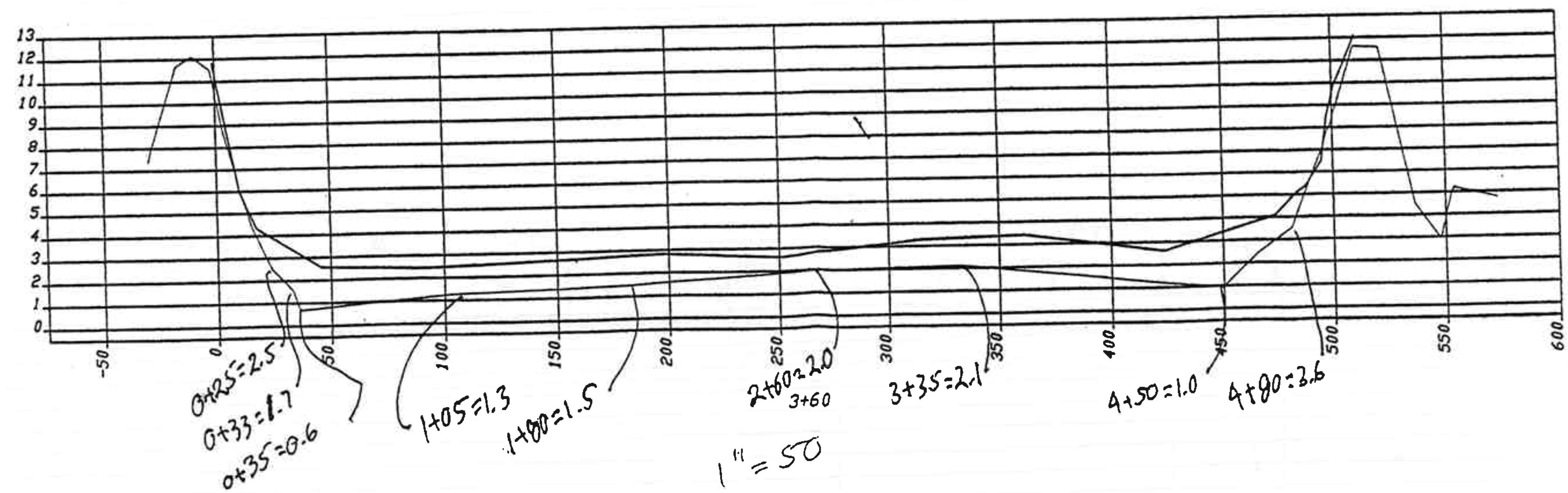

0+28=1.5
0+38=0.7
1+25=1.0
1+85=1.2
2+40
3+00=1.4
4+27=0.5
4+67=3.8

1"=50'

SHEET

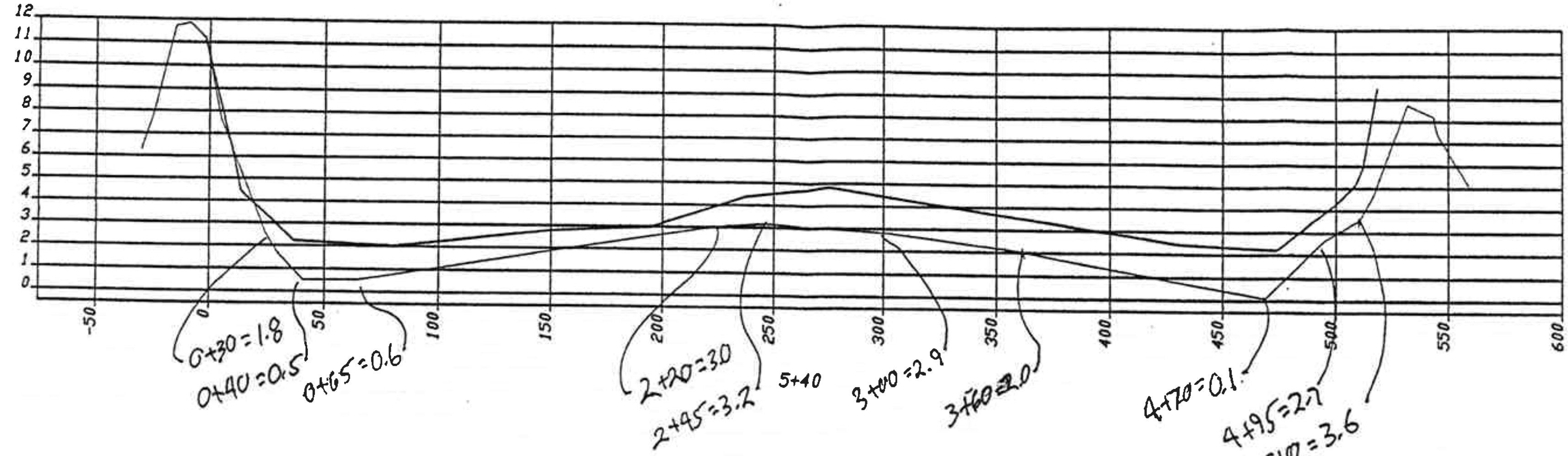


0+30=2.0
0+35=0.8
0+80=1.9
1+50=2.1
2+25=2.5
4+20
3+55=2.5
4+55=1.9
4+88=3.3

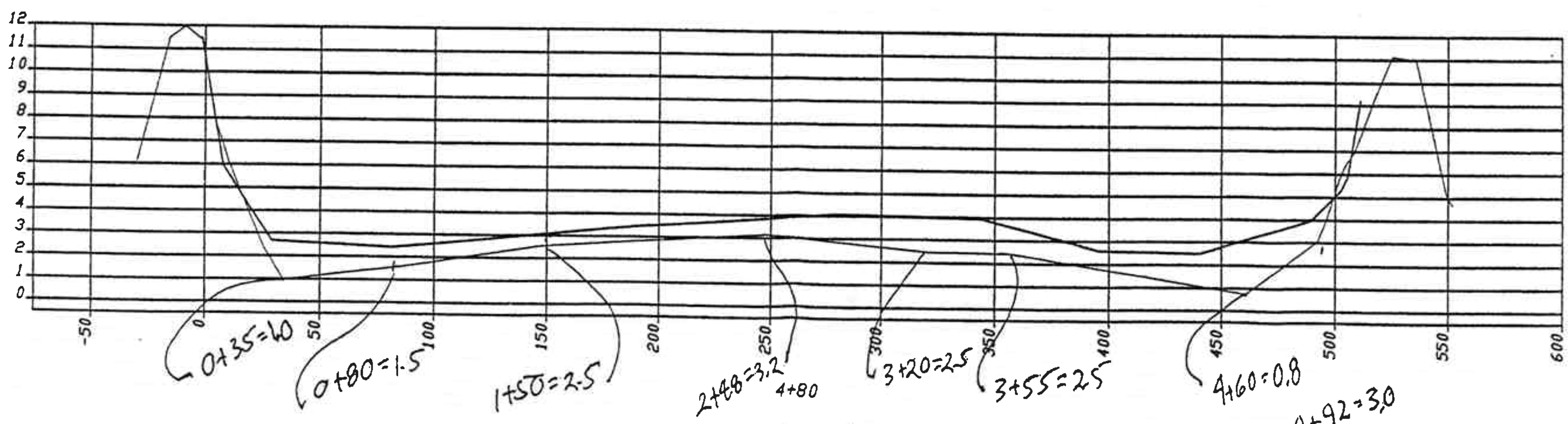


0+25=2.5
0+33=1.7
0+35=0.6
1+05=1.3
1+80=1.5
2+60=2.0
3+60
3+35=2.1
4+50=1.0
4+80=3.6

1" = 50

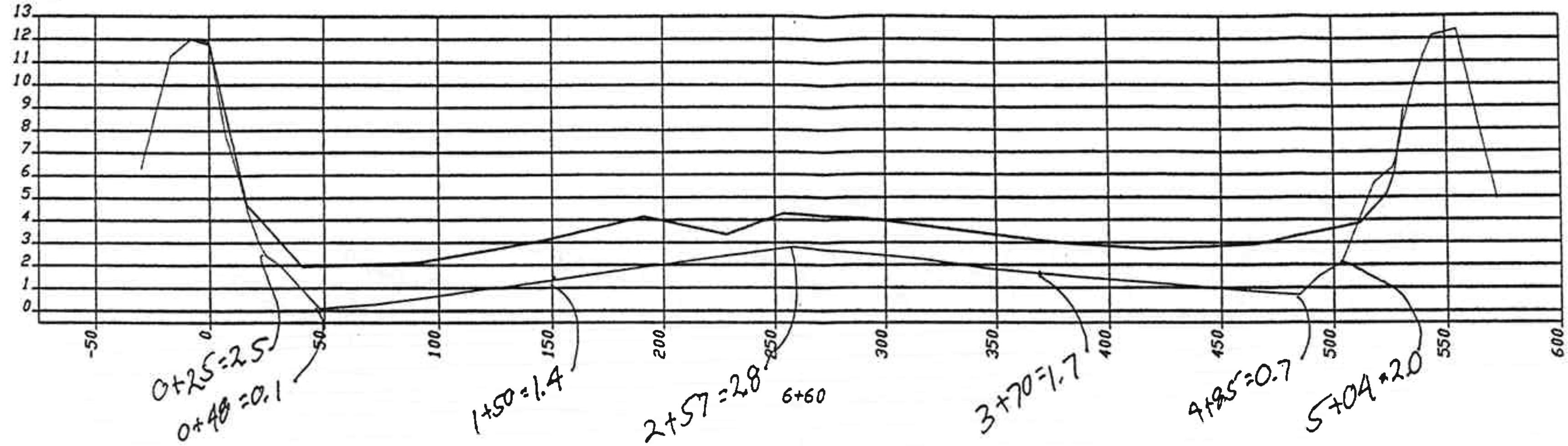


0+30=1.8
0+40=0.5
0+65=0.6
2+20=3.0
2+45=3.2
5+40
3+00=2.9
3+60=2.0
4+70=0.1
4+95=2.7
5+10=3.6

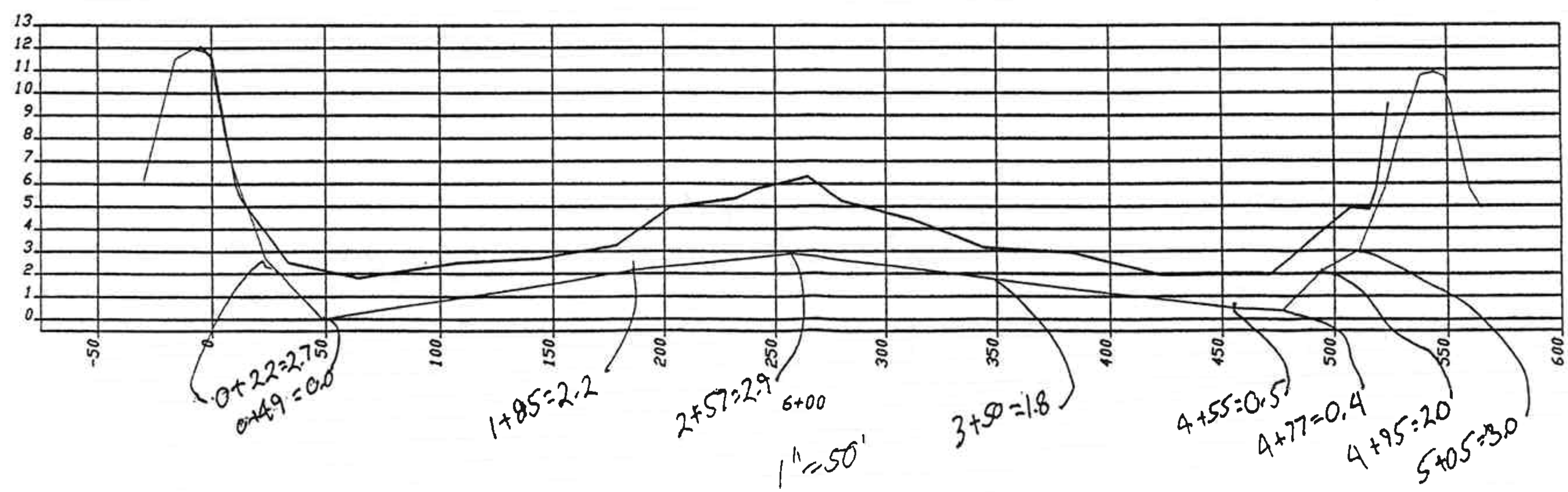


0+35=1.0
0+80=1.5
1+50=2.5
2+48=3.2
4+80
3+20=2.5
3+55=2.5
4+60=0.8
4+92=3.0

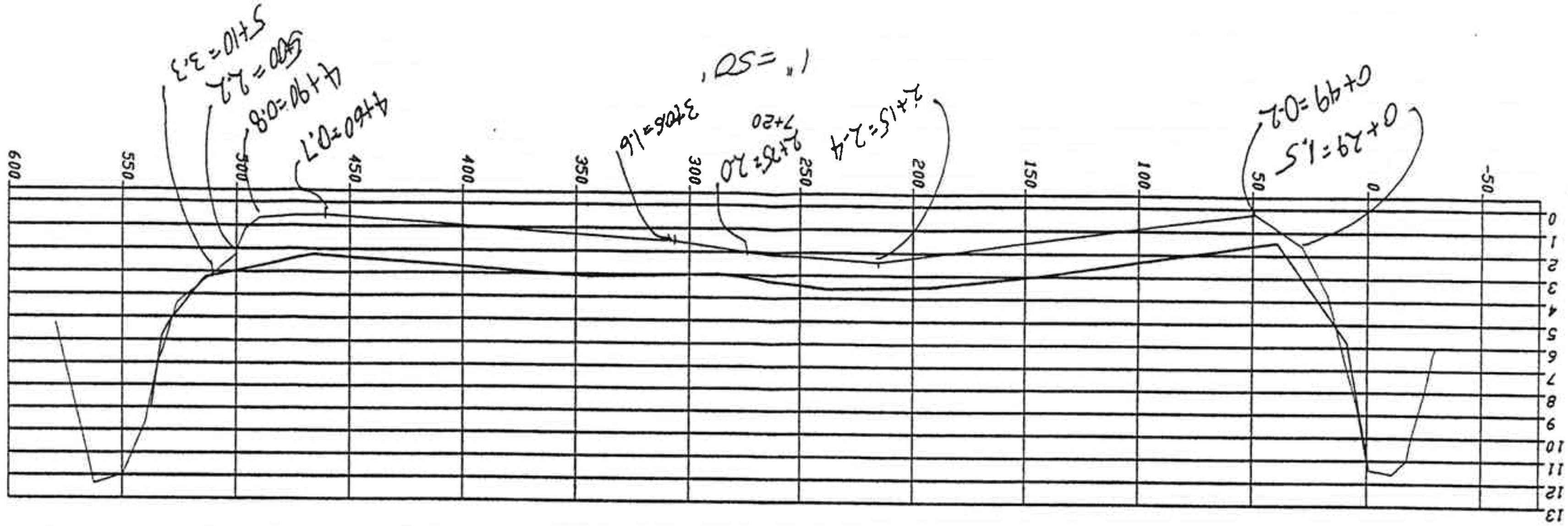
1" = 50'

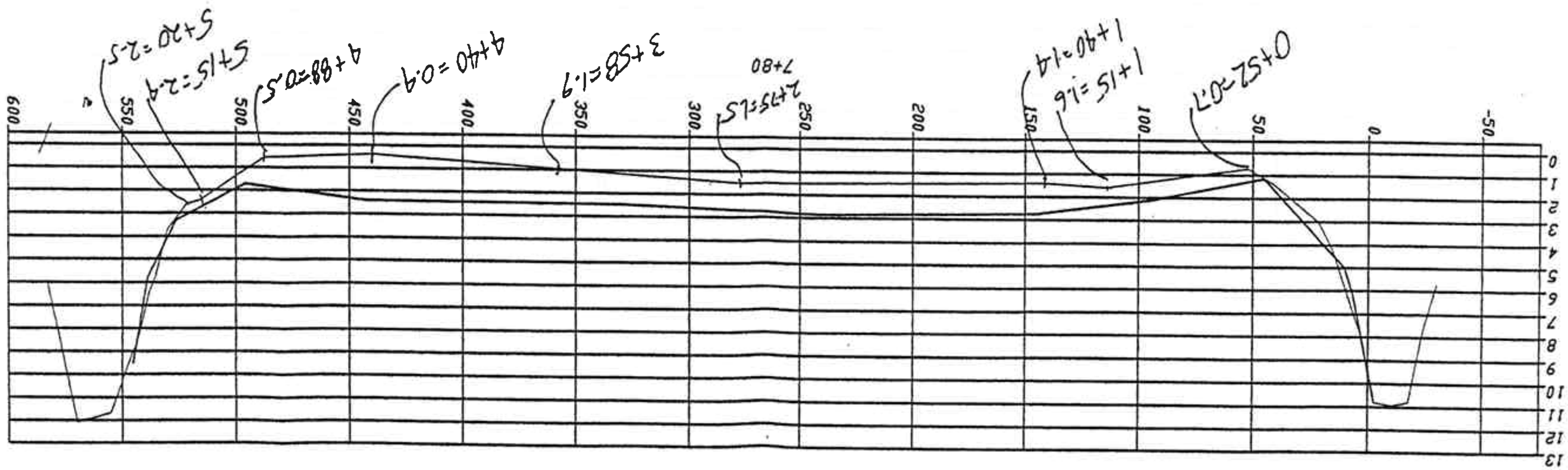


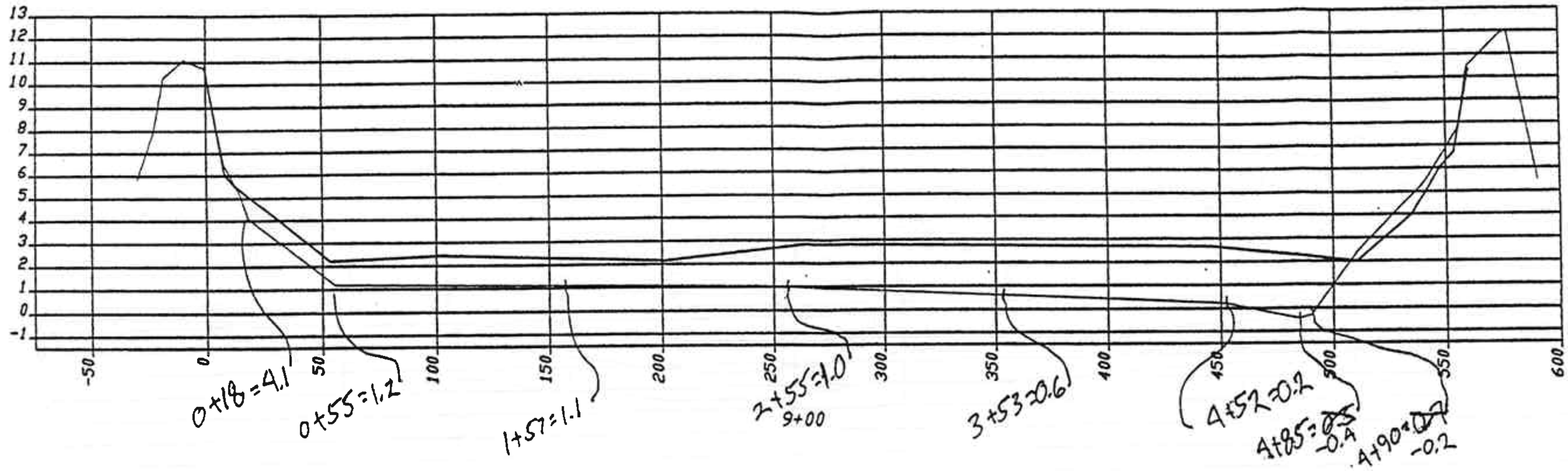
0+25=2.5
0+48=0.1
1+50=1.4
2+57=2.8
6+60
3+70=1.7
4+85=0.7
5+04=2.0



0+22=2.7
0+49=0.0
1+85=2.2
2+57=2.9
6+00
1"=50'
3+50=1.8
4+55=0.5
4+77=0.4
4+95=2.0
5+05=3.0


5+10 = 3.3
500 = 2.2
4+90=0.8
4+60=0.7
3+06=1.6
2+75=2.0
7+20
2+15=2.4
1" = 50'
0+49=0.2
0+29=1.5


5+20=2.5
5+15=2.4
4+88=0.5
4+40=0.4
3+58=1.9
2+75=1.5
7+80
1+40=1.4
1+15=1.6
0+52=0.7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400
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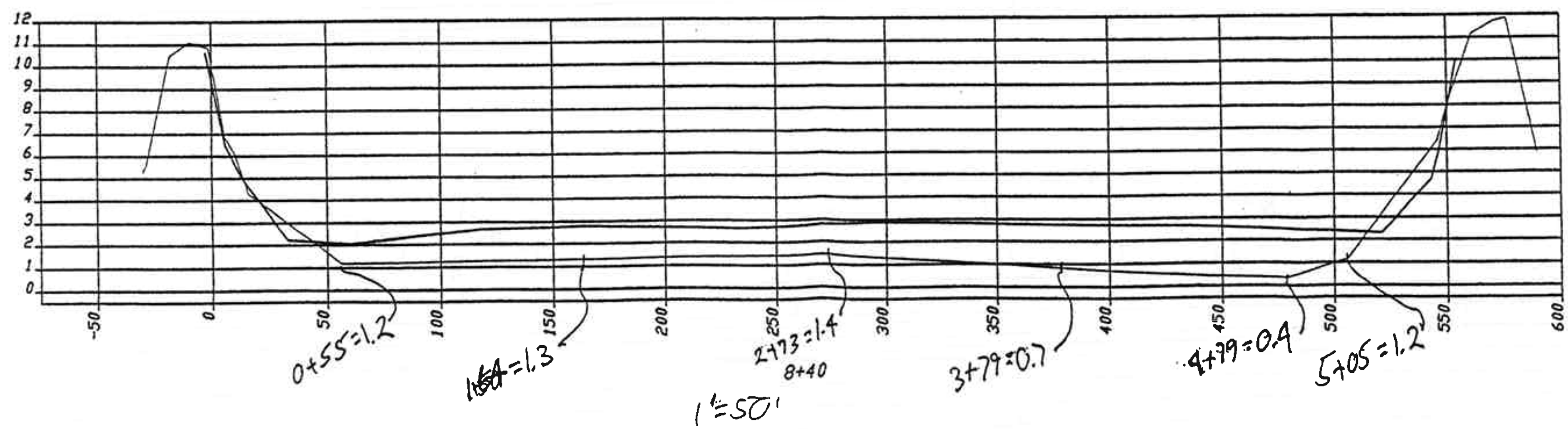
500
550
600
0+18=4.1
0+55=1.2
1+57=1.1
2+55=1.0
9+00
3+53=0.6
4+52=0.2
4+85=~~0.5~~ -0.4
4+90=~~0.7~~ -0.2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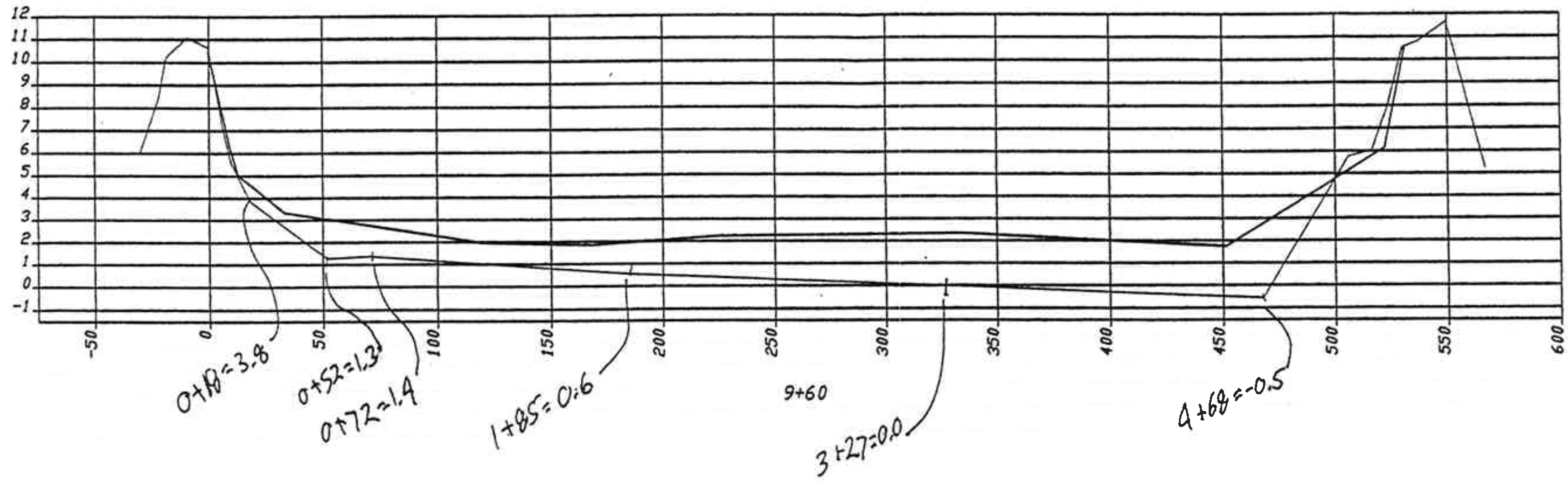
550
600
0+55=1.2
1+64=1.3
2+73=1.4
8+40
3+79=0.7
4+79=0.4
5+05=1.2
1"=50'



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200
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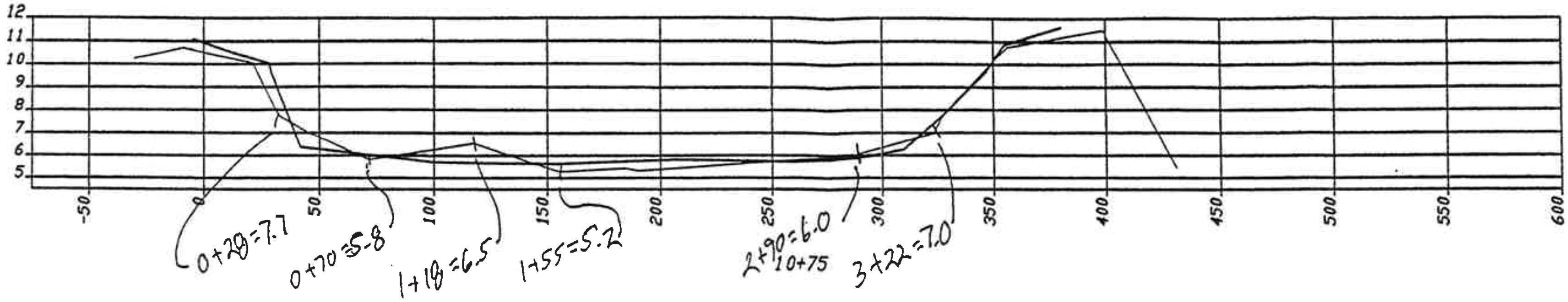
300
350
400
450
500
550
600
0+18=3.8
0+52=1.3'
0+72=1.4
1+85=0.6
9+60
3+27=0.0
4+68=-0.5

1"=50'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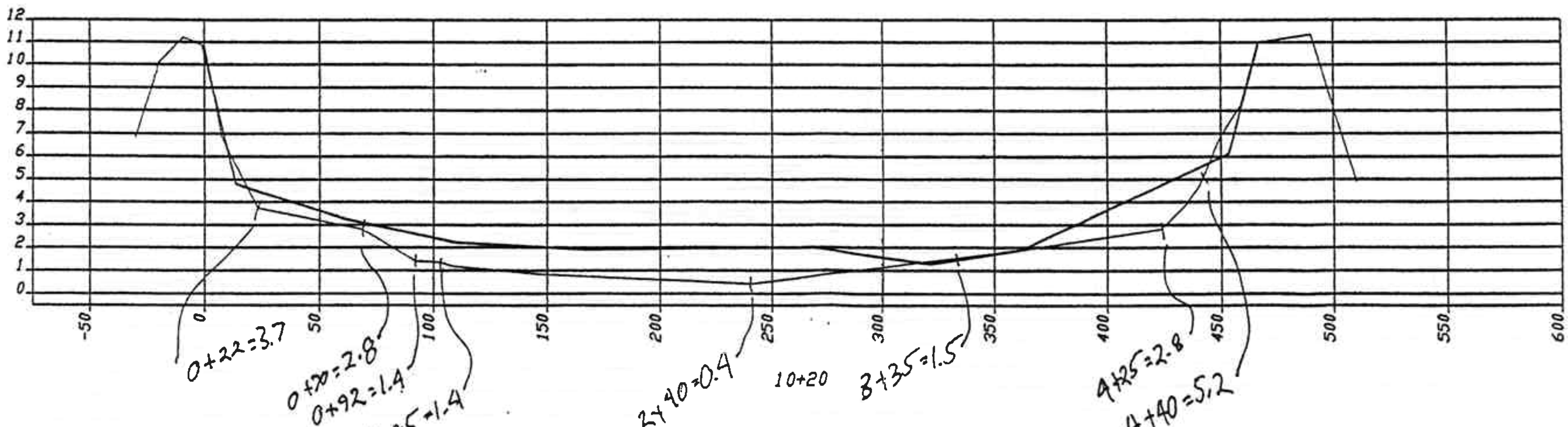
0+20=7.7
0+70=5.8
1+18=6.5
1+55=5.2
2+90=6.0
10+75
3+22=7.0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400
450
500
550
600
0+22=3.7
0+70=2.8
0+92=1.4
1+05=1.4
2+40=0.4
10+20
3+35=1.5
4+25=2.8
4+40=5.2

1" = 50'

COAST SURVEYING

KARL F. FOESTE

P.O. BOX 807
361 S.W. MAIN CT.
WARRENTON, OR 97146
(503) 861-2569

January 31, 2000

Mr. Alan Johansson
City of Warrenton
P.O. Box 250
Warrenton, Oregon 97146

Dear Alan,

Enclosed are printouts of the measured volume of sludge in the City of Warrenton's southern sewer lagoon. Page 1 gives a volume of 30,900 cu. yds. and an average depth of 1.6 feet of sludge. This volume was determined using a terrain modeling program. Pages 4 - 7 report the volume of sludge determined from the average end area of 20 cross sections of the subject lagoon. The total volume of sludge using the average end area method is 28,243 cu. yds. The difference of 2,657 cu. yds. between the two methods is attributed to the positioning of the cross sections relative to the west end of the lagoon and the high island located near the center of the lagoon. I consider the volume of 30,900 cu. yds. to be the more accurate of the two.

Please call me if you have any questions.

Sincerely,

Karl F. Foeste

Karl F. Foeste

Sewer Ponds for City of Warrenton
COORDINATE FILE : FIFTH.CRD

DESIGN SURFACE		REFERENCE SURFACE	
COORDINATE FILE	= FIFTH.CRD	COORDINATE FILE	= FIFTH.CRD
T-NET FILE	= PNDBTM3.TNT	T-NET FILE	= SWRPOND2.TNT

*** MEDIUM PRECISION ***	CUT	FILL	NET	
ANK VOLUMES (cu yds) :	30900.5309	~~152.1411~~	~~30748.3898~~	
	CUT	~~FILL~~	~~NO CHANGE~~	UNSOLVED
SURFACE AREAS (sq ft) :	525058.6773	~~11844.2487~~	~~0.0000~~	~~833993.5608~~
(acres) :	12.0537	~~.2719~~	~~0.0000~~	~~19.1459~~
VERAGE DEPTHS (feet) :	1.5890	~~.3468~~		
	WHOLE SITE	~~GRADED AREA~~		
ADJUST TO BALANCE (ft) :	1.5463	~~1.5463~~		

SOLUTION STATISTICS:

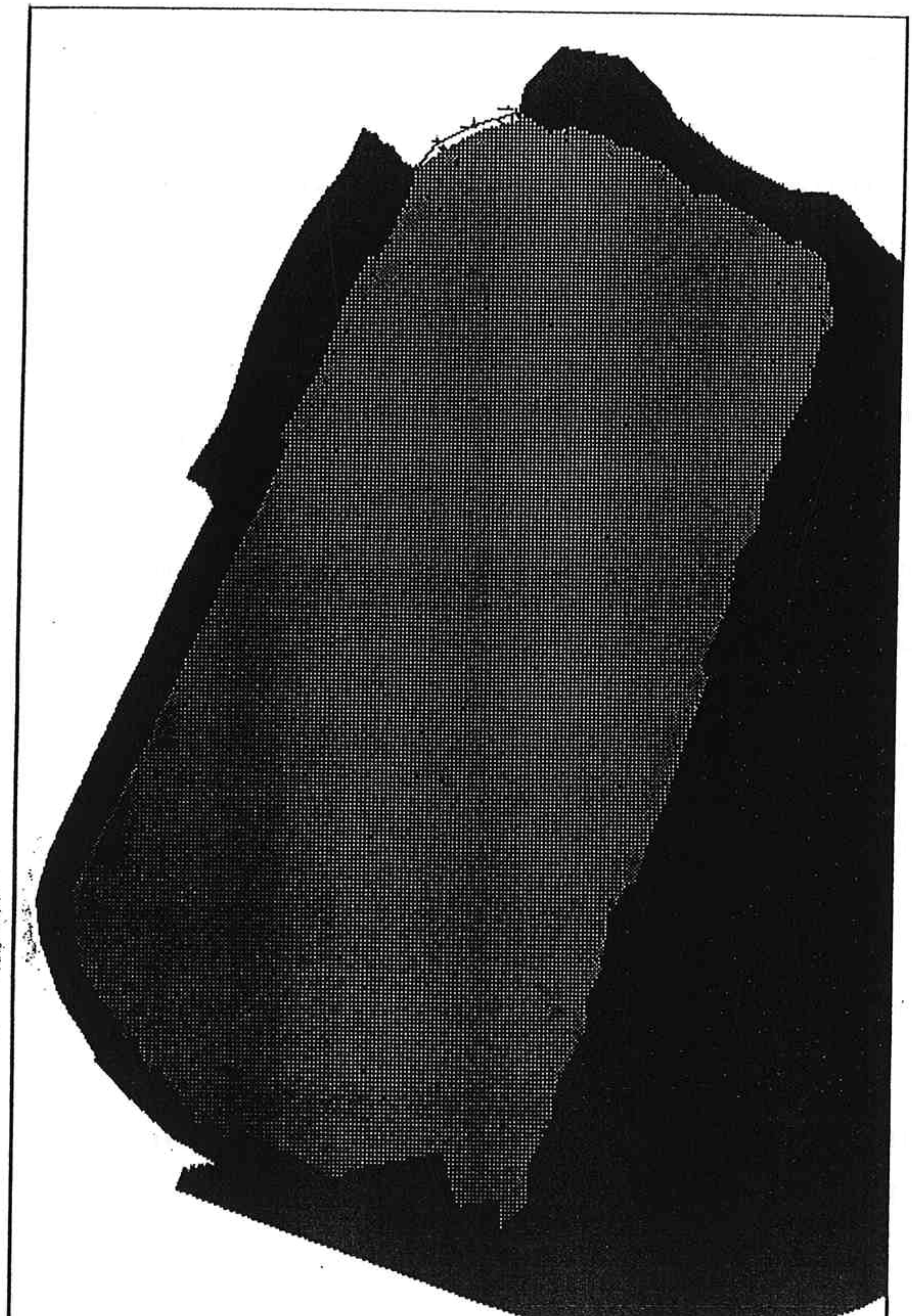
# OF TRIANGLES SOLVED :	~~1888~~
TOTAL SURFACE AREA :	~~1370896.49~~
TRIANGLE AVERAGE AREA :	~~726.11~~

TIME TO COMPUTE:

DING COMMON AREAS :	~~.08 min~~
VING VOLUMES :	~~.37 min~~

Sewer Ponds for City of Warrenton
COORDINATE FILE : FIFTH.CRD

2
17



Sewer Ponds for City of Warrenton
COORDINATE FILE : FIFTH.CRD

++

INISHED SURFACE : C:\DATA2\SWRPOND.XSC
ORIGINAL SURFACE : FIFTH.XSC
ASELINE SET # : 148
OB STATION : 0+00.00

++

olumes below based on: 0% SHRINKAGE
0% SWELL

NITIAL VOLUMES:		CUT	FILL	NET
	BANK	0.0000	0.0000	0.0000
	LOOSE	0.0000	0.0000	0.0000

STATION	INCREMENTAL VOLUMES CUT (yd3)	FILL (yd3)	CUMULATIVE VOLUMES CUT (yd3)	FILL (yd3)	NET (yd3)
+00.00					
17.3675 ft2 Cut Area		BANK	0.0000	0.0000	0.0000
478.3819 ft2 Fill Area		LOOSE	0.0000	0.0000	0.0000
BANK	22.6828	1527.7782			
LOOSE	22.6828	1527.7782			
+60.00					
3.0470 ft2 Cut Area		BANK	22.6828	1527.7782	-1505.0954
896.6185 ft2 Fill Area		LOOSE	22.6828	1527.7782	-1505.0954
BANK	42.1907	1954.5283			
LOOSE	42.1907	1954.5283			
+20.00					
34.9246 ft2 Cut Area		BANK	64.8735	3482.3065	-3417.4330
862.4570 ft2 Fill Area		LOOSE	64.8735	3482.3065	-3417.4330
BANK	56.0203	1930.4354			
LOOSE	56.0203	1930.4354			
+80.00					
15.4937 ft2 Cut Area		BANK	120.8938	5412.7419	-5291.8481
874.9348 ft2 Fill Area		LOOSE	120.8938	5412.7419	-5291.8481
BANK	22.0576	1837.7894			
LOOSE	22.0576	1837.7894			
+40.00					

4.3581 ft2 Cut Area	BANK	142.9513	7250.5313	-7107.5800
779.0757 ft2 Fill Area	LOOSE	142.9513	7250.5313	-7107.5800

BANK 8.9515 1713.0339
LOOSE 8.9515 1713.0339

,00.00

3.6982 ft2 Cut Area	BANK	151.9028	8963.5652	-8811.6624
762.6548 ft2 Fill Area	LOOSE	151.9028	8963.5652	-8811.6624

BANK 5.9993 1559.5300
LOOSE 5.9993 1559.5300

+60.00

1.7012 ft2 Cut Area	BANK	157.9022	10523.0952	-10365.1930
640.9222 ft2 Fill Area	LOOSE	157.9022	10523.0952	-10365.1930

BANK 10.2408 1329.9047
LOOSE 10.2408 1329.9047

+20.00

7.5155 ft2 Cut Area	BANK	168.1429	11852.9999	-11684.8570
555.9921 ft2 Fill Area	LOOSE	168.1429	11852.9999	-11684.8570

BANK 18.2229 1188.8942
LOOSE 18.2229 1188.8942

+80.00

8.8851 ft2 Cut Area	BANK	186.3659	13041.8941	-12855.5282
514.0127 ft2 Fill Area	LOOSE	186.3659	13041.8941	-12855.5282

BANK 14.7389 1338.5135
LOOSE 14.7389 1338.5135

+40.00

4.3799 ft2 Cut Area	BANK	201.1047	14380.4076	-14179.3028
690.6495 ft2 Fill Area	LOOSE	201.1047	14380.4076	-14179.3028

BANK 6.8969 1780.7021
LOOSE 6.8969 1780.7021

+00.00

1.8273 ft2 Cut Area	BANK	208.0017	16161.1097	-15953.1080
911.9824 ft2 Fill Area	LOOSE	208.0017	16161.1097	-15953.1080

BANK 15.8627 1919.2130
LOOSE 15.8627 1919.2130

00

12.4491 ft2 Cut Area	BANK	223.8643	18080.3226	-17856.4583

815.3093 ft2 Fill Area	LOOSE		223.8643	18080.3226	-17856.4583
BANK	25.7446	1715.4116			
LOOSE	25.7446	1715.4116			
-20.00					
10.7211 ft2 Cut Area	BANK		249.6090	19795.7342	-19546.1252
728.5611 ft2 Fill Area	LOOSE		249.6090	19795.7342	-19546.1252
BANK	26.3911	1498.6561			
LOOSE	26.3911	1498.6561			
-80.00					
13.0309 ft2 Cut Area	BANK		276.0000	21294.3903	-21018.3902
620.2293 ft2 Fill Area	LOOSE		276.0000	21294.3903	-21018.3902
BANK	68.2800	1498.0079			
LOOSE	68.2800	1498.0079			
40.00					
48.4211 ft2 Cut Area	BANK		344.2801	22792.3981	-22448.1181
727.9777 ft2 Fill Area	LOOSE		344.2801	22792.3981	-22448.1181
BANK	87.0577	1725.1923			
LOOSE	87.0577	1725.1923			
00.00					
29.9308 ft2 Cut Area	BANK		431.3377	24517.5904	-24086.2527
824.6953 ft2 Fill Area	LOOSE		431.3377	24517.5904	-24086.2527
BANK	54.3342	1877.7419			
LOOSE	54.3342	1877.7419			
+60.00					
18.9700 ft2 Cut Area	BANK		485.6719	26395.3323	-25909.6604
865.2724 ft2 Fill Area	LOOSE		485.6719	26395.3323	-25909.6604
BANK	42.2602	1386.3149			
LOOSE	42.2602	1386.3149			
0+20.00					
19.0642 ft2 Cut Area	BANK		527.9321	27781.6473	-27253.7152
382.4111 ft2 Fill Area	LOOSE		527.9321	27781.6473	-27253.7152
BANK	72.5507	455.2444			
LOOSE	72.5507	455.2444			
5.00					
52.1674 ft2 Cut Area	BANK		600.4828	28236.8916	-27636.4088
64.5561 ft2 Fill Area	LOOSE		600.4828	28236.8916	-27636.4088

BANK	12.7717	6.2303
LOOSE	12.7717	6.2303

10+80.00

85.7665 ft2 Cut Area	BANK	613.2545	28243.1219	-27629.8674
2.7309 ft2 Fill Area	LOOSE	613.2545	28243.1219	-27629.8674

==

TOTALS FOR STATION 0+00.00 THRU 10+80.00

	CUT	FILL	NET
BANK	~~613.2545~~	28243.1219	~~-27629.8674~~
LOOSE	~~613.2545~~	28243.1219	~~-27629.8674~~

OF ERRORS : 0
OF WARNINGS: 0

APPENDIX D

Pertinent Sections of Regulations

DIVISION 50

LAND APPLICATION OF DOMESTIC WASTEWATER TREATMENT FACILITY BIOSOLIDS, BIOSOLIDS DERIVED PRODUCTS, AND DOMESTIC SEPTAGE

340-050-0005
Purpose

(1) It is the purpose of these rules and best management practices to protect the environment and public health in Oregon by prescribing the methods, procedures and restrictions required for the safe handling and use of domestic wastewater treatment facility solids, biosolids, biosolids derived products, and domestic septage. These rules implement a program for biosolids and domestic septage management which satisfies or exceeds minimum federal regulations pertaining to land application.

(2) Industrial process water solids, agricultural wastes and sewerage waste water are not included in these rules.

Stat. Auth.: ORS Ch. 468
Stats. Implemented: ORS 468B
Hist.: DEQ 15-1984, f. & cert. ef. 8-21-84

340-050-0006
Policy

The Environmental Quality Commission (EQC) encourages the land application of treated domestic wastewater biosolids, biosolids derived products, and domestic septage which are managed in a manner which protects the public health and maintains or improves environmental quality. These beneficial recyclable materials improve soil tilth, fertility, and stability and their use enhances the growth of agricultural, silvicultural, and horticultural crops.

Stat. Auth.: ORS 459.045, 468.020 & 468B.095
Stats. Implemented: ORS 468.020 & 468B.095
Hist.: DEQ 18-1995, f. & cert. ef. 7-20-95

340-050-0010
Definitions

Unless otherwise indicated in this Division, definitions appearing under federal regulations **40 CFR §503.11, and §503.31** shall apply. In addition, as used in these rules, unless defferently required by context, the following definitions apply:

(1) "Agronomic Application Rate" means a rate of biosolids or domestic septage application which matches nutrient requirements for specific crop on an annual basis.

(2) "Beneficial Use Site" means any Department approved site for application of a regulated amount of biosolids or domestic septage used for crop or livestock production, soil reclamation and stabilization, or soil improvement. Application rates and site management practices shall assure continued agricultural, horticultural or silvicultural production and shall not lead to a temporary or long-term reduction in site productivity.

(3) "Biosolids" means solids derived from primary, secondary, or advanced treatment of domestic wastewater which have been treated through one or more controlled processes that significantly reduce pathogens and reduce volatile solids or chemically stabilize solids to the extent that they do not attract vectors. This term refers to domestic wastewater treatment facility solids that have undergone adequate treatment to permit their land application. This term has the same meaning as the term "sludge" in ORS 468B.095, and the term "sewage sludge" found elsewhere in OAR Chapter 340.

(4) "Biosolids Derived Products" means materials derived from composting domestic wastewater treatment facility solids or other processes, such as thermal drying, which result in a material which meets pollutant concentrations in **40 CFR §503.13(b)(3)**, the Class A pathogen requirements in **40 CFR §503.33(b)(1) to §503.33(b)(8)**. Biosolids derived products also include any soil amendments which, in part, contain biosolids meeting these criteria. Biosolids derived products are acceptable for distribution to the general public for immediate use.

(5) "Chemical Treatment" means the process of mixing lime or other chemicals with domestic wastewater solids or domestic septage to reduce the number of pathogens or amount of putrescible matter.

(6) "Composting" means a process by which domestic wastewater treatment facility solids, biosolids, or septage are mixed with carbonaceous material and aerated with controlled elevated temperatures to promote rapid decomposition and ultimate stabilization as well as pathogen reduction.

(7) "Controlled Access" means that public entry or traffic is unlikely, for example agricultural land that is privately owned. Parks or other public land may require fencing to ensure controlled access.

(8) "Domestic Wastewater Treatment Facility Solids" means the accumulated suspended and settleable solids of domestic wastewater, deposited in tanks or basins mixed with water to form a semi-liquid mass. Grit and

(a) Pollutant concentration and cumulative pollutant loading limits required under **40 CFR §503.13**. *(Note: not required for domestic septage.)*;

(b) One of the pathogen reduction standards established under **40 CFR §503.32**;

(c) One of the vector attraction reduction standards required under **40 CFR §503.33**; and

(d) Management practices required under **40 CFR §503.14 and 40 CFR §503.32(b)(5)**.

(3) In addition to meeting pollutant concentration and loading limits required under **40 CFR §503.13**, biosolids derived products must meet federal Class A pathogen reduction standards pursuant to **40 CFR §503.32(a)** and one of the vector attraction reduction standards required under **40 CFR §503.33(b)(1) through (8)**.

(4) Biosolids imports must meet the following criteria;

(a) **40 CFR §503.13(b)(1), Table 1** pollutant ceiling concentration limits;

(b) One of the **40 CFR §503.32(b)** Class B pathogen reduction standards;

(c) One of the **40 CFR §503.33(b)(1) through (8)** vector attraction reduction standards;

(d) Minimum biosolids quality requirements of the County, State, or Regional government where they are produced; and

(e) They must be applied within beneficial use (agronomic) rates.

(5) Prior to land application, domestic septage shall be screened to ensure the removal of hair, plastics, and other coarse materials. Screenings shall be disposed at a permitted solid waste landfill. Further, septage shall undergo the following additional treatment prior to land application:

(a) Domestic septic tank pumpings: The pH of the domestic septage shall be increased by introducing and actively mixing sufficient alkaline agent to elevate the pH to 12 or higher (without further addition of alkaline agent) for a minimum period of 30 minutes.

(b) Domestic holding tank, chemical toilet, and vault toilet pumpings:

(A) Prior to alkaline stabilization, domestic holding tank, chemical toilet, or vault toilet pumpings shall be mixed with domestic septic tank pumpings at a ratio of at least three gallons septic tank pumpings per gallon holding tank, vault toilet, or chemical toilet pumpings.

(B) The pH of blended domestic septage shall be increased to 12 or more by introducing and actively mixing sufficient alkaline agent to elevate the pH to 12 or more (without further addition of alkaline agent) for minimum period of 2 hours. At the end of the active mixing process, the domestic septage-alkaline agent mixture shall be allowed to further react for at least 22 additional hours. At the end of the 22-hours reaction process, the pH of the domestic septage-alkaline agent mixture shall be at least 11.5.

(6) When biosolids will be applied above normal agronomic rates for the purpose of land reclamation, the Department may require that an evaluation for potential groundwater quality impacts be conducted in accordance with OAR Chapter 340, Division 40. If the Department determines the application rate proposed could cause an adverse impact on groundwater quality, a groundwater quality protection program shall be required pursuant to OAR 340-040-0030.

Stat. Auth.: ORS 459.045, 468.020 & 468B.095
Stats. Implemented: ORS 459.020, 468B.035 & 468B.095
Hist.: DEQ 18-1995, f. & cert. ef. 7-20-95

340-050-0030
Biosolids and Domestic Septage Land Application Site Selection and Approval

(1) Prior approval must be obtained in writing from the Department for the land application of biosolids or domestic septage on beneficial use sites or disposal sites.

(2) Prior to approval of any proposed site that may be sensitive with respect to residential housing, runoff potential or threat to groundwater, the Department shall ensure that an opportunity is provided for public comment and, if required as noted in (a) below, public hearing.

(a) If, during the public comment period, at least 10 people, or an organization representing at least 10 people, indicate concerns about the proposed action, then opportunity shall be provided for public hearing.

(b) The Department shall take final action on site authori-zation within 30 days of the closure of the public comment period, or 30 days of the closure of the hearing's record.

(3) Land application site authorization letters are considered an integral part of the biosolids or domestic septage management plan. Provisions specified by the Department in site authorization letters, in accordance with a Department approved biosolids or domestic septage management plan, shall be considered enforceable conditions under the permitted source's NPDES, WPCF, or Solid Waste Disposal permit.

Stat. Auth.: ORS Ch. 468
Stats. Implemented: ORS 468B.095
Hist.: DEQ 15-1984, f. & ef. 8-21-84; DEQ 18-1995, f. & cert. ef. 7-20-95

340-050-0031
Biosolids and Domestic Septage Management Plans

340-050-0035
Monitoring Recordkeeping and Reporting

(1) The permittee shall provide the Department with biosolids analyses and maintain a log indicating the quantity, quality, and location of biosolids applied to Department approved sites. The site application log shall become a condition of the site authorization letter and must be available for Department review during the life of the application site. Site logs shall be maintained as part of the permittee's permanent records.

(2)(a) Biosolids analyses shall be performed on a representative sample and shall include but not be limited to, all pollutants listed in **40 CFR §503.13(b)(3) Table 1** and the following:

(F) Total Kjeldahl Nitrogen (TKN) —% dry weight;
(G) Nitrate Nitrogen (NO_3-N) —% dry weight;
(H) Ammonium Nitrogen (NH_4-N) —%dry weight;
(I) Total Phosphorous (P) —$ dry weight;
(J) Potassium (K) — % dry weight;
(K) pH — standard units;
(L) Total Solids — % dry weight;
(M) Volatile Solids — % dry weight.

(b) All tests shall be performed using sampling and analytical methods established under **40 CFR §503.8**; the Environmental Protection Agency's (EPA) *POTW Sludge Sampling and Analysis Attraction in Sewage Sludge* (EPA/625/R-52/013) guidance (1992), and EPA's POTW *Sludge Sampling Procedures and Protocols for the National Sewage Sludge Survey*(1989)document.

(c) Sampling locations and frequency shall be representative of the quality and quantity of biosolids generated, but in no case, unless otherwise authorized in writing by the Department, less frequent than required under **40 CFR §503.16, Table 1.**

(3) Recordkeeping requirements shall conform to **40 CFR §503.17.**

(4) Domestic Wastewater Treatment Facilities that produce biosolids with one or more trace pollutants whose annual average pollutant concentration exceeds **40 CFR §503.13(b)(3)** limits (based on a 95 percent confidence interval), shall track cumulative pollutant loading pursuant to **40 CFR §503.13(b)(2), Table 2** and maintain records adequate to demonstrate that pollutant additions do not exceed **Table 2** limits.

(5) Unless otherwise required by the Department, the quality and quantity of biosolids and land application actions shall be reported to the Department at least once annually. The Department may require more frequent reporting on biosolids production, treatment, characteristics, and land application activities. Monthly reporting is not required where exceptional quality biosolids are land applied.

(6) Annually, by February 19, each domestic NPDES, WPCF, and Solid Waste permitted source that has generated and land applied bulk biosolids or domestic septage, or prepared biosolids or biosolids derived products for distribution and marketing during the prior year, shall provide the Department with a comprehensive report that describes solids handling activities for the previous year. At a minimum, the report shall include, but is not limited to:

(a) Data, on each site that received solids, which is adequate to characterize solids quality and to demonstrate that solids were applied within agronomic loading rates and other required site management practices.

(b) Sources generating and applying biosolids that are required to track cumulative pollutant additions pursuant to **40 CFR §503.13(b)(2), Table 2**, shall also be required to submit information on annual and cumulative pollutant additions;

(c) Information sufficient to demonstrate that solids met pathogen reduction requirements required under **40 CFR §503.32** and vector attraction reduction standards required under **40 CFR §503.33**;

(d) Information describing any substantive modifications to solids handling or land application site management practices;

(e) A detailed description of any violation of **40 CFR §503** or OAR Chapter 340, Division 50 and remedial actions taken to prevent the recurrence of similar violations in the future.

(7) Annually, as a requirement of license renewal, sewage disposal service businesses shall submit information adequate to characterize solids handling activities which occurred during the previous licensing period. Information must include data describing the quantities and varieties of septages handled and locations where solids are used and disposed.

Stat. Auth.: ORS Ch. 468
Stats. Implemented: ORS 468B.035 & 468B.095
Hist.: DEQ 15-1984, f. & ef. 8-21-84; DEQ 18-1995, f. & cert. ef. 7-20-95

Best Management Practices for Site Selection and the Use and Application of Bulk Biosolids and Domestic Septage

340-050-0060

(a) A buffer strip large enough to prevent nuisance odors or wind drift is needed. Size of the buffer strip will be determined by the Department on a case-by-case basis and depend upon the method of application used, total solids content, and proximity to sensitive areas, for example:

(A) Direct injection: no limit required;

(B) Truck spreading (liquid): 0 to 200 feet;

(C) Spray irrigation: 50 to 500 feet;

(D) Cake or dried solids: 0 to 50 feet.

(b) Buffer strips should be provided along well traveled highways. The size of the buffer strip will vary with local conditions and should be left to the discretion of the Department field representative.

(c) No bulk Class B biosolids or domestic septage should be spread at the site closer than 50 feet to any ditch, channel, pond or waterway or within 200 feet of a domestic water source or well.

Stat. Auth.: ORS Ch. 468
Stats. Implemented: ORS 468B.095
~~Hist.: DEQ 15-1984, f. & ef. 8-21-84; DEQ 18-1995, f. & cert. ef.~~ 7-20-95

340-050-0080

Application of Biosolids and Domestic Septage

(1) Biosolids analyses offer a guide to determine the annual application rate for a particular crop; ascertain whether cumulative pollutant tracking is required; and establish that solids are sufficiently stable to comply with pathogen and vector attraction reduction standards required under **40 CFR §503.32 and 40 CFR §503.33**, respectively.

(2) The application of biosolids or domestic septage on agricultural land should be managed to utilize the fertilizer and organic matter value to the maximum extent possible. The recommended rate of biosolids or domestic septage application is normally based on the nitrogen requirement of the crop grown and will vary depending on the nitrogen content of the solids.

(3) Crop nitrogen requirements are used routinely to determine application rates for commercial fertilizer and these figures are readily available from state or county Extension Service offices. Applying biosolids and domestic septage within these limits helps ensure that solids nitrogen will be utilized for plant growth and that excess nitrogen which could leach into groundwater will not be of concern.

(4) Exceeding crop nitrogen requirements may occasionally be justified on a temporary basis in order to achieve rapid soil improvement or to prolong beneficial effects. Biosolids applications exceeding normal crop nitrogen requirements may be approved on a case-by-case basis for reclamation or soil improvement, if justification for a single high rate application is provided to the Department.

(a) Where a site has previously been amended with biosolids at soil improvement or reclamation rates, documentation of background soil nitrate-nitrogen (NO_3-N) shall be submitted for Department approval prior to the application of additional biosolids;

(b) Soil samples shall be collected and tested according to protocols published by Oregon State University and the American Society of Agronomy.

(5) Sites proposed for routine annual application at agronomic rates must periodically be assessed to determine the impact of nitrogen from biosolids and other sources.

(a) The criteria for requiring evaluation or performance monitoring [e.g., soil testing for carry-over nitrate-nitrogen (NO_3-N)] will be biosolids applicatoins exceeding 2 out of 3 successive years at agronomic rates;

(b) Soil samples shall be collected and tested according to protocols published by Oregon State University and the American Society of Agronomy.

Stat. Auth.: ORS Ch. 468
Stats. Implemented: ORS 468B.095
~~Hist.: DEQ 15-1984, f. & ef. 8-21-84; DEQ 18-1995, f. & cert. ef. 7-20-95~~

Part 503 - Standards for the Use or Disposal of Sewage Sludge

(c) All other requirements for frequency of monitoring, recordkeeping, and reporting in this part are effective on July 20, 1993.

§503.3 Permits and direct enforceability.

(a) Permits. The requirements in this part may be implemented through a permit:

(1) Issued to a "treatment works treating domestic sewage", as defined in 40 CFR 122.2, in accordance with 40 CFR parts 122 and 124 by EPA or by a State that has a State sludge management program approved by EPA in accordance with 40 CFR part 123 or 40 CFR part 501 or

(2) Issued under subtitle C of the Solid Waste Disposal Act; part C of the Safe Drinking Water Act; the Marine Protection, Research, and Sanctuaries Act of 1972; or the Clean Air Act. "Treatment works treating domestic sewage" shall submit a permit application in accordance with either 40 CFR 122.21 or an approved State program.

(b) Direct enforceability. No person shall use or dispose of sewage sludge through any practice for which requirements are established in this part except in accordance with such requirements.

§503.4 Relationship to other regulations.

Disposal of sewage sludge in a municipal solid waste landfill unit, as defined in 40 CFR 258.2, that complies with the requirements in 40 CFR part 258 constitutes compliance with section 405(d) of the CWA. Any person who prepares sewage sludge that is disposed in a municipal solid waste landfill unit shall ensure that the sewage sludge meets the requirements in 40 CFR part 258 concerning the quality of materials disposed in a municipal solid waste landfill unit.

§503.5 Additional or more stringent requirements.

(a) On a case-by-case basis, the permitting authority may impose requirements for the use or disposal of sewage sludge in addition to or more stringent than the requirements in this part when necessary to protect public health and the environment from any adverse effect of a pollutant in the sewage sludge.

(b) Nothing in this part precludes a State or political subdivision thereof or interstate agency from imposing requirements for the use or disposal of sewage sludge more stringent than the requirements in this part or from imposing additional requirements for the use or disposal of sewage sludge.

§503.6 Exclusions.

(a) *Treatment processes.* This part does not establish requirements for processes used to treat domestic sewage or for processes used to treat sewage sludge prior to final use or disposal, except as provided in §503.32 and §503.33.

(b) *Selection of a use or disposal practice.* This part does not require the selection of a sewage sludge use or disposal practice. The determination of the manner in which sewage sludge is used or disposed is a local determination.

(c) *Co-firing of sewage sludge.* This part does not establish requirements for sewage sludge co-fired in an incinerator with other wastes or for the incinerator in which sewage sludge and other wastes are co-fired. Other wastes do not include auxiliary fuel, as defined in 40 CFR 503.41(b), fired in a sewage sludge incinerator.

(d) *Sludge generated at an industrial facility.* This part does not establish requirements for the use or disposal of sludge generated at an industrial facility during the treatment of industrial wastewater, including sewage sludge generated during the treatment of industrial wastewater combined with domestic sewage.

(e) *Hazardous sewage sludge.* This part does not establish requirements for the use or

North Capitol Street, NE., Washington, DC 20002 (Document Number 955-001-00000-1).

(5) *Salmonella sp. bacteria.* Part 9260 D., "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992, American Public Health Association, 1015 15th Street, NW., Washington, DC 20005; or

Kenner, B.A. and H.P. Clark, "Detection and enumeration of *Salmonella* and *Pseudomonas aeruginosa*", Journal of the Water Pollution Control Federation, Vol. 46, no. 9, September 1974, pp. 2163-2171. Water Environment Federation, 601 Wythe Street, Alexandria, Virginia 22314.

(6) *Specific oxygen uptake rate.* Part 2710 B., "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992, American Public Health Association, 1015 15th Street, NW., Washington, DC 20005.

(7) *Total, fixed, and volatile solids.* Part 2540 G., "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992, American Public Health Association, 1015 15th Street, NW., Washington, DC 20005.

§503.9 General definitions.

(a) *Apply sewage sludge or sewage sludge applied to the land* means land application of sewage sludge.

(b) *Base flood* is a flood that has a one percent chance of occurring in any given year (i.e., a flood with a magnitude equaled once in 100 years).

(c) *Class I sludge management facility* is any publicly owned treatment works (POTW), as defined in 40 CFR 501.2, required to have an approved pretreatment program under 40 CFR 403.8(a) (including any POTW located in a State that has elected to assume local program responsibilities pursuant to 40 CFR 403.10(e)) and any treatment works treating domestic sewage, as defined in 40 CFR 122.2, classified as a Class I sludge management facility by the EPA Regional Administrator, or, in the case of approved State programs, the Regional Administrator in conjunction with the State Director, because of the potential for its sewage sludge use or disposal practice to affect public health and the environment adversely.

(d) *Cover crop* is a small grain crop, such as oats, wheat, or barley, not grown for harvest.

(e) *CWA* means the Clean Water Act (formerly referred to as either the Federal Water Pollution Act or the Federal Water Pollution Control Act Amendments of 1972), Public Law 92-500, as amended by Public Law 95-217, Public Law 95-576, Public Law 96-483, Public Law 97-117, and Public Law 100-4.

(f) *Domestic septage* is either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant.

(g) *Domestic sewage* is waste and wastewater from humans or household operations that is discharged to or otherwise enters a treatment works.

(h) *Dry weight basis* means calculated on the basis of having been dried at 105 degrees Celsius until reaching a constant mass (i.e., essentially 100 percent solids content).

(i) *EPA* means the United States Environmental Protection Agency.

(j) *Feed crops* are crops produced primarily for consumption by animals.

(k) *Fiber crops* are crops such as flax and cotton.

(l) *Food crops* are crops consumed by humans. These include, but are not limited to, fruits, disposal. This includes, but is not limited to, thickening, stabilization, and dewatering of sewage sludge. This does not include storage of sewage sludge.

(aa) *Treatment works* is either a federally owned, publicly owned, or privately owned device or system used to treat (including recycle and reclaim) either domestic sewage or a combination of domestic sewage and industrial waste of a liquid nature.

(bb) *Wetlands* means those areas that are inundated or saturated by surface water or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Subpart B - Land Application

§503.10 Applicability.

(a) This subpart applies to any person who prepares sewage sludge that is applied to the land, to any person who applies sewage sludge to the land, to sewage sludge applied to the land, and to the land on which sewage sludge is applied.

(b)(1) *Bulk sewage sludge.* The general requirements in §503.12 and the management practices in §503.14 do not apply when bulk sewage sludge is applied to the land if the bulk sewage sludge meets the pollutant concentrations in §503.13(b)(3), the Class A pathogen requirements in §503.32(a), and one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8).

(2) The Regional Administrator of EPA or, in the case of a State with an approved sludge management program, the State Director, may apply any or all of the general requirements in §503.12 and the management practices in §503.14 to the bulk sewage sludge in §503.10(b)(1) on a case-by-case basis after determining that the general requirements or management practices are needed to protect public health and the environment from any reasonably anticipated adverse effect that may occur from any pollutant in the bulk sewage sludge.

(c)(1) The general requirements in §503.12 and the management practices in §503.14 do not apply when a bulk material derived from sewage sludge is applied to the land if the derived bulk material meets the pollutant concentrations in §503.13(b)(3), the Class A pathogen requirements in §503.32(a), and one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8).

(2) The Regional Administrator of EPA or, in the case of a State with an approved sludge management program, the State Director, may apply any or all of the general requirements in §503.12 or the management practices in §503.14 to the bulk material in §503.10(c)(1) on a case-by-case basis after determining that the general requirements or management practices are needed to protect public health and the environment from any reasonably anticipated adverse effect that may occur from any pollutant in the bulk sewage sludge.

(d) The requirements in this subpart do not apply when a bulk material derived from sewage sludge is applied to the land if the sewage sludge from which the bulk material is derived meets the pollutant concentrations in §503.13(b)(3), the Class A pathogen requirements in §503.32(a), and one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8).

(e) *Sewage sludge sold or given away in a bag or other container for application to the land.* The general requirements in §503.12 and the management practices in §503.14 do not apply when sewage sludge is sold or given away in a bag or other container for application to the land if the sewage sludge sold or given away in a bag or other container for application to the land meets the pollutant concentrations in §503.13(b)(3), the Class A pathogen requirements in §503.32(a), and one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8).

(f) The general requirements in §503.12 and the management practices in §503.14 do not apply when a material derived from sewage sludge is sold or given away in a bag or other container for application to the land if the derived material meets the pollutant concentrations in §503.13(b)(3), the Class A pathogen requirements in §503.32(a), and one of the vector

(b) No person shall apply bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) to agricultural land, forest, a public contact site, or a reclamation site if any of the cumulative pollutant loading rates in §503.13(b)(2) has been reached.

(c) No person shall apply domestic septage to agricultural land, forest, or a reclamation site during a 365 day period if the annual application rate in §503.13(c) has been reached during that period.

(d) The person who prepares bulk sewage sludge that is applied to agricultural land, forest, a public contact site, or a reclamation site shall provide the person who applies the bulk sewage sludge written notification of the concentration of total nitrogen (as N on a dry weight basis) in the bulk sewage sludge.

(e)(1) The person who applies sewage sludge to the land shall obtain information needed to comply with the requirements in this subpart.

(2)(i) Before bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13 (b)(2) is applied to the land, the person who proposes to apply the bulk sewage sludge shall contact the permitting authority for the State in which the bulk sewage sludge will be applied to determine whether bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) has been applied to the site since July 20, 1993.

(ii) If bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) has not been applied to the site since July 20, 1993, the cumulative amount for each pollutant listed in Table 2 of §503.13 may be applied to the site in accordance with §503.13(a)(2)(i).

(iii) If bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) has been applied to the site since July 20, 1993, and the cumulative amount of each pollutant applied to the site in the bulk sewage sludge since that date is known, the cumulative amount of each pollutant applied to the site shall be used to determine the additional amount of each pollutant that can be applied to the site in accordance with §503.13(a)(2)(i).

(iv) If bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) has been applied to the site since July 20, 1993, and the cumulative amount of each pollutant applied to the site in the bulk sewage sludge since that date is not known, an additional amount of each pollutant shall not be applied to the site in accordance with §503.13(a)(2)(i).

(f) When a person who prepares bulk sewage sludge provides the bulk sewage sludge to a person who applies the bulk sewage sludge to the land, the person who prepares the bulk sewage sludge shall provide the person who applies the sewage sludge notice and necessary information to comply with the requirements in this subpart.

(g) When a person who prepares sewage sludge provides the sewage sludge to another person who prepares the sewage sludge, the person who provides the sewage sludge shall provide the person who receives the sewage sludge notice and necessary information to comply with the requirements in this subpart.

(h) The person who applies bulk sewage sludge to the land shall provide the owner or lease holder of the land on which the bulk sewage sludge is applied notice and necessary information to comply with the requirements in this subpart.

(i) Any person who prepares bulk sewage sludge that is applied to land in a State other than the State in which the bulk sewage sludge is prepared shall provide written notice, prior to the initial application of bulk sewage sludge to the land application site by the applier, to the permitting authority for the State in which the bulk sewage sludge is proposed to be applied. The notice shall include:

(1) The location, by either street address or latitude and longitude, of each land application site.

(2) The approximate time period bulk sewage sludge will be applied to the site.

(3) The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) for the person who prepares the bulk sewage sludge.

Selenium	100
Zinc	7500

(2) Cumulative pollutant loading rates.

TABLE 2 OF §503.13.-CUMULATIVE POLLUTANT LOADING RATES

Pollutant	Cumulative Pollutant Loading Rate (Kilograms per Hectare)
Arsenic	41
Cadmium	39
Copper	1500
Lead	300
Mercury	17
Nickel	420
Selenium	100
Zinc	2800

(3) Pollutant concentrations.

TABLE 3 OF §503.13.-POLLUTANT CONCENTRATIONS

Pollutant	Monthly Average Concentration (Milligrams / Kilogram)[1]
Arsenic	41
Cadmium	39
Copper	1500
Lead	300
Mercury	17
Nickel	420
Selenium	100
Zinc	2800

[1]Dry weight basis.

(4) Annual pollutant loading rates.

TABLE 4 OF §503.13.-ANNUAL POLLUTANT LOADING RATES

Pollutant	Annual Pollutant Loading Rate (Kilograms per Hectare per 365 Day Period)
Arsenic	2.0
Cadmium	1.9
Copper	75
Lead	15
Mercury	0.85
Nickel	21
Selenium	5.0
Zinc	140

(3) The Class A pathogen requirements in §503.32(a) shall be met when sewage sludge is sold or given away in a bag or other container for application to the land.

(b) *Pathogens-domestic septage.* The requirements in either §503.32 (c)(1) or (c)(2) shall be met when domestic septage is applied to agricultural land, forest, or a reclamation site.

(c) *Vector attraction reduction-sewage sludge.* (1) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(10) shall be met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site.

(2) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) shall be met when bulk sewage sludge is applied to a lawn or a home garden.

(3) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) shall be met when sewage sludge is sold or given away in a bag or other container for application to the land.

(d) *Vector attraction reduction-domestic septage.* The vector attraction reduction requirements in §503.33(b)(9), (b)(10), or (b)(12) shall be met when domestic septage is applied to agricultural land, forest, or a reclamation site.

§503.16 Frequency of monitoring.

(a) *Sewage sludge.* (1) The frequency of monitoring for the pollutants listed in Table 1, Table 2, Table 3 and Table 4 of §503.13; the pathogen density requirements in §503.32(a) and in §503.32(b)(2) through (b)(4); and the vector attraction reduction requirements §503.33 (b)(1) through §503.33(b)(8) shall be the frequency in Table 1 of §503.16.

TABLE 1 OF §503.16. - Frequency of Monitoring - Land Application

Amount of Sewage Sludge[1] (Metric Tons per 365 Day Period)	Frequency
Greater than zero but less than 290	Once per year.
Equal to or greater than 290 but less than 1,500	Once per quarter (four times per year).
Equal to or greater than 1,500 but less than 15,000	Once per 60 days (six times per year).
Equal to or greater than 15,000	Once per month (12 times per year).

[1]Either the amount of bulk sewage sludge applied to the land or the amount of sewage sludge received by a person who prepares sewage sludge that is sold or given away in a bag or other container for application to the land (dry weight basis).

(2) After the sewage sludge has been monitored for two years at the frequency in Table 1 of §503.16, the permitting authority may reduce the frequency of monitoring for pollutant concentrations and for the pathogen density requirements in §503.32 (a)(5)(ii) and (a)(5)(iii), but in no case shall the frequency of monitoring be less than once per year when sewage sludge is applied to the land.

(b) *Domestic septage.* If either the pathogen requirements in §503.32(c)(2) or the vector attraction reduction requirements in §503.33(b)(12) are met when domestic septage is applied to agricultural land, forest, or a reclamation site, each container of domestic septage applied to the land shall be monitored for compliance with those requirements.

(Approved by the Office of Management and Budget under control number 2040-0157)

§503.17 Recordkeeping.

(a) *Sewage sludge.* (1) The person who prepares the sewage sludge in §503.10(b)(1) or (e) shall develop the following information and shall retain the information for five years:

(i) The concentration of each pollutant listed in Table 3 of §503.13 in the sewage sludge.

(A) The following certification statement:

"I certify, under penalty of law, that the management practices in §503.14 and the vector attraction reduction requirement in [insert either §503.33 (b)(9) or (b)(10)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practices and vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including fine and imprisonment."

(B) A description of how the management practices in §503.14 are met for each site on which bulk sewage sludge is applied.

(C) A description of how the vector attraction reduction requirements in either §503.33(b)(9) or (b)(10) are met for each site on which bulk sewage sludge is applied.

(4) If the pollutant concentrations in §503.13(b)(3) and the Class B pathogen requirements in §503.32(b) are met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site:

(i) The person who prepares the bulk sewage sludge shall develop the following information and shall retain the information for five years:

(A) The concentration of each pollutant listed in Table 3 of §503.13 in the bulk sewage sludge.

(B) The following certification statement:

"I certify under, penalty of law, that the Class B pathogen requirements in §503.32(b) and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) if one of those requirements is met] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements [and vector attraction reduction requirements if applicable] have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

(C) A description of how the Class B pathogen requirements in §503.32(b) are met.

(D) When one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) is met, a description of how the vector attraction reduction requirement is met.

(ii) The person who applies the bulk sewage sludge shall develop the following information and shall retain the information for five years.

(A) The following certification statement:

"I certify, under penalty of law, that the management practices in §503.14, the site restrictions in §503.32(b)(5), and the vector attraction reduction requirements in [insert either §503.33 (b)(9) or (b)(10), if one of those requirements is met] have been met for each site on which bulk sewage sludge is applied. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practices and site restrictions [and the vector attraction reduction requirements if applicable] have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

(B) A description of how the management practices in §503.14 are met for each site on which bulk sewage sludge is applied.

(C) A description of how the site restrictions in §503.32(b)(5) are met for each site on which bulk sewage sludge is applied.

false certification including fine and imprisonment."

(I) A description of how the management practices in §503.14 are met for each site on which bulk sewage sludge is applied.

(J) The following certification statement when the bulk sewage sludge meets the Class B pathogen requirements in §503.32(b):

"I certify, under penalty of law, that the site restrictions in §503.32(b)(5) have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the site restrictions have been met. I am aware that there are significant penalties for false certification including fine and imprisonment."

(K) A description of how the site restrictions in §503.32(b)(5) are met for each site on which Class B bulk sewage sludge is applied.

(L) The following certification statement when the vector attraction reduction requirement in either §503.33 (b)(9) or (b)(10) is met:

"I certify, under penalty of law, that the vector attraction reduction requirement in [insert either §503.33(b)(9) or §503.33(b)(10)] has been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the vector attraction reduction requirement has been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

(M) If the vector attraction reduction requirements in either §503.33 (b)(9) or (b)(10) are met, a description of how the requirements are met.

(6) If the requirements in §503.13(a)(4)(ii) are met when sewage sludge is sold or given away in a bag or other container for application to the land, the person who prepares the sewage sludge that is sold or given away in a bag or other container shall develop the following information and shall retain the information for five years:

(i) The annual whole sludge application rate for the sewage sludge that does not cause the annual pollutant loading rates in Table 4 of §503.13 to be exceeded.

(ii) The concentration of each pollutant listed in Table 4 of §503.13 in the sewage sludge.

(iii) The following certification statement:

"I certify, under penalty of law, that the management practice in §503.14(e), the Class A pathogen requirement in §503.32(a), and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practice, pathogen requirements, and vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

(iv) A description of how the Class A pathogen requirements in §503.32(a) are met.

(v) A description of how one of the vector attraction requirements in §503.33 (b)(1) through (b)(8) is met.

(b) *Domestic septage.* When domestic septage is applied to agricultural land, forest, or a reclamation site, the person who applies the domestic septage shall develop the following information and shall retain the information for five years:

(1) The location, by either street address or latitude and longitude, of each site on which domestic septage is applied.

(a) *Aerobic digestion* is the biochemical decomposition of organic matter in sewage sludge into carbon dioxide and water by microorganisms in the presence of air.

(b) *Anaerobic digestion* is the biochemical decomposition of organic matter in sewage sludge into methane gas and carbon dioxide by microorganisms in the absence of air.

(c) *Density of microorganisms* is the number of microorganisms per unit mass of total solids (dry weight) in the sewage sludge.

(d) *Land with a high potential for public exposure* is land that the public uses frequently. This includes, but is not limited to, a public contact site and a reclamation site located in a populated area (e.g. a construction site located in a city).

(e) *Land with a low potential for public exposure* is land that the public uses infrequently. This includes, but is not limited to, agricultural land, forest, and a reclamation site located in an unpopulated area (e.g., a strip mine located in a rural area).

(f) *Pathogenic organisms* are disease-causing organisms. These include, but are not limited to, certain bacteria, protozoa, viruses, and viable helminth ova.

(g) *pH* means the logarithm of the reciprocal of the hydrogen ion concentration.

(h) *Specific oxygen uptake rate (SOUR)* is the mass of oxygen consumed per unit time per unit mass of total solids (dry weight basis) in the sewage sludge.

(i) *Total solids* are the materials in sewage sludge that remain as residue when the sewage sludge is dried at 103 to 105 degrees Celsius.

(j) *Unstabilized solids* are organic materials in sewage sludge that have not been treated in either an aerobic or anaerobic treatment process.

(k) *Vector attraction* is the characteristic of sewage sludge that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents.

(l) *Volatile solids* is the amount of the total solids in sewage sludge lost when the sewage sludge is combusted at 550 degrees Celsius in the presence of excess air.

§503.32 Pathogens.

(a) *Sewage sludge-Class A.* (1) The requirement in §503.32(a)(2) and the requirements in either §503.32(a)(3), (a)(4), (a)(5), (a)(6), (a)(7), or (a)(8) shall be met for a sewage sludge to be classified Class A with respect to pathogens.

(2) The Class A pathogen requirements in §503.32 (a)(3) through (a)(8) shall be met either prior to meeting or at the same time the vector attraction reduction requirements in §503.33, except the vector attraction reduction requirements in §503.33 (b)(6) through (b)(8), are met.

(3) *Class A-Alternative 1.* (i) Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of *Salmonella* sp. bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10 (b), (c), (e), or (f).

(ii) The temperature of the sewage sludge that is used or disposed shall be maintained at a specific value for a period of time.

(A) When the percent solids of the sewage sludge is seven percent or higher, the temperature of the sewage sludge shall be 50 degrees Celsius or higher; the time period shall be 20 minutes or longer; and the temperature and time period shall be determined using equation (2), except when small particles of sewage sludge are heated by either warmed

(B) When the density of enteric viruses in the sewage sludge prior to pathogen treatment is less than one Plaque-forming Unit per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to enteric viruses until the next monitoring episode for the sewage sludge.

(C) When the density of enteric viruses in the sewage sludge prior to pathogen treatment is equal to or greater than one Plaque-forming Unit per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to enteric viruses when the density of enteric viruses in the sewage sludge after pathogen treatment is less than one Plaque-forming Unit per four grams of total solids (dry weight basis) and when the values or ranges of values for the operating parameters for the pathogen treatment process that produces the sewage sludge that meets the enteric virus density requirement are documented.

(D) After the enteric virus reduction in paragraph (a)(5)(ii)(C) of this section is demonstrated for the pathogen treatment process, the sewage sludge continues to be Class A with respect to enteric viruses when the values for the pathogen treatment process operating parameters are consistent with the values or ranges of values documented in paragraph (a)(5)(ii)(C) of this section.

(iii)(A) The sewage sludge shall be analyzed prior to pathogen treatment to determine whether the sewage sludge contains viable helminth ova.

(B) When the density of viable helminth ova in the sewage sludge prior to pathogen treatment is less than one per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to viable helminth ova until the next monitoring episode for the sewage sludge.

(C) When the density of viable helminth ova in the sewage sludge prior to pathogen treatment is equal to or greater than one per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to viable helminth ova when the density of viable helminth ova in the sewage sludge after pathogen treatment is less than one per four grams of total solids (dry weight basis) and when the values or ranges of values for the operating parameters for the pathogen treatment process that produces the sewage sludge that meets the viable helminth ova density requirement are documented.

(D) After the viable helminth ova reduction in paragraph (a)(5)(iii)(C) of this section is demonstrated for the pathogen treatment process, the sewage sludge continues to be Class A with respect to viable helminth ova when the values for the pathogen treatment process operating parameters are consistent with the values or ranges of values documented in paragraph (a)(5)(iii)(C) of this section.

(6) *Class A-Alternative 4.* (i) Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of *Salmonella* sp. bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10 (b), (c), (e), or (f).

(ii) The density of enteric viruses in the sewage sludge shall be less than one Plaque-forming Unit per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10 (b), (c), (e), or (f), unless otherwise specified by the permitting authority.

(iii) The density of viable helminth ova in the sewage sludge shall be less than one per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10 (b), (c), (e), or (f), unless otherwise specified by the permitting authority.

(7) *Class A-Alternative 5.* (i) Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the

high potential for public exposure or a lawn, unless otherwise specified by the permitting authority.

(vii) Public access to land with a high potential for public exposure shall be restricted for one year after application of sewage sludge.

(viii) Public access to land with a low potential for public exposure shall be restricted for 30 days after application of sewage sludge.

(c) *Domestic septage.* (1) The site restrictions in §503.32(b)(5) shall be met when domestic septage is applied to agricultural land, forest, or a reclamation site; or

(2) The pH of domestic septage applied to agricultural land, forest, or a reclamation site shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 30 minutes and the site restrictions in §503.32 (b)(5)(i) through (b)(5)(iv) shall be met.

§503.33 Vector attraction reduction.

(a)(1) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(10) shall be met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site.

(2) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) shall be met when bulk sewage sludge is applied to a lawn or a home garden.

(3) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8) shall be met when sewage sludge is sold or given away in a bag or other container for application to the land.

(4) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(11) shall be met when sewage sludge (other than domestic septage) is placed on an active sewage sludge unit.

(5) One of the vector attraction reduction requirements in §503.33 (b)(9), (b)(10), or (b)(12) shall be met when domestic septage is applied to agricultural land, forest, or a reclamation site and one of the vector attraction reduction requirements in §503.33 (b)(9) through (b)(12) shall be met when domestic septage is placed on an active sewage sludge unit.

(b)(1) The mass of volatile solids in the sewage sludge shall be reduced by a minimum of 38 percent (see calculation procedures in "Environmental Regulations and Technology-Control of Pathogens and Vector Attraction in Sewage Sludge", EPA-625/R-92/013, 1992, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268).

(2) When the 38 percent volatile solids reduction requirement in §503.33(b)(1) cannot be met for an anaerobically digested sewage sludge, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge anaerobically in the laboratory in a bench-scale unit for 40 additional days at a temperature between 30 and 37 degrees Celsius. When at the end of the 40 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 17 percent, vector attraction reduction is achieved.

(3) When the 38 percent volatile solids reduction requirement in §503.33(b)(1) cannot be met for an aerobically digested sewage sludge, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge that has a percent solids of two percent or less aerobically in the laboratory in a bench-scale unit for 30 additional days at 20 degrees Celsius. When at the end of the 30 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 15 percent, vector attraction reduction is achieved.

(4) The specific oxygen uptake rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5 milligrams of oxygen per hour per gram of total solids (dry weight basis) at a temperature of 20 degrees Celsius.

The relationship between the annual pollutant loading rate (APLR) for a pollutant and the annual whole sludge application rate (AWSAR) for 1a sewage sludge is shown in equation (1).

$$APLR = C \times AWSAR \times 0.001 \quad (1)$$

Where:

APLR=Annual pollutant loading rate in kilograms per hectare per 365 day period.

C=Pollutant concentration in milligrams, per kilogram of total solids (dry weight basis).

AWSAR=Annual whole sludge application rate in metric tons per hectare per 365 day period (dry weight basis).

0.001=A conversion factor.

To determine the AWSAR, equation (1) is rearranged into equation (2):

$$AWSAR = APLR \div C \times 0.001 \quad (2)$$

The procedure used to determine the AWSAR for a sewage sludge is presented below.

Procedure:

1. Analyze a sample of the sewage sludge to determine the concentration for each of the pollutants listed in Table 4 of §503.13 in the sewage sludge.

2. Using the pollutant concentrations from Step 1 and the APLRs from Table 4 of §503.13, calculate an AWSAR for each pollutant using equation (2) above.

3. The AWSAR for the sewage sludge is the lowest AWSAR calculated in Step 2.

Appendix B to Part 503 -

PATHOGEN TREATMENT PROCESSES

A. Processes to Significantly Reduce Pathogens (PSRP)

1. Aerobic digestion-Sewage sludge is agitated with air or oxygen to maintain aerobic conditions for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 40 days at 20 degrees Celsius and 60 days at 15 degrees Celsius.

2. Air drying-Sewage sludge is dried on sand beds or on paved or unpaved basins. The sewage sludge dries for a minimum of three months. During two of the three months, the ambient average daily temperature is above zero degrees Celsius.

3. Anaerobic digestion-Sewage sludge is treated in the absence of air for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 15 days at 35 to 55 degrees Celsius and 60 days at 20 degrees Celsius.

4. Composting-Using either the within-vessel, static aerated pile, or windrow composting methods, the temperature of the sewage sludge is raised to 40 degrees Celsius or higher and remains at 40 degrees Celsius or higher for five days. For four hours during the five days, the temperature in the compost pile exceeds 55 degrees Celsius.

CITY OF WARRENTON

BIOSOLIDS SITE AUTHORIZATION SUBMITTAL

February 2002

Prepared by:

LEE ENGINEERING, INC.
1300 John Adams Street
Oregon City, Oregon 97045
(503) 655-1342

LEI
LEE ENGINEERING, INC.
CONSULTING ENGINEERS
Civil • Structural • Environmental

February 27, 2002
Project No. 2873.010

Mr. Alan Johansson
City of Warrenton
P.O. Box 250
Warrenton, OR 97146

Re: Biosolids Management Report and Biosolids Site Authorization Submittal

Dear Mr. Johansson:

We are transmitting to you two copies of the Biosolids Management Plan and Biosolids Site Authorization Submittal. We recommend that both documents be forwarded to Bruce Hendersen for his review as soon as possible. We understand that his approval may be contingent upon DEQ receiving the facility plan being prepared by HLB but sending him the management plan now to see if any changes are required should expedite the approval process.

The Biosolids Site Submittal is not complete without a signed site management agreement with Mr. Nygaarg, Attachment 2, and documentation of public notice, Attachment 3. These attachments should be completed by the City and inserted in the document prior to final submittal.

Please call if you have any questions.

Sincerely,

LEE ENGINEERING, INC.

Michael J Dees

Michael J Dees, PE
Project Manager
Susan Foreman, E.I.

W/Encl.

P:\2873 - City of Warrenton - Biosolids Management Plan\Word Processing\Johansson.022702.doc

1300 John Adams Street • Oregon City, OR 97045 • office: 503.655.1342 • fax: 503.655.1360 • e-mail: general@lei-ce.com

CITY OF WARRENTON

BIOSOLIDS SITE AUTHORIZATION SUBMITTAL

REGISTERED PROFESSIONAL
ENGINEER
61321PE
OREGON
JULY 13, 1999
MICHAEL J. DEES

Expires: 12/31/03

February 2002

Prepared by:

LEE ENGINEERING, INC.
1300 John Adams Street
Oregon City, Oregon 97045
(503) 655-1342

CITY OF WARRENTON
BIOSOLIDS SITE AUTHORIZATION SUBMITTAL

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CITY OF WARRENTON
BIOSOLIDS SITE AUTHORIZATION SUBMITTAL

1. SITE DESCRIPTION

1.1 LOCATION

The City of Warrenton is applying for authorization to land apply biosolids to four sites located four to six miles from the sewage treatment lagoon. These sites consist of land that was previously forested and is currently used for pasture and hay. A general vicinity map, Drawing 1, is included to show location and transport routes from the sewage treatment lagoon.

The sites are delineated on tax lot maps provided by the City in Drawings 2 through 5. The tax lot, section number and street name are included on these maps with an indication of the gross area of the site and the net area available for biosolids application.

1.2 TOPOGRAPHY

Susan Foreman of Lee Engineering, Alan Johansson, Director of Public Works for the City of Warrenton, and Bruce Henderson of the Department of Environmental Quality (DEQ) conducted site visits on January 24 and February 1, 2002. During these visits, the overall suitability of the sites, the degree of saturation of the soil, and features unsuitable for application or requiring buffers were observed. The following list summarizes these features:

1. Streams, channelized surface water, ponds, ditches, and springs require a buffer of 50 feet.

2. Sudden changes in slope, embankments or escarpments require a buffer of 50 feet.

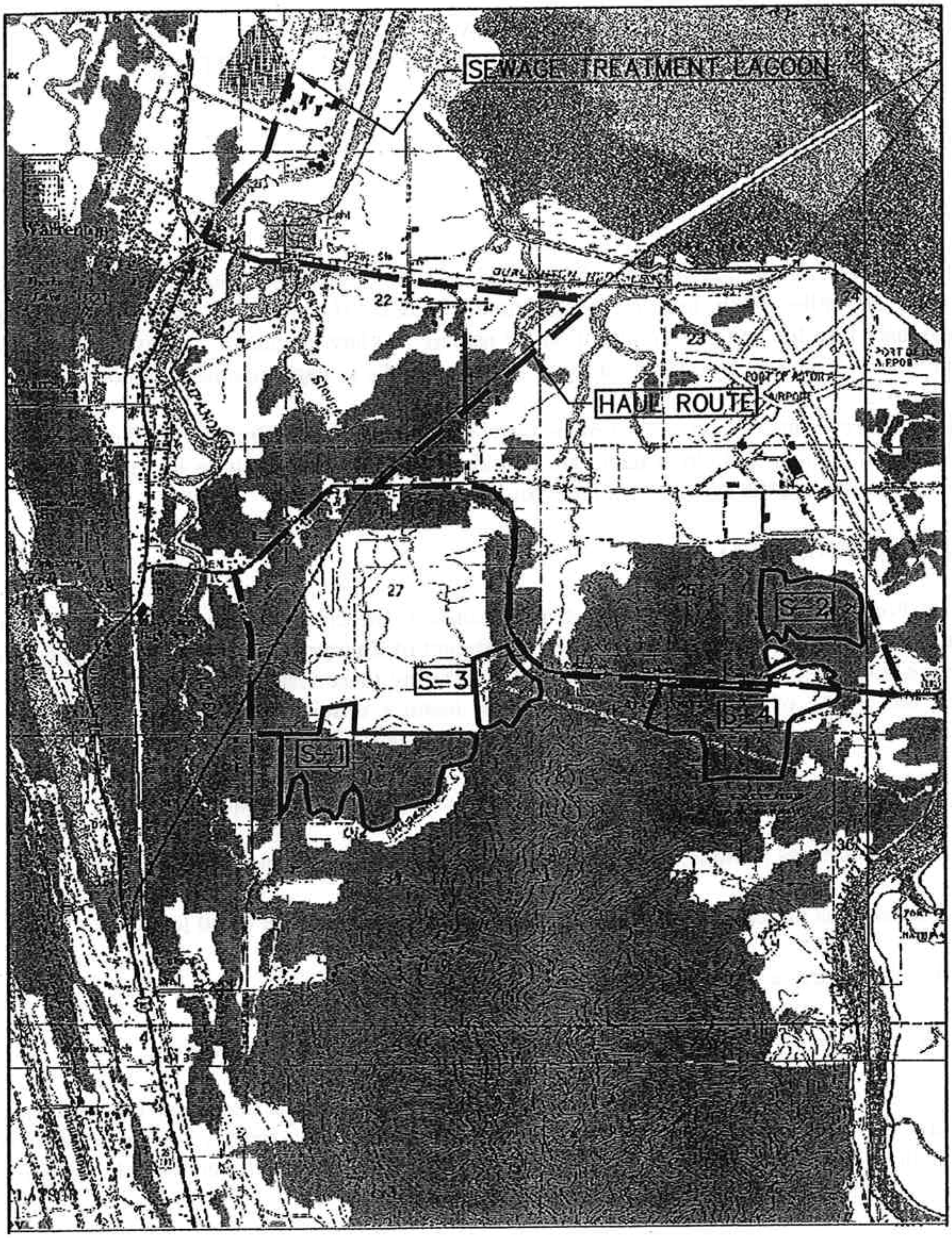
3. Wetlands, as indicated by massive tussock grass, require a buffer of 50 feet.

4. A well requires a buffer of 200 feet.

5. Any slopes greater than 15% are considered unsuitable for land application.

Subsequent field visits were made to create detailed maps of each site, Drawings 6 through 9. Features requiring buffers and oversteep slopes were mapped. The net acreage was calculated by subtracting areas not suitable for land application. The combined net available application acreage for all four sites is estimated to be 196 acres.

Site One is an area of pasture with access by a gate on SE Dolphin Ave. The site is over 200 ft. from any residences. Adjacent property owners are an ODOT maintenance station on the northern property line, and Pacific Corps (PP&L) on the western boundary. Since the buildings on both of these properties are set back from the fence line, a 50 ft. buffer is considered sufficient. The southern boundary of Site One parallels Old Skippanon Creek. There are numerous small surface water drainages and oversteep slope exclusions.



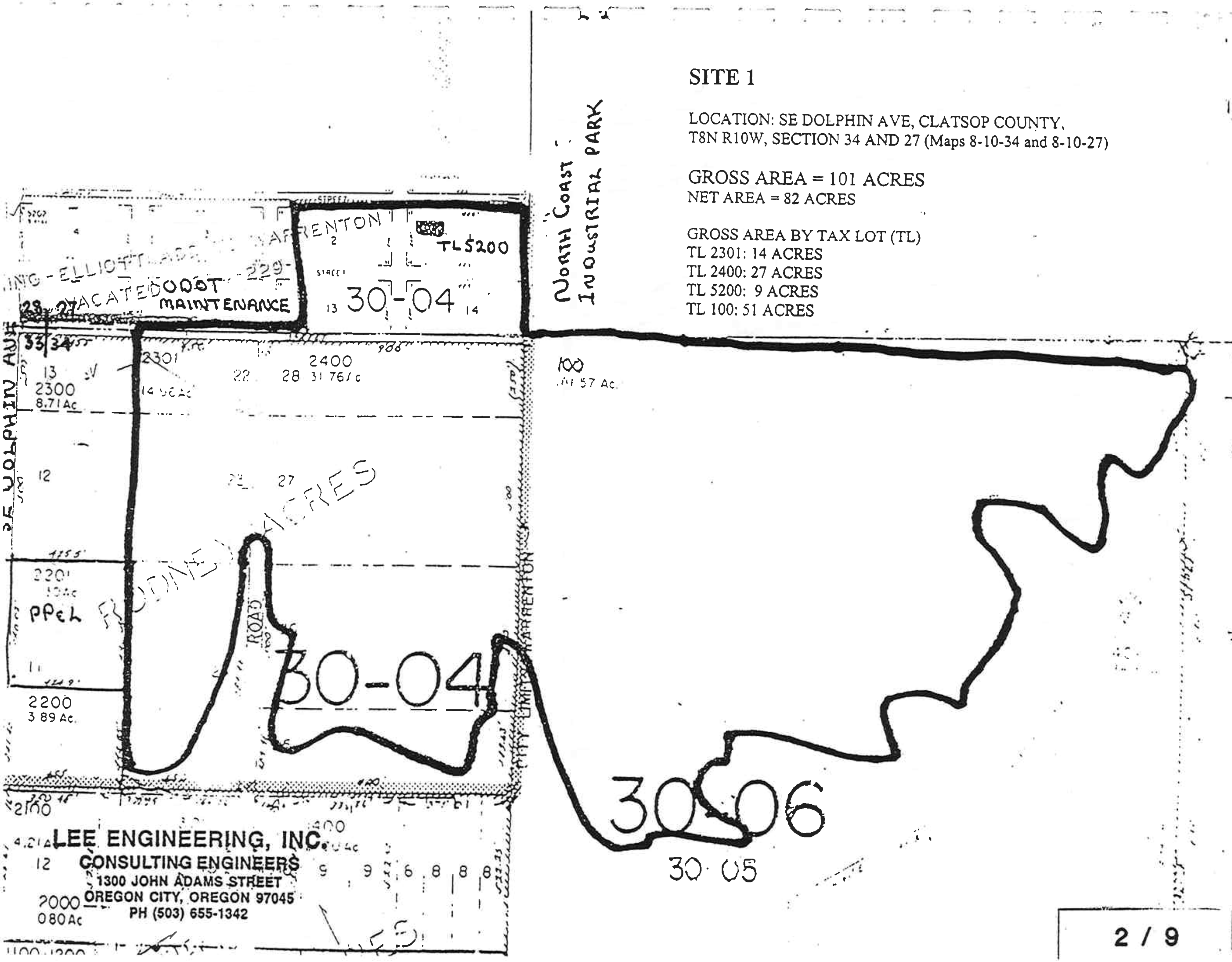
OWNER: CITY OF WARRENTON		LEE ENGINEERING, INC. 1300 JOHN ADAMS ST. OREGON CITY, OR, 97045	
DWG TITLE: BIOSOLIDS LAND APPLICATION SITES VICINITY MAP	DATE: 02/22/02 FILE NO: 2673VICINITY	REVISED:	1 / 9

SITE 1

LOCATION: SE DOLPHIN AVE, CLATSOP COUNTY, T8N R10W, SECTION 34 AND 27 (Maps 8-10-34 and 8-10-27)

GROSS AREA = 101 ACRES
NET AREA = 82 ACRES

GROSS AREA BY TAX LOT (TL)
TL 2301: 14 ACRES
TL 2400: 27 ACRES
TL 5200: 9 ACRES
TL 100: 51 ACRES



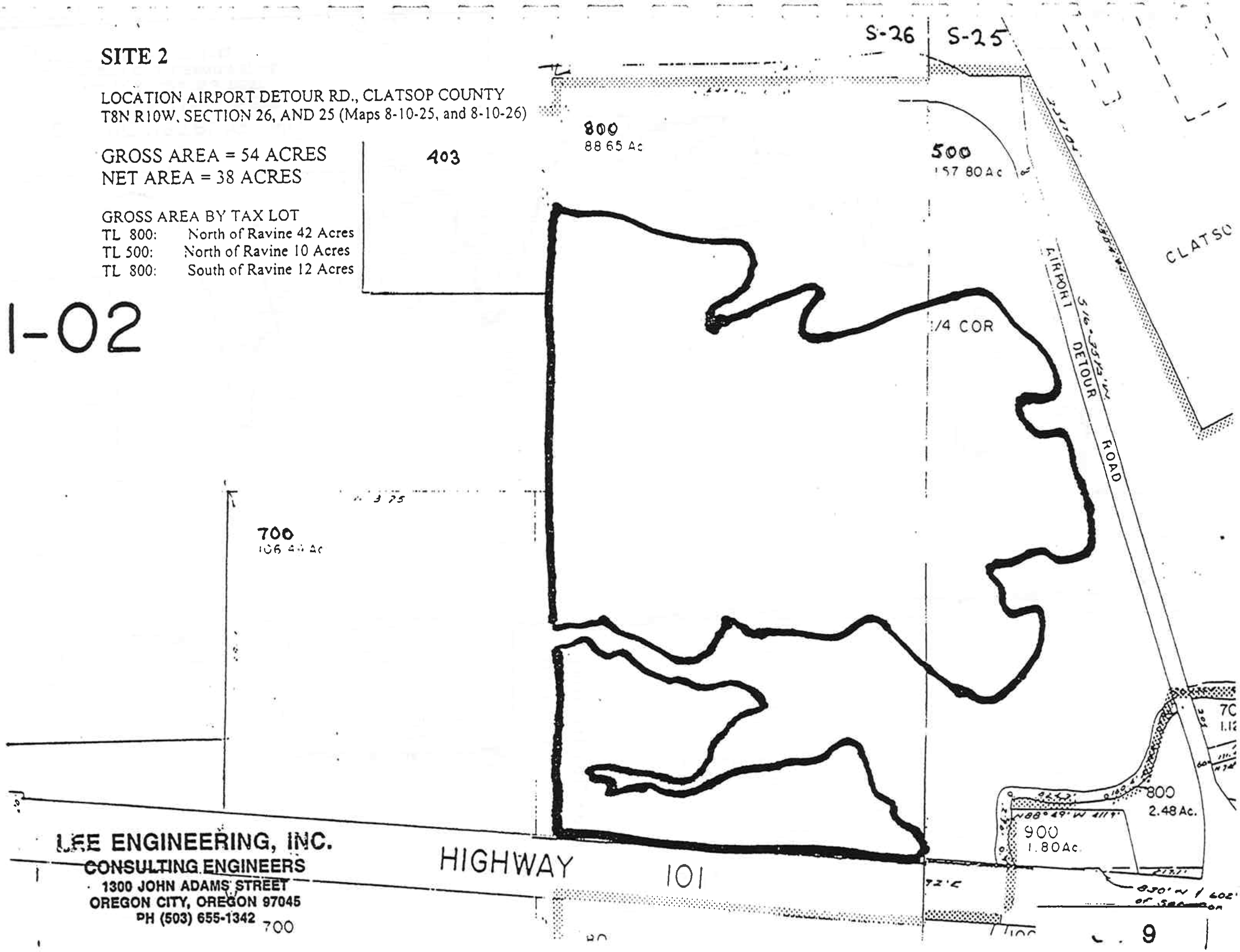
SITE 2

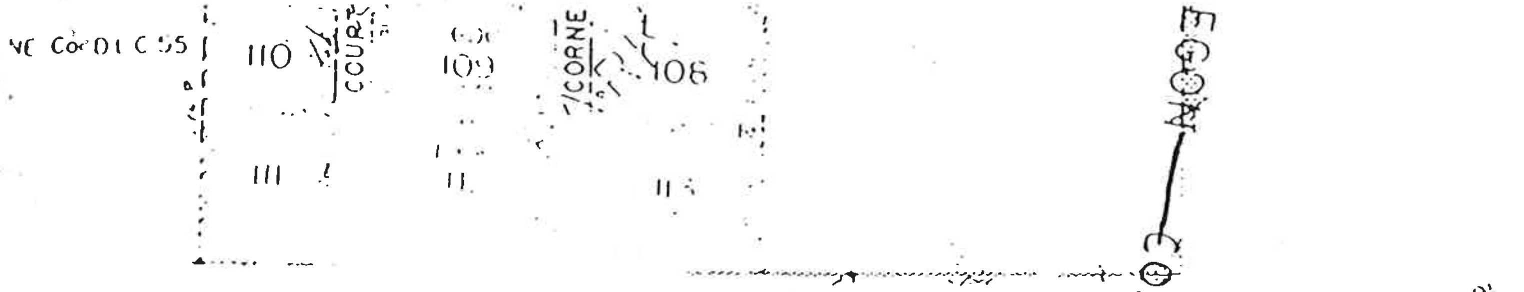
LOCATION AIRPORT DETOUR RD., CLATSOP COUNTY
T8N R10W, SECTION 26, AND 25 (Maps 8-10-25, and 8-10-26)

GROSS AREA = 54 ACRES
NET AREA = 38 ACRES

GROSS AREA BY TAX LOT
TL 800: North of Ravine 42 Acres
TL 500: North of Ravine 10 Acres
TL 800: South of Ravine 12 Acres

I-02





SITE 3

LOCATION: HWY 101, CLATSOP COUNTY
T8N R10W, SECTION 27 (Map 8-10-27)

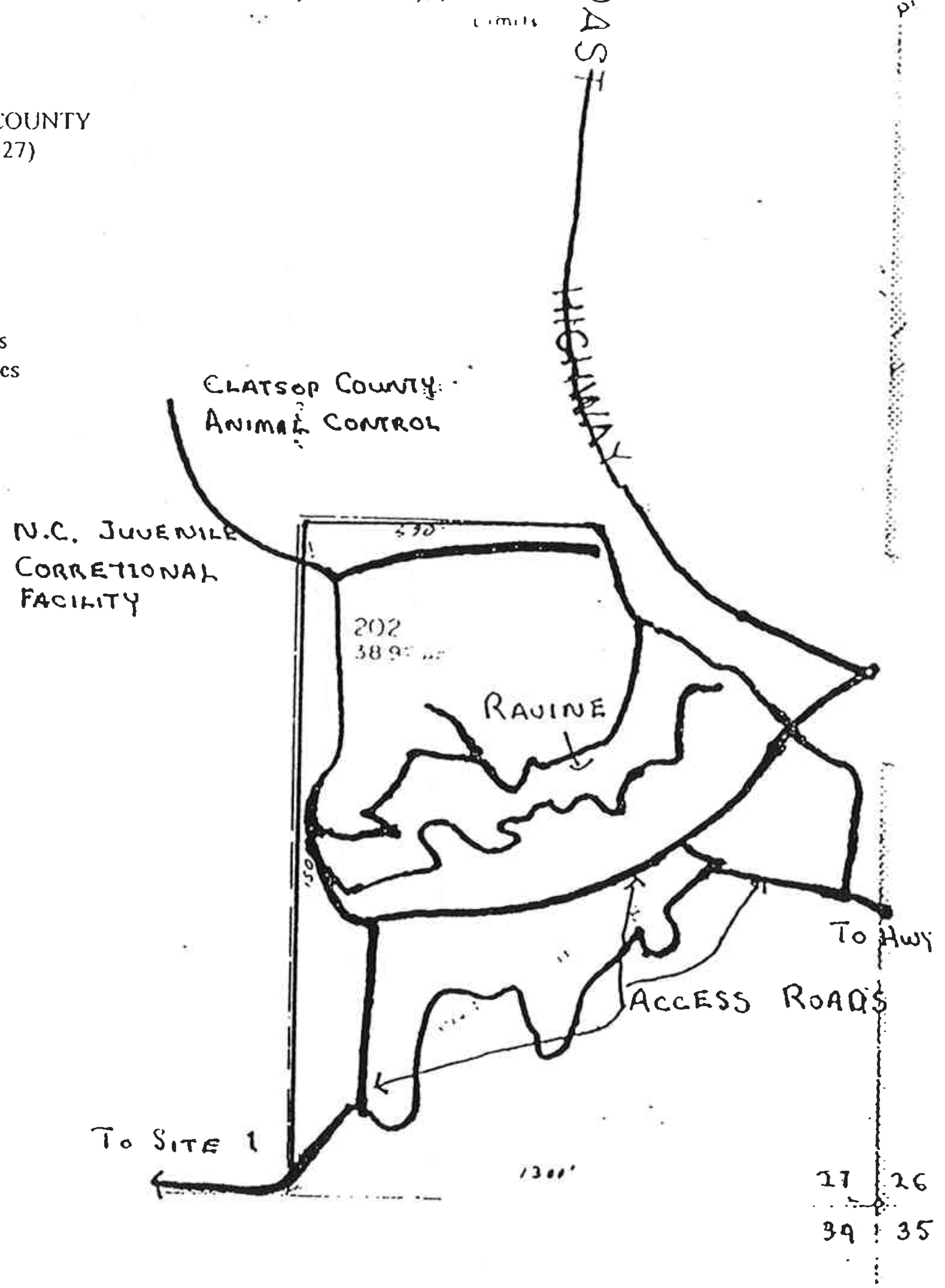
GROSS AREA = 21ACRES
NET AREA = 15 ACRES

GROSS AREA BY TAX LOT
TL 202: North of Ravine 9.5 Acres
TL 202: South of Ravine 11.5 Acres

30-05

N

1" = 400'



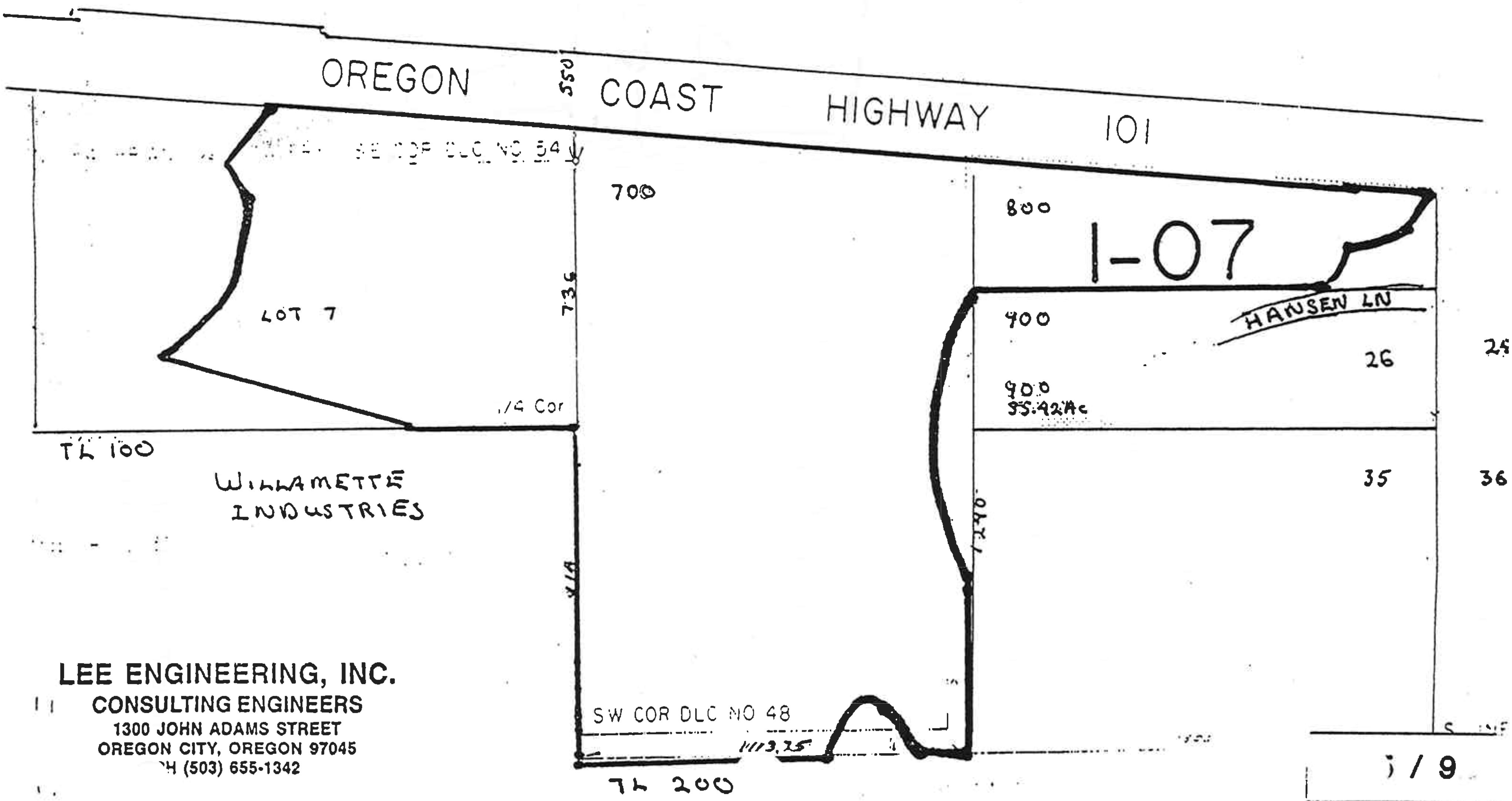
LEE ENGINEERING, INC.
CONSULTING ENGINEERS
1300 JOHN ADAMS STREET
OREGON CITY, OREGON 97045
PH (503) 655-1342

SITE 4

LOCATION HWY 101, CLATSOP COUNTY
T8N R10W, SECTION 26,AND 35 (Map 8-10-26)

GROSS AREA = 74 ACRES
NET AREA = 61 ACRES

GROSS AREA BY TAX LOT
TIL 700: 41 ACRES
TL7: 24 ACRES
TL 800: 9 ACRES



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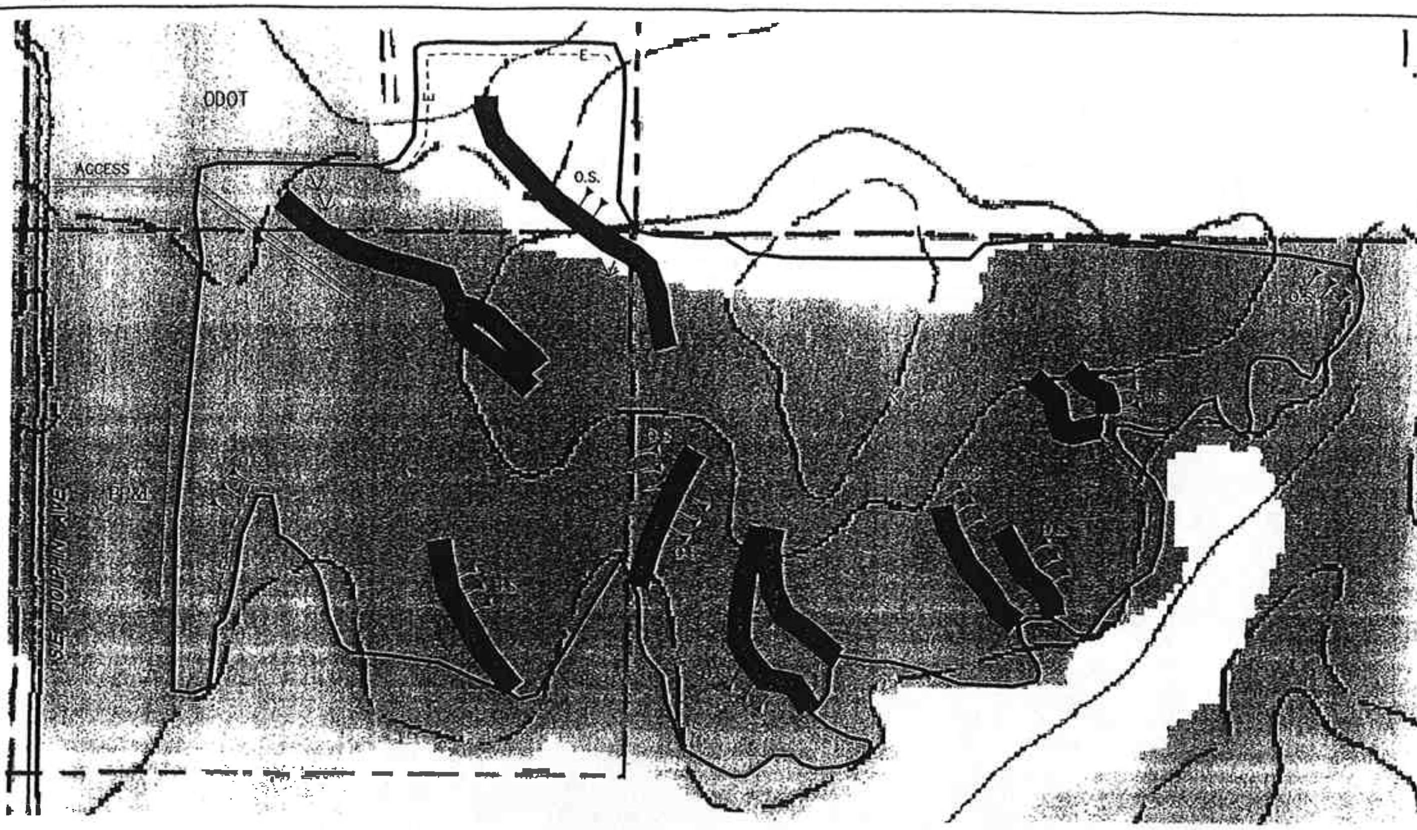


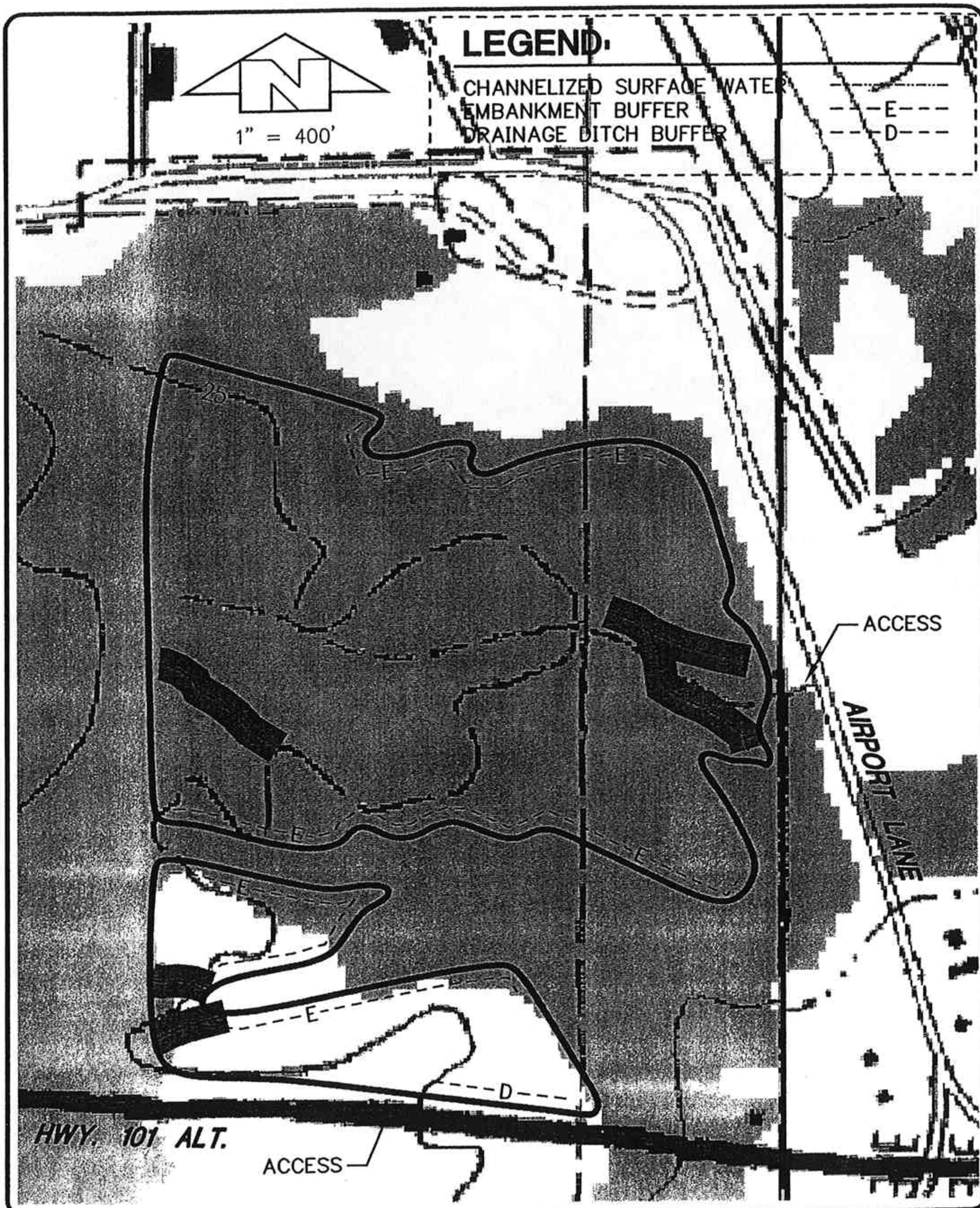
LEGEND:

CHANNELIZED SURFACE WATER	
EMBANKMENT BUFFER	---E---
OVERSTEEP SLOPES	O.S.
WETLANDS	

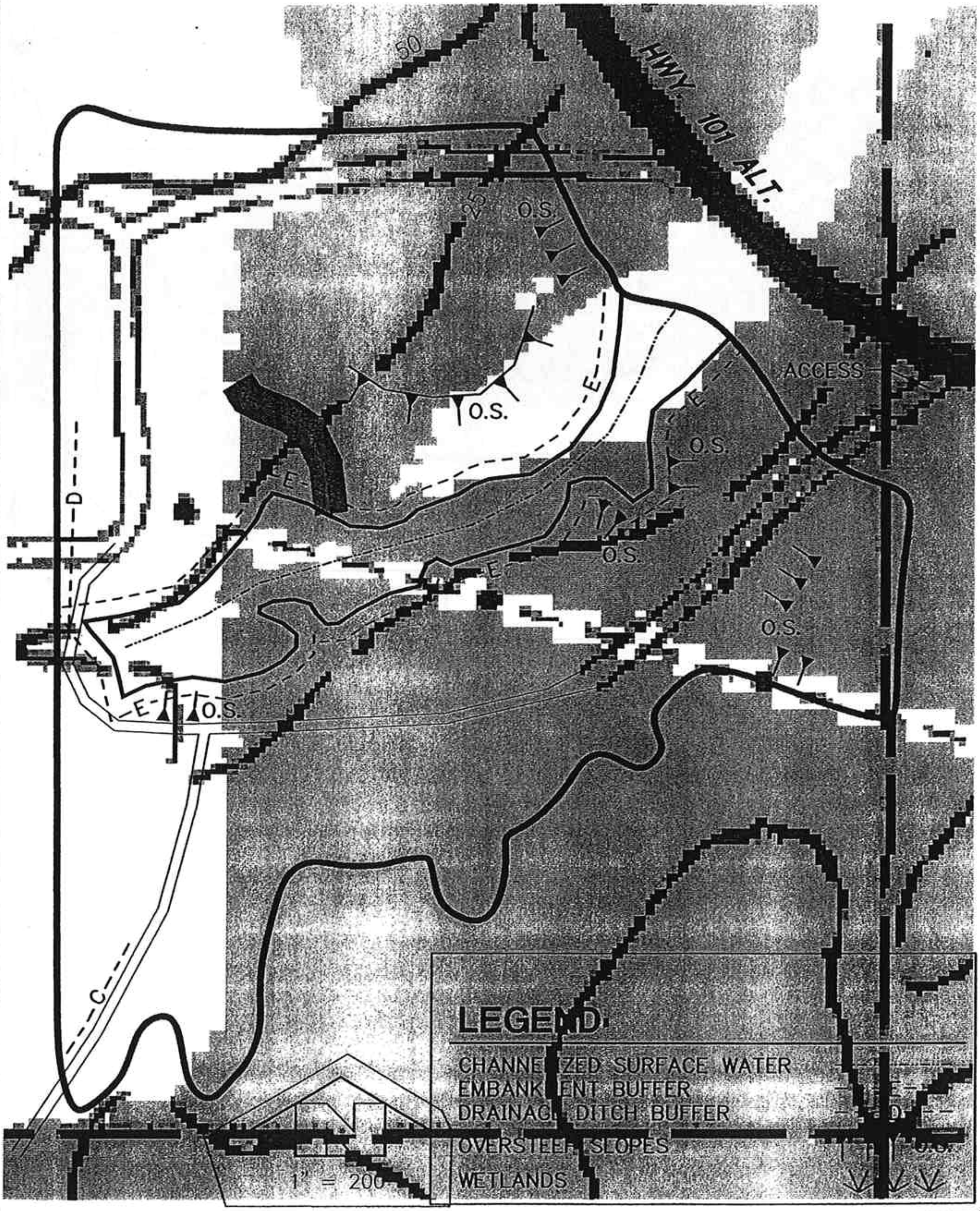
N

1" = 300'

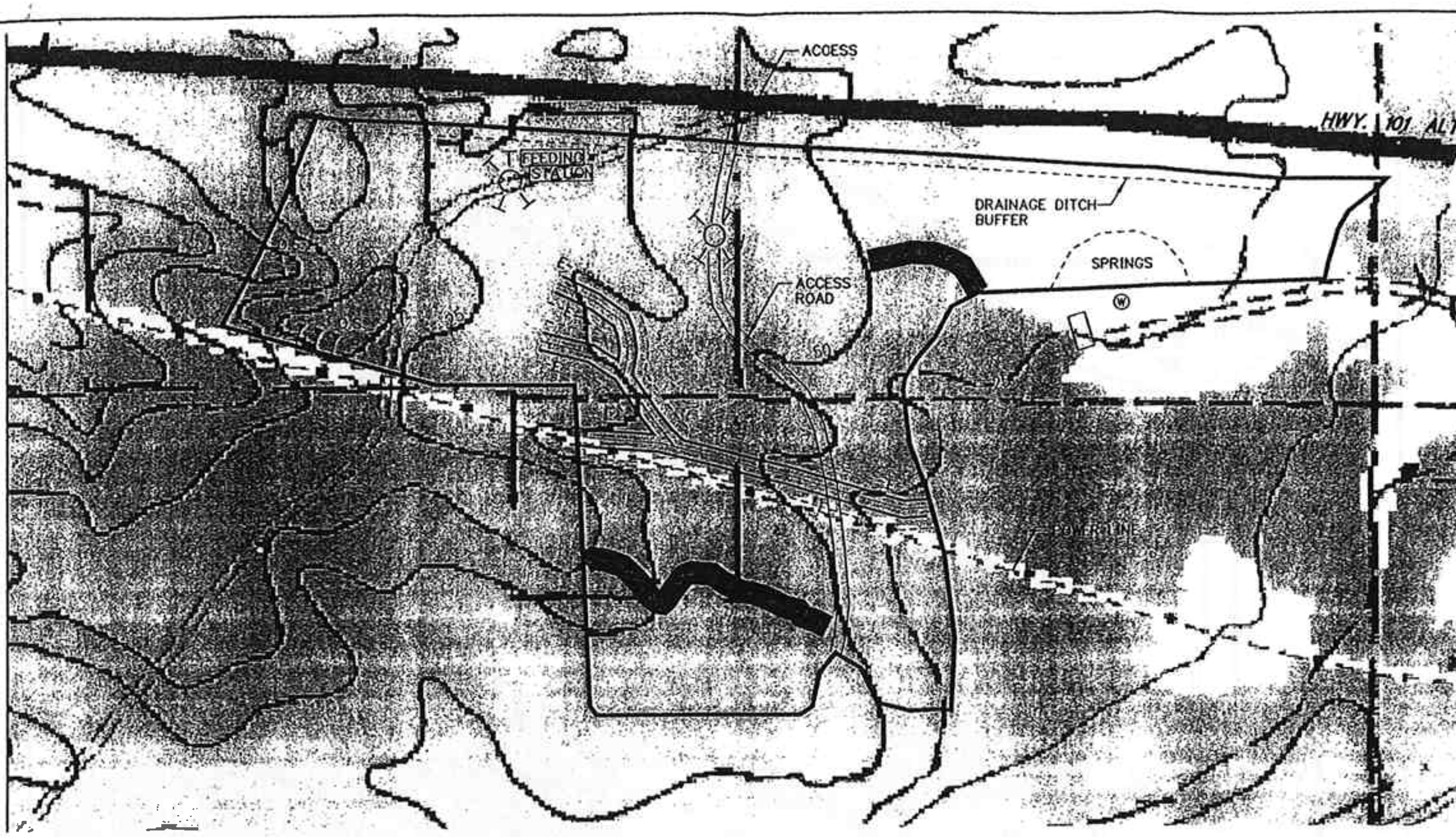
OWNER: CITY OF WARRENTON	LEE ENGINEERING, INC. 1300 JOHN ADAMS ST. OREGON CITY, OR, 97045		
DWG TITLE: SITE ONE BIOSOILDS	DATE: 02/25/02 FILE NO:	REVISED:	6 / 9



OWNER: CITY OF WARRENTON	LEE ENGINEERING, INC. 1300 JOHN ADAMS ST. OREGON CITY, OR, 97045		
DWG TITLE: BIOSOLIDS APPLICATION SITE 2	DATE: 02/13/22 FILE NO: 2873SIT2	REVISED:	7 / 9



OWNER: CITY OF WARRENTON	LEE ENGINEERING, INC. 1300 JOHN ADAMS ST. OREGON CITY, OR, 97045		
DWG TITLE: BIOSOLIDS APPLICATION SITE 3	DATE: 02/25/02 FILE NO: 2873SITE3	REVISED:	8 / 9



LEGEND:

CHANNELIZED SURFACE WATER	
EMBANKMENT BUFFER	---E---
OVERSTEEP SLOPES	O.S.
WETLANDS	

1" = 300'

OWNER: CITY OF WARRENTON	LEE ENGINEERING, INC. 1300 JOHN ADAMS ST. OREGON CITY, OR. 97045		
DWG TITLE: BIOSOLIDS APPLICATION SITE 4	DATE: 02/25/02 FILE NO: 2873SITE4	REVISED:	9 / 9

Site Two, located north of Highway 101, is divided into northern and southern sections that are split by a waterway and ravine. The escarpment is delineated on the site map, and a 50 ft. buffer is provided. Smaller surface water sources and an embankment to the north will also need to be provided with buffers. There is a low elevation area in the center of Section One. If ponding occurs when biosolids are applied, a 50 ft. buffer will need to be provided for the low area.

Site Three is also bisected by a ravine into northern and southern sections. A buffer adjacent to the escarpment is provided around the ravine. There is also a large oversteep area on the northern slope. The Clatsop County Animal Shelter and North Coast Juvenile Detention Center are adjacent to this site but all buildings are set back more than 200 ft. from the property line.

Site Four, located south of 101, is currently being used to graze cattle. Buffers are provided around the two feeding stations. There is a stream bisecting this site, which is bordered by a ravine. The ravine averages 50 ft. wide and 50 ft. buffers are provided on each side. There is a residence adjacent to the site on Tax Lot 900 that has a stock and irrigation well. Although the well is not a domestic water source, a 200 ft. buffer is provided for it. A 200 ft. buffer between the residence and the proposed land application areas is also given.

A breakdown of areas for each of the four sites is summarized in Table 1-1. The City of Warrenton will be responsible for making sure that required buffers and oversteep areas are clearly marked with stakes prior to land application of biosolids.

TABLE 1-1
LAND APPLICATION SITE SUMMARY

	Site 1	Site 2	Site 3	Site 4
Section # (T8NR10W)	S-34, S -27	S-25, S-26	S-27	S-35
Gross Area (Acres)	101.0	54.0	21.0	74.0
Oversteep Area (Acres)	4.0		1.5	1.0
Surface Water Buffers (Acres)	9.0	4.0		2.0
Embankment Buffers (Acres)	5.0	10.0	3.0	6.0
Wetlands Buffers (Acres)	1.0	1.0		0.5
Culvert Buffer		1.0	0.5	1.5
Road			1.0	1.0
Feeding Stations				0.25
Well Buffer				0.75
Net Area (Acres)	82	38	15	61

1.3 SOILS

During the proposed application site visits, Bruce Hendersen investigated the soil with a hand held bore. The average depth of his sample was 2 ft. The soil did not appear to be saturated. An SCS soil survey map entitled General Soil Map of Clatsop County indicates that the prevalent soil type of the four proposed sites is Grindbrook Walluski Hebo, which is described as "deep and very deep, moderately drained and poorly drained silt loam and silty clay loam; on terraces." The General Soil Map is included as part of Attachment 1.

A detailed SCS Soil Survey Map for each of the sites delineated is included as Drawing S-1. Table 1-2 lists the soils present for each site. A copy of the soil survey map description (USDA) for each soil series indicated is included in Attachment 1.

TABLE 1-2
SUMARY OF SOILS

	Soil	Sites
71-C	Walluski Silt Loam, 0-7 % slopes	2,3
71-B	Walluski Silt Loam, 7-15 % slopes 7	1
71-D	Walluski Silt Loam, 15-20 % slopes	1,3
60-D	Templeton Silt Loam, 3-30% slopes	4,2
20-C	Gridbrook Silt loam, 7-20% slopes	4
12-A	Coquille to Clatsop complex, protected 0-1% slopes	1,3

1.4 MANAGEMENT AGREEMENT

The owner of all of the proposed sites is Mr. Martin Nygaarg.. The site management agreement between the City of Warrenton, and Mr. Nygaarg is included as Attachment 1.

Mr. Martin Nygaarg, President Warrenton Fiber Company
P.O Box 100 Warrenton, OR 97146,
(503-861-3305)

2. SITE MANAGEMENT

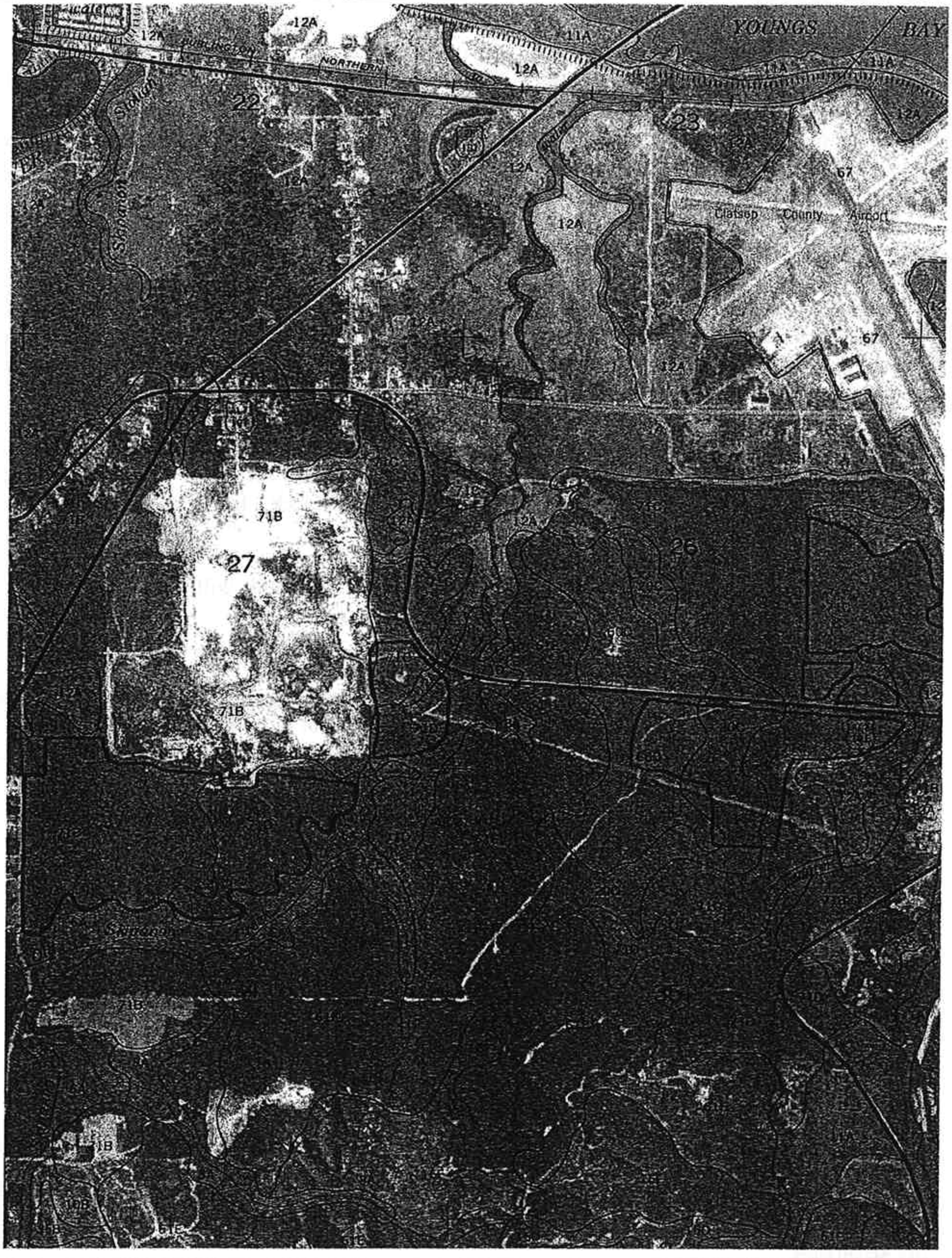
2.1 PUBLIC NOTIFICATION AND ACCESS

All property owners or occupants adjacent to the proposed sites will be notified by the City of the proposed land application of biosolids. Documentation of this notification, a complete list of the adjacent property owners, and a copy of the letter sent to them is included in Attachment 3.

Public access to land with a low potential for public exposure shall be restricted for 30 days after application of sewage sludge 503.32(b) It is recommended that to comply with this requirement the land application site be posted with signs that state: "Warning – Do Not Enter – Biosolids Application Site." The postings shall be in both English and Spanish.

2.2 CROP MANAGEMENT

All of the sites are mowed annually or bi-annually. The agronomic rate of 140 lbs. nitrogen/acre/year for non-irrigated hay is considered appropriate for these sites.



OWNER: **CITY OF WARRENTON**		**LEE ENGINEERING, INC.** 1300 JOHN ADAMS ST. OREGON CITY, OR 97045	
DWG TITLE: **SOIL SURVEY BIOSOLIDS LAND APPLICATION SITES**	DATE: **FEB 2002** FILE NO: **2873DWG1**	REVISED:	**DWG S-1**

These sites are used for grazing animals only during the winter months, and currently only Site Four is being used for this purpose. Since the sludge will be applied between June 1 and October 30, there should not be any livestock on the property following land application of the biosolids. The authorization agreement with the owner includes the provision that livestock will be kept off the site for a minimum of 30 days after application. The property owner will be notified by the City of the dates and location of biosolids application

2.3 METHODS OF APPLICATION

Liquid biosolids that have been screened at the treatment site will be transported in tanker cars to the land application site. The tankers will be equipped with a pressurized to spray bar for direct surface application. The bar will be close enough to the ground to eliminate airborne biosolids that are susceptible to being blown off site.

If the City chooses to dewater the biosolids prior to hauling, the dewatered biosolids can be land applied with mechanical spreaders. Common farm-type manure spreaders pulled by a tractor may be used, or spreaders can be mounted directly on a truck chassis to increase hauling efficiency.

The biosolids will be applied between June1 and October 30. Biosolids will not be applied

2.4 BIOSOLIDS CHARACTERISTICS

Preliminary sampling on January 26, 2000 consisted of a composite sample that was taken from the four corners of the primary cell. Preliminary analysis of biosolids from the Warrenton Sewage Treatment Lagoon indicate that the concentrations for all of the regulated metals are less than pollutant concentration limits in Table 3 of the Federal Regulations.

TABLE 2-1
POLLUTANT CONCENTRATIONS

Pollutant	Table 1 of §503.13	Table 3 of §503.13	Lagoon #1
	Ceiling Concentration	Concentration Limit	01/26/00
	Mg/ Kg[1]	Mg/ Kg[1]	Mg/ Kg[1]
Arsenic	75	41	<1.7
Cadmium	85	39	.08
Copper	4,300	1,500	147
Lead	840	300	31.2
Mercury	57	17	<.33
Molybdenum	75		1.5
Nickel	420	420	4.2
Selenium	100	100	0.83
Zinc	7,500	2,800	183

[1]Dry weight basis.

Preliminary sampling indicated that the fecal coliform count was well below 2,000,000 MPN/dry g., meeting the requirement for pathogen reduction.

The solids concentration of the original sample was unrealistically high compared to most municipal sludges. Because of the importance having an accurate estimate of the average concentration in order to determine the total mass of the biosolids in the lagoon, additional samples were obtained by Lee Engineering on December 20, 2001. These samples were analyzed for Total Solids (TS), Total Nitrogen (TKN), Ammonia Nitrogen (NH_4-N), and Nitrate Nitrite (NO_3-N, NO_2-N). Complete lab results are included in Attachment 5.

A small boat was used to obtain samples that were representative of the entire lagoon. Seven sample sites were defined at the center of six sampling regions of equal volume. A diagram is included in Appendix A giving the results.

The samples were obtained with a sludge judge, a narrow tube sampling device made of clear plastic material. The bottom of the tube was sealed with a small plastic ball that allowed the person obtaining the samples to control what was placed in the sample container. Care was taken to ensure that the sample contained bi0solids from the entire sludge blanket and to exclude excess water. The average concentration of the biosolids was 5%.

2.5 BIOSOLIDS APPLICATION RATE

Based upon lab results from the sampling conducted on December 20, 2001, the average available nitrogen in biosolids from the Warrenton sewage treatment lagoon is estimated to be 16.605 lbs./DT. These calculations are included in Attachment 4. Assuming an agronomic rate of 140 lbs. nitrogen/acre/year for non-irrigated hay, the forecasted application rate is 8.43 dry tons of biosolids per acre per year, and a total net area of 136 acres is required.

Biosolids Site Submittals have been prepared for the site(s) listed in Table 4-4 and are being submitted to DEQ for authorization concurrently with this report. The biosolids application rates are based on the results of the preliminary sampling. The application rate in dry tons /acre/yr is based on the available nitrogen in the sludge and will be readjusted following the sampling for each quadrant.

Solids concentrations may vary due to dredging techniques and rehydration and the person responsible for land application should make adjustment to the rate at which solids are applied. Centrifuging is an accepted method of estimating the suspended solids concentrations.[1]

A simple settleometer test may also be used, if the volume of settled sludge is compared to the volume at a known solids concentration.

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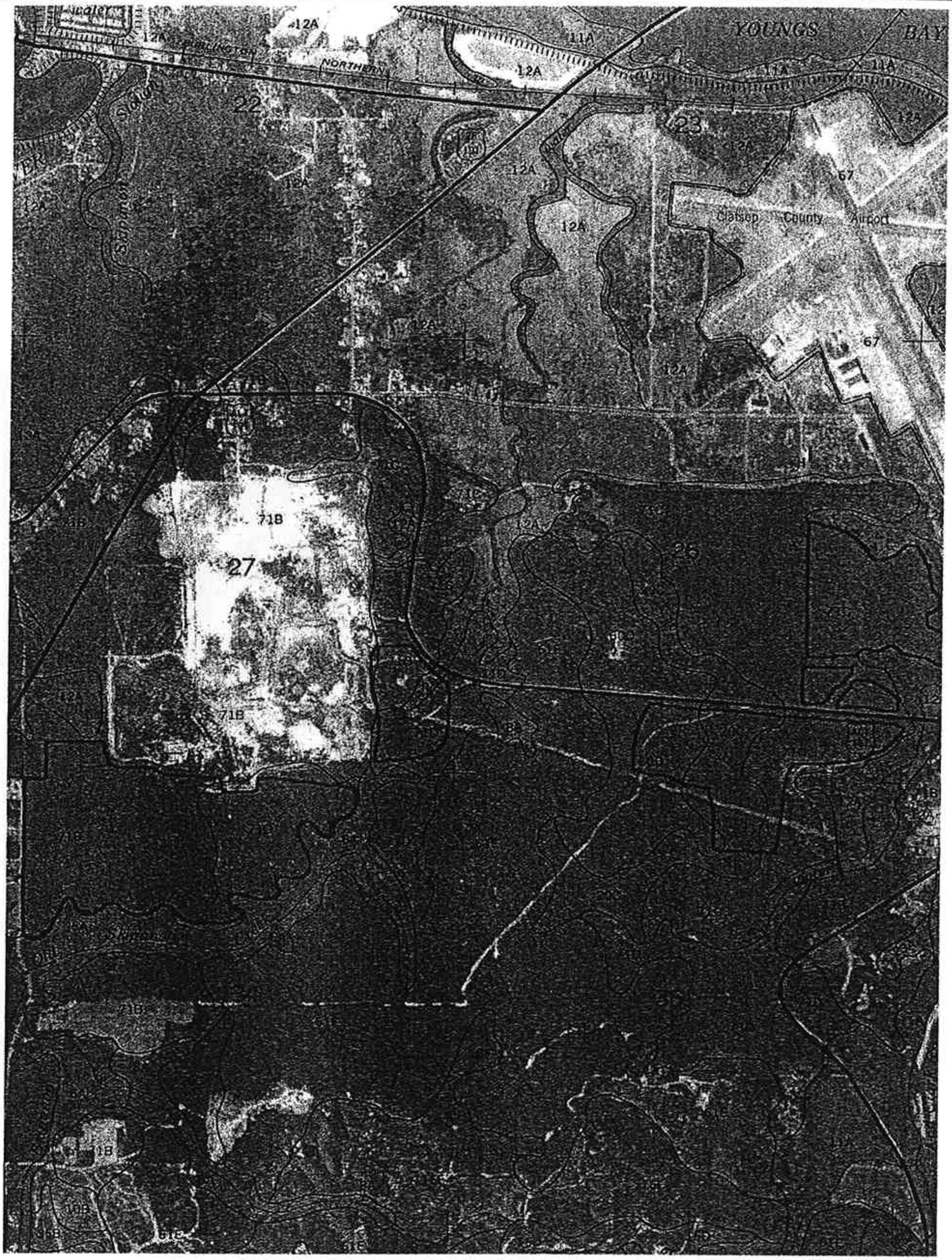
[1] *Operation of Municipal Wastewater Treatment Plants MOP 11*, Water Environment Federation, p. 531.

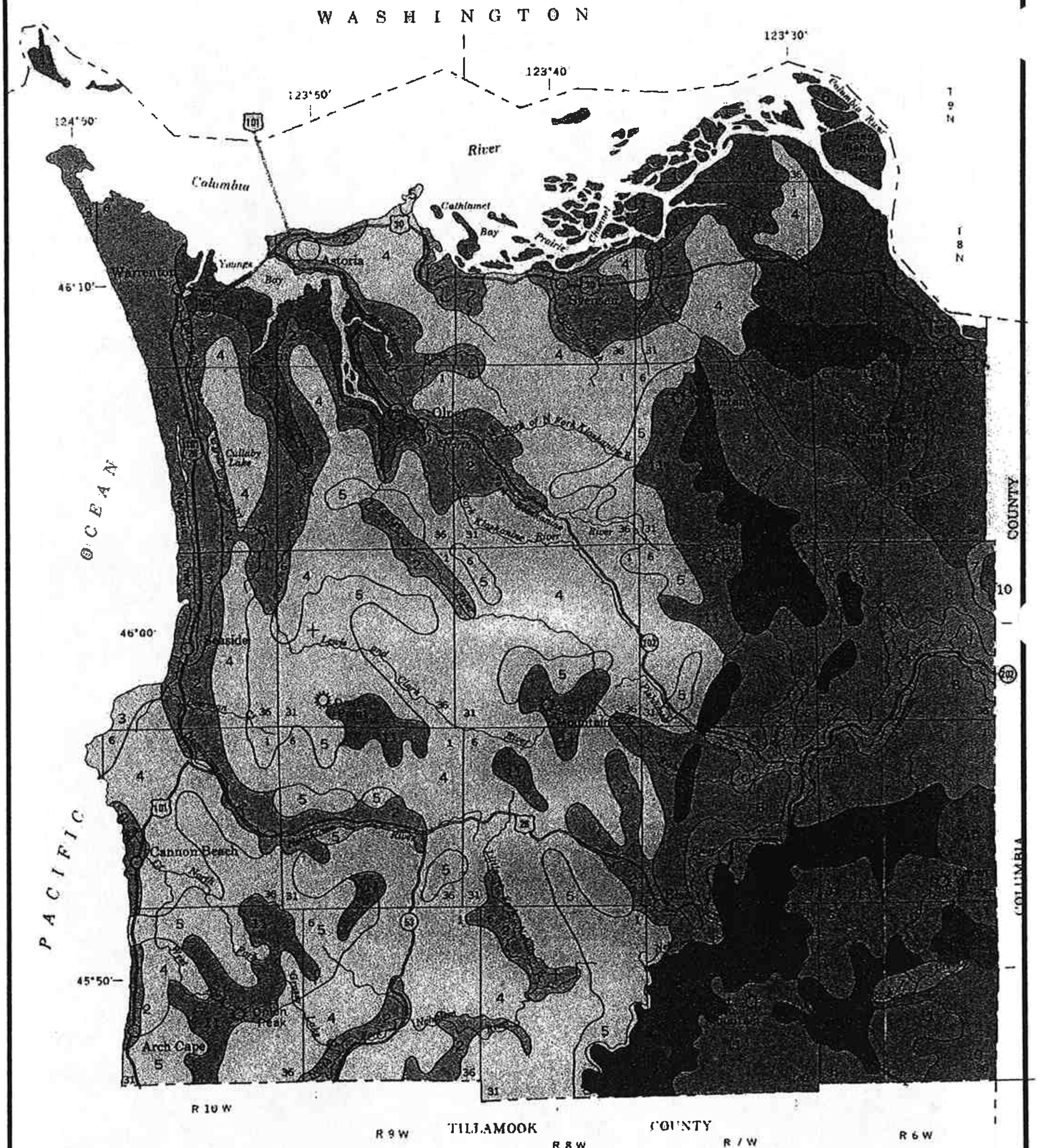
TABLE 2-2 BIOSOLIDS SITE MANAGEMENT				
	Site 1	Site 2	Site 3	Site 4
Net Area	82 Acres	38	15	61
Crop	Un-irrigated Hay	Un-irrigated Hay	Un-irrigated Hay	Un-irrigated Hay
Application	6/1-9/ 30	6/1-9/ 30	6/1-9/ 30	6/1-9/ 30
	Spreading/Truck	Spreading/Truck	Spreading/Truck	Spreading/Truck
Agronomic Loading	140 lbs N/acre/yr	140 lbs N/acre/yr	140 lbs N/acre/yr	140 lbs N/acre/yr
	11,480 lbs N/yr.	5,320 lbs N/yr	2,100 lbs N/yr	8,540 lbs N/yr
Biosolids Mass	8.43 DT/acre/yr	8.43 DT/acre/yr	8.43 DT/acre/yr	8.43 Dt/acre/yr
	691 DT/yr	320 DT/yr	127 DT/yr	514 DT/yr
Biosolids Volume@3%	65,834 gal/acre/yr	65,834 gal/acre/yr	65,834 gal/acre/yr	65,834 gal/acre/yr
	5.4 MG/yr	2.50 MG/yr	0.99 MG/yr	4.01 MG/yr
Biosolids Volume @6%	32,693 gal/acre/yr.	32,693 gal/acre/yr.	32,693 gal/acre/yr.	32,693 gal/acre/yr
	2.7 MG/yr	1.24 MG/yr	490,395	1.99 MG/yr

ATTACHMENT 1

Soil Survey Information



OWNER: **CITY OF WARRENTON**		**LEE ENGINEERING, INC.** 1300 JOHN ADAMS ST. OREGON CITY, OR 97045	
DWG TITLE: **SOIL SURVEY BIOSOLIDS LAND APPLICATION SITES**	DATE: **FEB 2002** FILE NO: **2873DWG1**	REVISED:	**DWG S-1**



OWNER:	**CITY OF WARRENTON**		**LEE ENGINEERING, INC.** 1300 JOHN ADAMS ST. OREGON CITY, OR 97045
DWG TITLE:	**CLATSOP COUNTY SOIL SURVEY BIOSOLIDS LAND APPLICATION SITES**	DATE: FEB 2002 FILE NO: 2873DWG2	REVISED:	**DWG S-2**

LEGEND

SOILS ON FLOOD PLAINS, TERRACES, AND DUNES IN THE FOG BELT

Coquille-Clatsop: Very deep, very poorly drained silt loam and muck; on tide influenced flood plains

2 Grindbrook-Walluski-Hebo: Deep and very deep, moderately well drained and poorly drained silt loam and silty clay loam; on terraces

3 Waldport-Gearhart-Brallier: Very deep, excessively drained, somewhat excessively drained, and very poorly drained fine sand, fine sandy loam, and mucky peat; on dunes and in swales

SOILS ON MOUNTAINS IN THE FOG BELT

4 Skipanon-Templeton-Svensen: Deep and very deep, well drained gravelly silt loam, silt loam, and loam; on mountains

5 Klootchie-Necanicum-Ascar: Deep and moderately deep, well drained silt loam, gravelly loam, and extremely gravelly loam; on mountains

WARM SOILS ON FLOOD PLAINS AND TERRACES

Locoda-Wauna: Deep and very deep, poorly drained and very poorly drained silt loam; on tide influenced flood plains

7 Eilersten-McNulty-Kirkendall: Deep and very deep, well drained silt loam; on terraces and flood plains

WARM SOILS ON MOUNTAINS

Rinearson: Deep, well drained silt loam; on mountains

Hemcross-Klistan-Harslow: Very deep and moderately deep, well drained silt loam and gravelly loam; on mountains

Alstony-Scaponia-Braun: Deep and moderately deep, well drained soils; on mountains

COLD SOILS ON MOUNTAINS

11 Caterl-Laderly-Murtip: Deep and moderately deep, well drained gravelly silt loam, very gravelly loam, and loam; on mountains

Compiled 1986

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
OREGON AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
CLATSOP COUNTY, OREGON

Scale 1:253,440

1 0 1 2 3 4 Miles

OWNER: **CITY OF WARRENTON**		**LEE ENGINEERING, INC.** 1300 JOHN ADAMS ST. OREGON CITY, OR 97045	
DWG TITLE: **GENERAL SOIL MAP LEGEND**	DATE: FEB 2002 FILE NO: 2873DWG3	REVISED:	**DWG S-3**

Typical pedon of Waldport fine sand, 3 to 15 percent slopes, in an area of grassland; north of Del Mar Beach Road and west of Neacoxie Creek, in the NE1/4NE 1/4 of sec. 33, T. 7 N., R. 10 W., Willamette Meridian:

A1—0 to 3 inches; very dark brown (10YR 2/2) fine sand, grayish brown (10YR 5/2) and light gray (10YR 7/1) dry; weak fine subangular blocky structure; very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many fine irregular pores; very strongly acid; clear wavy boundary.

A2—3 to 5 inches; dark brown (10YR 3/3) fine sand, pale brown (10YR 6/3) dry; single grain; loose; many very fine, fine, and medium roots; many fine irregular pores; strongly acid; clear wavy boundary.

C1—5 to 15 inches; pale brown (10YR 6/3) fine sand, light gray (10YR 7/2) dry; single grain; loose; many very fine, fine, and medium roots; many fine irregular pores; strongly acid; gradual smooth boundary.

C2—15 to 60 inches; light brownish grey (10YR 6/2) fine sand, light gray (10YR 7/1) dry; single grain; loose; common fine roots; many fine irregular pores; medium acid.

The mean annual soil temperature is 49 to 53 degrees F. The difference between the mean summer and mean winter soil temperature is less than 9 degrees.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3 when moist and 5 or 6 when dry, and chroma of 2 or 3 when moist and 1 to 3 when dry. The content of clay is 1 to 5 percent.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 6 when moist and 6 or 7 when dry, and chroma of 2 or 3 when moist and 1 or 2 when dry. The content of clay is 1 to 5 percent.

Walluski Series

The Walluski series consists of very deep, moderately well drained soils on terraces. These soils formed in silty alluvium. Slopes are 0 to 20 percent. The mean annual precipitation is 70 to 100 inches. The mean annual air temperature is 48 to 52 degrees F.

Typical pedon of Walluski silt loam, 0 to 7 percent slopes, in a wooded area, about 500 feet west of Lewis and Clark Road, in the SW1/4SW1/4NW1/4 of sec. 17, T. 7 N., R. 9 W., Willamette Meridian:

O—1 inch to 0; loose litter of needles, twigs, leaves, and moss.

A1—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many medium and fine irregular pores; extremely acid; clear wavy boundary.

AB—7 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/2) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; extremely acid; gradual wavy boundary.

Bw1—14 to 21 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine and medium subangular blocky structure; hard, friable, sticky and slightly plastic; many fine and medium roots; common very fine tubular pores; extremely acid; clear wavy boundary.

Bw2—21 to 31 inches; dark yellowish brown (10YR 4/4) silty clay loam, light yellowish brown (10YR 6/4) dry; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; common fine and very fine tubular pores; extremely acid; clear wavy boundary.

Bw3—31 to 47 inches; yellowish brown (10YR 5/4) silty clay loam, light yellowish brown (10YR 6/4) dry; many fine and medium distinct light gray (10YR 6/1) mottles and many medium prominent strong brown (7.5YR 5/6, 5/8) mottles; moderate fine prismatic structure; hard, firm, sticky and plastic; few fine and medium roots; common very fine tubular pores; extremely acid; clear wavy boundary.

2BC—47 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, light gray (10YR 7/1) dry; many medium and coarse distinct gray (10YR 5/1) stains and many fine and medium prominent yellowish red (5YR 5/6) and yellowish brown (10YR 6/8) mottles; weak medium subangular blocky structure; very hard, firm, sticky and plastic; few fine roots; few very fine tubular pores; extremely acid.

The mean annual soil temperature is 49 to 53 degrees F. The difference between the mean summer and mean winter soil temperature is less than 9 degrees. Depth to mottles is 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist or dry. The content of clay is 18 to 27 percent.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5 when moist and 5 or 6 when dry, and chroma of 3 or 4 when moist or dry. The content of clay is 22 to 35 percent. Chroma of 2 or less when moist is below a depth of 30 inches.

The 2BC horizon has hue of 10YR or 2.5Y, value of 5 or 6 when moist and 6 or 7 when dry, and chroma of 1 or 2 when moist of dry. The content of clay is 27 to 45 percent.

Onsite sewage disposal systems may not be suitable because of the risk of polluting the ground water.
If the density of housing is moderate to high, a community sewage system may be needed.

Suitable management practices:
Design and construct buildings and access roads to compensate for the steepness of slope.
Revegetate disturbed areas at construction sites as soon as possible to reduce the hazard of wind erosion.
In the steeper areas, reduce erosion by disturbing only the part of the site that is used for construction.
Design structures to offset the limited ability of the soil to support a load.
Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.
Design roads and streets to compensate for the instability of the soil.
Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant material for foundations, basements, and underground utilities.
Build roads in the less sloping areas of the unit to reduce the amount of cut and fill needed.
Reduce the risk of erosion on steep cut and fill slopes by establishing a plant cover on them.

71B—Walluski silt loam, 0 to 7 percent slopes.

Composition

Walluski soil and similar inclusions - 85 percent
Contrasting inclusions - 15 percent

Walluski Soil

Position on landscape: Terraces
Slope range: 0 to 7 percent
Elevation: 50 to 300 feet
Native plants: Sitka spruce, western hemlock, red alder, salmonberry, salal, western swordfern, red huckleberry
Organic mat on surface: Moss, needles, and twigs 1 inch thick
Typical profile:
0 to 14 inches - very dark grayish brown silt loam
14 to 21 inches - dark brown silt loam
21 to 60 inches - dark yellowish brown, yellowish brown, and light brownish gray, mottled silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Slow
Available water capacity: 9 to 12 inches
Potential rooting depth: 60 inches or more
Runoff: Slow
Hazard of erosion by water: Slight
Depth to perched water table: November to May ... to 36 inches

Included Areas

Soils that are wet
Soils that are well drained
Soils that have slopes of more than 7 percent
Soils that have more than 15 percent gravel and cobb... between depths of 20 and 40 inches

Major Uses

Cropland, homesites, wildlife habitat

Major Management Factors

Soil-related factors: Permeability, wetness, load supporting capacity, susceptibility of the upper lay... to compaction, shrink-swell potential
Climatic factors (mean annual):
Precipitation - 70 to 100 inches
Soil temperature - 49 to 53 degrees F (varies less than 9 degrees from summer to winter)
Frost-free period - 210 to 245 days

Cropland

General management considerations:
Most climatically adapted crops can be grown if adequate drainage is provided.
Wetness limits the production of deep-rooted crops.
Suitable crops for planting are grasses and legumes.
Grasses and legumes grow well if they are adequately fertilized.
Drainage should be maintained throughout the growing season.
Most crops respond to nitrogen, phosphorus, potassium, and lime.
Legumes respond to phosphorus and lime. Additions of potassium may also be needed.
Grazing when the soil is wet results in compaction of the upper layer, poor tilth, and excessive runoff.

Suitable management practices:
Plant deep-rooted crops in areas where natural drainage is adequate or where a drainage system has been installed.
Use tile drains to reduce wetness if a suitable outlet is available.
Irrigate during the dry period in summer.
Regulate the rate of irrigation to prevent a rise in the level of the water table.
Regulate the application of irrigation water to control runoff and erosion.
Apply enough water to wet the root zone but not so much that it leaches plant nutrients.

Maintain or improve fertility by using a cropping system that includes grasses, legumes, or grass-legume mixtures.
Reduce the risk of erosion by using minimum tillage, seeding disturbed areas to native or tame pasture plants, and planting early in spring or in mid-August to provide adequate cover in winter.
Maintain the quality and quantity of forage by rotating grazing, limiting grazing to drier periods, mowing and clipping, controlling weeds, and applying fertilizer annually.

Building Site Development

General management considerations:
Excavation increases the risk of water erosion.
The quality of roadbeds and road surfaces can be adversely affected by shrinking and swelling and limited soil strength.
Septic tank absorption fields may function poorly because of seasonal wetness and the restricted permeability of the soil.
If the density of housing is moderate to high, a community sewage may be needed.

Suitable management practices:
Reduce wetness by installing drain tile around footings.
Reduce the risk of erosion and the maintenance cost by stabilizing areas that have been disturbed.
Design buildings and roads to offset the limited ability of the soil to support a load.
Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant material for foundations, basements, and underground utilities.
Increase the size of the septic tank absorption field to compensate for the restricted permeability.
Provide a stable base and an adequate wearing surface to improve trafficability of roads.
Install culverts to carry seasonal runoff where roads cross natural drainageways.
Seed road cuts and fills to permanent vegetation.

71C—Walluski silt loam, 7 to 15 percent slopes.

Composition

Walluski soil and similar inclusions - 85 percent
Contrasting inclusions - 15 percent

Walluski Soil

Position on landscape: Terraces
Slope range: 7 to 15 percent
Elevation: 50 to 300 feet
Native plants: Sitka spruce, western hemlock, red alder, salmonberry, salal, western swordfern, red huckleberry
Organic mat on surface: Moss, needles, and twigs 1 inch thick
Typical profile:
0 to 14 inches - very dark grayish brown silt loam
14 to 21 inches - dark brown silt loam
21 to 60 inches - dark yellowish brown, yellowish brown, and light brownish gray, mottled silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Slow
Available water capacity: 9 to 12 inches
Potential rooting depth: 60 inches or more
Runoff: Medium
Hazard of erosion by water: Moderate
Depth to perched water table: November to May - 24 to 36 inches

Included Areas

Soils that are wet
Soils that are well drained
Soils that have slopes of less than 7 percent or more than 15 percent
Soils that have more than 15 percent gravel and cobbles between depths of 20 and 40 inches

Major Uses

Cropland, homesites, wildlife habitat

Major Management Factors

Soil-related factors: Slope, erosion by water, susceptibility of the upper layer to compaction, permeability, wetness, load supporting capacity
Climatic factors (mean annual):
Precipitation - 70 to 100 inches
Soil temperature - 49 to 53 degrees F (varies less than 9 degrees from summer to winter)
Frost-free period - 210 to 245 days

Cropland

General management considerations:
Most climatically adapted crops can be grown if adequate drainage is provided.
Wetness limits the production of deep-rooted crops.
Suitable crops for planting are grasses and legumes.
Grasses and legumes grow well if they are adequately fertilized.
Drainage should be maintained throughout the growing season.
Most crops respond to nitrogen, phosphorus, potassium, and lime.
Legumes respond to phosphorus and lime. Additions of potassium may also be needed.

Grazing when the soil is wet results in compaction of the upper layer, poor tilth, and excessive runoff.

Suitable management practices:

- Plant deep-rooted crops in areas where natural drainage is adequate or where a drainage system has been installed.
- Use tile drains to reduce wetness if a suitable outlet is available.
- Select plants that tolerate wetness or provide drainage.
- Use tile drains to intercept runoff from higher lying areas.
- Maintain or improve fertility by using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risk of erosion by seeding disturbed areas to native or tame pasture plants and planting in spring to provide adequate cover in winter.
- Maintain the quality and quantity of forage by adjusting stocking, especially on the steeper slopes; rotating grazing; limiting grazing to drier periods; mowing and clipping; controlling weeds; and applying fertilizer annually.

Building Site Development

General management considerations:

- Excavation increases the risk of water erosion.
- The quality of roadbeds and road surfaces can be adversely affected by limited soil strength.
- Septic tank absorption fields may function poorly because of seasonal wetness and the restricted permeability of the soil.
- If the density of housing is moderate to high, a community sewage system may be needed.

Suitable management practices:

- Reduce wetness by installing drain tile around footings.
- Reduce the risk of erosion and the maintenance cost by stabilizing areas that have been disturbed.
- Design buildings and roads to offset the limited ability of the soil to support a load.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant material for foundations, basements, and underground utilities.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Build roads in the less sloping areas of the unit to reduce the amount of cut and fill needed.
- Provide a stable base and an adequate wearing surface to improve trafficability of roads.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.
- Reduce the risk of erosion on steep cut and fill slopes by establishing a plant cover on them.

71D—Walluski silt loam, 15 to 20 percent slopes

Composition

Walluski soil and similar inclusions - 80 percent
Contrasting inclusions - 20 percent

Walluski Soil

Position on landscape: Terraces
Slope range: 15 to 20 percent
Elevation: 50 to 300 feet
Native plants: Sitka spruce, western hemlock, red alder, salmonberry, salal, western swordfern, red huckleberry
Organic mat on surface: Moss, needles, and twigs 1 inch thick
Typical profile:
0 to 14 inches - very dark grayish brown silt loam
14 to 21 inches - dark brown silt loam
21 to 60 inches - dark yellowish brown, yellowish brown, and light brownish gray, mottled silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Slow
Available water capacity: 9 to 12 inches
Potential rooting depth: 60 inches or more
Runoff: Medium
Hazard of erosion by water: Moderate
Depth to perched water table: November to May - 24 to 36 inches

Included Areas

Soils that have slopes of less than 15 percent
Soils that are well drained
Soils that are wet
Soils that have more than 15 percent gravel and cobbles between depths of 20 and 40 inches

Major Uses

Cropland, homesites, wildlife habitat

Major Management Factors

Soil-related factors: Slope, erosion by water, susceptibility of the upper layer to compaction, permeability, wetness, load supporting capacity
Climatic factors (mean annual):
Precipitation - 70 to 100 inches
Soil temperature - 49 to 53 degrees F (varies less than 9 degrees from summer to winter)

Frost-free period - 210 to 215 days

Cropland

General management considerations:

Most climatically adapted crops can be grown if adequate drainage is provided.
Wetness limits the production of deep-rooted crops.
Suitable crops for planting are grasses and legumes.
Grasses and legumes grow well if they are adequately fertilized.
Drainage should be maintained throughout the growing season.
Most crops respond to nitrogen, phosphorus, potassium, and lime.
Legumes respond to phosphorus and lime. Additions of potassium may also be needed.
Grazing when the soil is wet results in compaction of the upper layer, poor tilth, and excessive runoff.

Suitable management practices:

Plant deep-rooted crops in areas where natural drainage is adequate or where a drainage system has been installed.
Use tile drains to reduce wetness if a suitable outlet is available.
Select plants that tolerate wetness or provide drainage.
Use tile drains to intercept runoff from higher lying areas.
Maintain or improve fertility by using a cropping system that includes grasses, legumes, or grass-legume mixtures.
Reduce the risk of erosion by using minimum tillage, seeding disturbed areas to native or tame pasture plants, and planting early in spring to provide adequate cover in winter.
Maintain the quality and quantity of forage by adjusting stocking, especially on the steeper slopes; rotating grazing; limiting grazing to drier periods; controlling weeds; and applying fertilizer annually.

Building Site Development

General management considerations:

Excavation increases the risk of water erosion.
The quality of roadbeds and road surfaces can be adversely affected by limited soil strength.
Septic tank absorption fields may function poorly because of seasonal wetness and the restricted permeability of the soil.
If the density of housing is moderate to high, a community sewage system may be needed.

Suitable management practices:

Design and construct buildings and access roads to compensate for the steepness of slope.
Reduce wetness by installing drain tile around footings.
In the steeper areas, reduce erosion by disturbing only the part of the site that is used for construction.
Reduce the risk of erosion and the maintenance cost by stabilizing areas that have been disturbed.
Design buildings and roads to offset the limited ability of the soil to support a load.
Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant material for foundations, basements, and underground utilities.
Install septic tank absorption lines in adjacent areas that are more nearly level.
Increase the size of the septic tank absorption field to compensate for the restricted permeability.
Build roads in the less sloping areas of the unit to reduce the amount of cut and fill needed.
Provide a stable base and an adequate wearing surface to improve trafficability of roads.
Install culverts to carry seasonal runoff where roads cross natural drainageways.
Reduce the risk of erosion on steep cut and fill slopes by establishing a plant cover on them.

72A—Warrenton loamy fine sand, 0 to 3 percent slopes.

Composition

Warrenton soil and similar inclusions - 85 percent
Contrasting inclusions - 15 percent

Warrenton Soil

Position on landscape: Interdunal areas
Slope range: 0 to 3 percent
Elevation: 10 to 20 feet
Native plants: Sitka spruce, willows, rushes, sedges, skunkcabbage, salal
Organic mat on surface: Moss, twigs, roots, needles, and leaves 3 inches thick
Typical profile:
0 to 11 inches - black loamy fine sand
11 to 22 inches - very dark gray, mottled loamy fine sand
22 to 60 inches - very dark gray, mottled fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Permeability: Rapid
Available water capacity: 4 to 6 inches
Potential rooting depth: 60 inches or more for water tolerant plants
Runoff: Ponded

O—3 inches to 0; needles, twigs, and leaves.

A1—0 to 8 inches; very dark brown (10YR 2/2) loam, grayish brown (10YR 5/2) dry; moderate fine and very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; extremely acid; clear wavy boundary.

A2—8 to 17 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; very strongly acid; gradual wavy boundary.

Bw—17 to 38 inches; brown (10YR 4/3) loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; very strongly acid; clear wavy boundary.

C—38 to 60 inches; variegated strong brown (7.5YR 4/6, 5/6) and light brownish gray (10YR 6/2) fine sandy loam, strong brown (7.5YR 5/6), reddish yellow (7.5YR 6/6), and very pale brown (10YR 7/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; extremely acid.

The mean annual soil temperature is 49 to 53 degrees F. The difference between the mean summer and mean winter soil temperatures is less than 9 degrees. The umbric epipedon is 10 to 20 inches thick.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist or dry. The content of clay is 15 to 20 percent. The horizon is extremely acid to strongly acid.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 2 to 5 when moist or dry. The content of clay is 20 to 30 percent. The horizon is extremely acid or very strongly acid.

The C horizon has variegated colors. It is loam, fine sandy loam, or sandy loam and is 15 to 25 percent clay. The lower part of the horizon is 0 to 35 percent soft sandstone gravel. The horizon is extremely acid or very strongly acid.

Templeton Series

The Templeton series consists of deep, well drained soils in mountainous areas. These soils formed in colluvium derived from siltstone. Slopes are 3 to 90 percent. The mean annual precipitation is 70 to 100 inches. The mean annual air temperature is 45 to 51 degrees F.

Typical pedon of Templeton silt loam, 3 to 30 percent slopes, off a spur road east of Twilight Road, 350 feet south and 340 feet west of the northeast corner of sec. 20, T. 8 N., R. 8 W., Willamette Meridian:

O—3 inches to 0; leaves, twigs, moss, and wood[illegible] material.

A1—0 to 5 inches; very dark grayish brown (10Y[illegible] silt loam, brown (10YR 5/3) dry; moderate fin[illegible] granular structure; slightly hard, friable, slightly [illegible] and slightly plastic; many fine and very fine roo[illegible] many fine and very fine irregular pores; extreme[illegible] acid; gradual smooth boundary.

A2—5 to 12 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate coarse and fine granular structure; slightly hard, friable, slightly st[illegible] and slightly plastic; many very fine, fine, and med[illegible] roots; many fine and very fine irregular pores; ve[illegible] strongly acid; clear wavy boundary.

Bw1—12 to 38 inches; dark yellowish brown (10YR 4/[illegible] silty clay loam, light yellowish brown (10YR 6/4) d[illegible] moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine and coarse roots; common fine and very fine tubular pores; ve[illegible] strongly acid; gradual smooth boundary.

Bw2—38 to 58 inches; dark yellowish brown and yellowish brown (10YR 4/4 and 5/6) silty clay loam, light yellowish brown and brownish yellow (10YR 6/4 and 6/6) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; very strongly acid; gradual wavy boundary.

Cr—58 inches; weathered siltstone.

The mean annual soil temperature is 47 to 52 degrees F. The difference between the mean summer and mean winter soil temperature is less than 9 degrees. The umbric epipedon is 10 to 20 inches. Depth to the paralithic contact is 40 to 60 inches.

The A horizon has hue of 5YR, 7.5YR, or 10YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist or dry. The content of clay is 18 to 27 percent. The horizon is 0 to 15 percent soft siltstone gravel.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5 when moist and 5 or 6 when dry, and chroma of 4 or 6 when moist or dry. The content of clay is 25 to 35 percent. The content of soft siltstone gravel is 0 to 25 percent.

Tolany Series

The Tolany series consists of very deep, well drained soils in mountainous areas. These soils formed in colluvium derived from mixed material. Slopes are 3 to 30 percent. The mean annual precipitation is 70 to 90 inches. The mean annual air temperature is 41 to 45 degrees F.

Typical pedon of Tolany silt loam, 3 to 30 percent slopes, in a wooded area on the south side of Kelly Road, in the NE1/4NE1/4 of sec. 22, T. 7 N., R. 6 W., Willamette Meridian:

Figure 8.—Roadbank failure in an area of Svensen loam, 60 to 90 percent slopes.

Prepare the site carefully to control competing vegetation.
Hand plant nursery stock to establish or improve a stand.
Improve stands by thinning before trees reach commercial size and by selective cutting of mature trees.

60D—Templeton silt loam, 3 to 30 percent slopes.

Composition

Templeton soil and similar inclusions - 85 percent
Contrasting inclusions - 15 percent

Templeton Soil

Position on landscape: Mountaintops
Slope range: 3 to 30 percent
Elevation: 100 to 1,600 feet
Native plants: Western hemlock, Sitka spruce, Douglas-fir, red alder, salal, salmonberry, western swordfern, red huckleberry, Oregon oxalis
Organic mat on surface: Moss, needles, and twigs 3 inches thick
Typical profile:
0 to 12 inches - very dark grayish brown and dark brown silt loam
12 to 38 inches - dark grayish brown silty clay loam
38 to 58 inches - dark yellowish brown and yellowish brown silty clay loam
58 inches - weathered siltstone
Depth class: Deep (40 to 60 inches)
Drainage class: Well drained
Permeability: Moderate
Available water capacity: 10 to 13 inches
Potential rooting depth: 40 to 60 inches
Runoff: Medium
Hazard of erosion by water: Moderate

Included Areas

Soils that have weathered siltstone at a depth of less than 40 inches
Soils that have basalt at a depth of 40 to 60 inches
Soils that have slopes of more than 30 percent
Soils that have more than 15 percent hard rock fragments throughout the profile

Major Uses

Woodland, wildlife habitat

Major Management Factors

Soil-related factors: Erosion by water, susceptibility of upper layer to compaction
Climatic factors (mean annual):
Precipitation - 70 to 100 inches
Soil temperature - 47 to 52 degrees F (varies less than 9 degrees from summer to winter)
Frost-free period - 100 to 210 days

Woodland

Mean site index for stated species: Western hemlock - 156 (based on 100-year site curve); 112 (based on 50-year site curve)
Growth at culmination of mean annual increment (CMAI): 266 cubic feet per acre in a stand of 50-year-old trees 1.5 inches or larger in diameter at breast height
Estimated total production per acre: 107,380 board feet (International rule, one-fourth-inch kerf) from a fully stocked stand of trees 70 years old
Mean site index for stated species: Douglas-fir - 165 (based on 100-year site curve); 125 (based on 50-year site curve)
Mean site index for stated species: Sitka spruce - 180 (based on 100-year site curve)

General management considerations:
Wheeled and tracked equipment can be used in the more gently sloping areas, but cable yarding generally is safer and disturbs the soil less.
Using wheeled and tracked equipment when the soil is wet produces ruts, compacts the soil, and damages the roots of trees.
When wet, unsurfaced roads and skid trails are slippery. They may be impassable during rainy periods.
Logging roads require suitable surfacing for year-round use.
The soil is subject to sliding and slumping because it is very plastic and is underlain by highly fractured bedrock.
Susceptibility of cut and fill areas to erosion is moderate.
Adequately designed road drainage reduces the risk of erosion.
Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. A plant cover or water bars are needed.
Reforestation occurs naturally in cutover areas if a seed source is present.
Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.
Carefully managed reforestation reduces competition from undesirable understory plants.
Reforestation can be accomplished by planting western hemlock, Sitka spruce, or Douglas-fir seedlings.

Suitable management practices:
Use ground skidding equipment in harvesting, but limit its use when the soil is wet.
Reduce the risk of erosion by seeding roads, cutbanks, and landings and installing water bars and culverts.
To reduce compaction use suitable methods of harvest, lay out skid trails in advance, and harvest when the soil is least susceptible to compaction.
Avoid excessive damage to the soil and to the vegetation downslope from roadbuilding sites by removing waste material.
Prepare the site carefully to control competing vegetation.
Hand plant nursery stock to establish or improve a stand.
Improve stands by thinning before trees reach commercial size and by selective cutting of mature trees.

61E—Templeton-Ecola silt loams, 30 to 60 percent slopes.

Composition

Templeton soil and similar inclusions - 50 percent
Ecola soil and similar inclusions - 40 percent
Contrasting inclusions - 10 percent

Templeton Soil

Position on landscape: Mountainsides
Slope range: 30 to 60 percent
Elevation: 100 to 1,600 feet
Native plants: Western hemlock, Sitka spruce, Douglas-fir, red alder, salal, salmonberry, western swordfern, red huckleberry, vine maple, Oregon oxalis
Organic mat on surface: Moss, needles, and twigs 3 inches thick
Typical profile:
0 to 12 inches - very dark grayish brown and dark brown silt loam

Grindbrock Series

The Grindbrook series consists of deep and very deep, moderately well drained soils on terraces. These soils formed in mixed alluvium. Slopes are 0 to 30 percent. The mean annual precipitation is 70 to 100 inches. The mean annual air temperature is 48 to 51 degrees F.

Typical pedon of Grindbrook silt loam, 7 to 20 percent slopes, in a cutover area; about 300 feet northwest of road in the NE1/4NE1/4SW1/4 of sec. 20, T. 7 N., R. 9 W., Willamette Meridian:

O—1 inch to 0; roots, moss, leaves, and twigs.

A1—0 to 10 inches; black (10YR 2/1) silt loam, dark brown (10YR 3/3) dry; moderate fine granular structure and moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine irregular pores; extremely acid; clear wavy boundary.

A2—10 to 15 inches; very dark brown (10YR 2/2) silt loam, dark yellowish brown (10YR 4/3) dry; moderate fine subangular blocky structure; slightly hard, friable, sticky and slightly plastic; many fine and very fine roots; many very fine tubular pores; extremely acid; clear wavy boundary.

BA—15 to 28 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; many very fine tubular pores; very strongly acid; clear smooth boundary.

Bw1—28 to 35 inches; brown (10YR 4/3) silty clay loam, yellowish brown (10YR 5/4) dry; many medium faint yellowish brown (10YR 5/4 and 5/6) mottles; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; many very fine tubular pores; extremely acid; clear smooth boundary.

Bw2—35 to 60 inches; gray (10YR 6/1) silty clay loam, pale brown (10YR 6/3) dry; many prominent yellowish brown (10YR 5/6) mottles; strong fine subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; many very fine tubular pores; extremely acid.

The mean annual soil temperature is 49 to 52 degrees F. The difference between the mean summer and mean winter temperature is less than 9 degrees. Depth to bedrock is 40 to 60 inches or more. The umbric epipedon is 20 to 30 inches thick. The textural control section averages 25 to 35 percent clay.

The A horizon has value of 2 or 3 when moist and 3 to 5 when dry, and it has chroma of 3 or 4 when moist or dry. The content of clay is 20 to 35 percent.

The Bw horizon has value of 4 to 7 when moist or dry, and it has chroma of 3 or 4 when moist or dry. It is silty clay loam to silty clay or clay. The content of clay is [illegible] to 45 percent.

Hapludalfs

Hapludalfs are deep, well drained to somewhat poorly drained soils on terraces and fans. These soils formed in mixed alluvium. Slopes are 0 to 15 percent. The mean annual precipitation is 60 to 90 inches. The mean annual air temperature is 48 to 51 degrees F.

Reference pedon of a Hapludalf silt loam in an area of Udifluvents-Hapludalfs complex, 0 to 15 percent slopes; about 200 feet east of Northrup Creek Road, in the NE1/4NE1/4SW1/4 of sec. 8, T. 6 N., R. 6 W., Willamette Meridian:

A1—0 to 4 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine irregular pores; very strongly acid; gradual smooth boundary.

A2—4 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; strong medium granular structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine tubular pores; very strongly acid; clear wavy boundary.

Bw—11 to 20 inches; dark yellowish brown (10YR 3/4) silt loam, yellowish brown (10YR 5/4) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine tubular pores; extremely acid; clear wavy boundary.

Bt1—20 to 32 inches; dark yellowish brown (10YR 4/4) silt loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common fine and medium roots; many very fine tubular pores; few thin clay films on ped faces and in pores; extremely acid; clear wavy boundary.

Bt2—32 to 44 inches; yellowish brown (10YR 5/4) loam, light yellowish brown (10YR 6/4) dry; common fine faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; common very fine tubular pores; common thin clay films on ped faces and in pores; extremely acid; clear wavy boundary.

C—44 to 60 inches; grayish brown (10YR 5/2) loamy fine sand, light gray (10YR 7/2) dry; many medium distinct yellowish brown (10YR 5/6) mottles and many medium prominent strong brown (7.5YR 5/8) mottles; massive; soft, very friable, nonsticky and slightly plastic; very few very fine roots; common very fine tubular pores; extremely acid.

aintain the quality and quantity of forage by 'otating grazing, limiting grazing to drier periods, nowing and clipping, and applying fertilizer annually.

ind

ite index for stated species: Western emlock - 166 (based on 100-year site curve); 120 sed on 50-year site curve)
ed total production per acre: 115,780 board feet nternational rule, one-fourth-inch kerf) from a stand f trees 70 years old
at culmination of mean annual increment MAI): 266 cubic feet per acre in a stand of 50-ear-old trees 1.5 inches or larger in diameter at reast height

al management considerations:
Vheeled and tracked equipment can be used in the more gently sloping areas, but cable yarding generally is safer and disturbs the soil less.
sing wheeled and tracked equipment when the soil wet produces ruts, compacts the soil, and nages the roots of trees.
...n wet, unsurfaced roads and skid trails are slippery. They may be impassable during rainy periods.
utbanks occasionally slump when saturated.
dequately designed road drainage reduces the risk of erosion.
Spoil from excavations is subject to rill and gully erosion and to sloughing.
Soil compaction increases if yarding and skid trails converge.
ogging roads require suitable surfacing for year-round use.
Windthrow is a hazard when the soil is saturated and winds are strong.
eforestation occurs naturally in cutover areas if a seed source is present.
Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.
Carefully managed reforestation reduces competition from undesirable understory plants.
Trees suitable for planting include western hemlock, Sitka spruce, and Douglas-fir.

able management practices:
Use conventional equipment in harvesting, but limit its use when the soil is wet.
ice the risk of erosion by avoiding excessive disturbance of the soil, seeding roads and landings, installing water bars and culverts, and seeding cuts and fills.
To reduce compaction use suitable methods of harvest, lay out skid trails in advance, and harvest when the soil is least susceptible to compaction.
Prepare the site carefully to control competing vegetation.
Hand plant nursery stock to establish or improve a stand.
Improve stands by thinning before trees reach commercial size and by selective cutting of mature trees.

Building Site Development

General management considerations:
Excavation increases the risk of water erosion.
Road cutbanks are subject to slumping.
The quality of roadbeds and road surfaces can be adversely affected by limited soil strength.
Septic tank absorption fields may function poorly because of the restricted permeability of the soil and seasonal wetness.
If the density of housing is moderate to high, a community sewage system may be needed.

Suitable management practices:
Reduce wetness by installing drain tile around footings.
Design buildings and roads to offset the limited ability of the soil to support a load.
Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant material for foundations, basements, and underground utilities.
Increase the size of the septic tank absorption field to compensate for the restricted permeability.
Provide a stable base and an adequate wearing surface to improve trafficability of roads.

20C—Grindbrook silt loam, 7 to 20 percent slopes.

Composition

Grindbrook soil and similar inclusions - 85 percent
Contrasting inclusions - 15 percent

Grindbrook Soil

Position on landscape: Terraces
Slope range: 7 to 20 percent
Elevation: 100 to 350 feet
Native plants: Western hemlock, Sitka spruce, Douglas-fir, red alder, salmonberry, salal, red huckleberry, western swordfern, Oregon oxalis
Organic mat on surface: Moss, needles, and twigs 1 inch thick
Typical profile:
0 to 15 inches - black to very dark brown silt loam
15 to 28 inches - dark brown silt loam

28 to 60 inches - brown and gray, mottled silty clay loam

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Moderately slow
Available water capacity: 9 to 12 inches
Potential rooting depth: 60 inches or more
Runoff: Medium
Hazard of erosion by water: Moderate
Depth to perched water table: November through May - 24 to 36 inches

Included Areas

Soils that are poorly drained or somewhat poorly drained
Soils that are clayey between depths of 10 and 40 inches
Soils that are well drained
Soils that have slopes of less than 7 percent or more than 20 percent
Soils that have partially weathered, waterworn rock fragments at a depth of 25 inches or more

Major Uses

Cropland, woodland, homesites, wildlife habitat

Major Management Factors

Soil-related factors: Slope, erosion by water, permeability, wetness, load supporting capacity, susceptibility to compaction
Climatic factors (mean annual):
Precipitation - 70 to 100 inches
Soil temperature - 49 to 52 degrees F (varies less than 9 degrees from summer to winter)
Frost-free period - 180 to 210 days

Cropland

General management considerations:
Most climatically adapted crops can be grown if adequate drainage is provided.
Suitable crops for planting are grasses and legumes.
Grasses and legumes grow well if they are adequately fertilized.
Most crops respond to nitrogen, phosphorus, potassium, and lime.
Legumes respond to phosphorus and lime. Additions of potassium may also be needed.
Grazing when the soil is wet results in compaction of the upper layer, poor tilth, and excessive runoff.

Suitable management practices:
Select plants that tolerate wetness or provide drainage.
Use tile drains to reduce wetness if a suitable outlet is available.
Maintain or improve fertility by using a crop system that includes grasses, legum… legume mixtures.
Reduce the risk of erosion by tilling or… or across the slope and planting early in… provide adequate cover in winter.
Maintain the quality and quantity of forage by adjusting stocking, especially on the steep slopes; rotating grazing; limiting grazing to periods; and applying fertilizer annually.

Woodland

Mean site index for stated species: Western hemlock - 166 (based on 100-year site curve)… (based on 50-year site curve)
Estimated total production per acre: 115,780 boar… (International rule, one-fourth-inch kerf) from a… of trees 70 years old
Growth at culmination of mean annual increment (CMAI): 266 cubic feet per acre in a stand of … year-old trees 1.5 inches or larger in diameter at breast height

General management considerations:
Wheeled and tracked equipment can be used in… more gently sloping areas, but cable yarding generally is safer and disturbs the soil less.
Using wheeled and tracked equipment when the s… is wet produces ruts, compacts the soil, ar… damages the roots of trees.
When wet, unsurfaced roads and skid trails are slippery. They may be impassable during rainy periods.
Constructing roads at midslope results in large cuts and fills, which increases the risk of erosion.
Susceptibility of cut and fill areas to erosion is moderate.
Cutbanks occasionally slump when saturated.
Spoil from excavations is subject to rill and gully erosion and to sloughing.
The waste material from roadbuilding can damage vegetation. It is also a potential source of sedimentation.
Adequately designed road drainage reduces the risk of erosion.
Logging roads require suitable surfacing for year-round use.
Windthrow is a hazard when the soil is saturated and winds are strong.
Reforestation occurs naturally in cutover areas if a seed source is present.
Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.
Carefully managed reforestation reduces competition from undesirable understory plants.

Composition

Coquille soil and similar inclusions - 60 percent
Clatsop soil and similar inclusions - 30 percent
Contrasting inclusions - 10 percent

Coquille Soil

Position on landscape: Tide-influenced flood plains
Slope range: 0 to 1 percent
Elevation: 5 to 10 feet
Native plants: Willow, salmonberry, rushes, sedges, grasses
Typical profile:
0 to 6 inches - very dark gray silt loam
6 to 30 inches - dark grayish brown, mottled silt loam
30 to 60 inches - dark gray silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Permeability: Slow
Available water capacity: 10 to 13 inches
Potential rooting depth: 60 inches or more for water tolerant plants
Runoff: Ponded
Hazard of erosion by water: Slight
Depth to water table: 24 inches above the surface to 24 inches below the surface throughout the year
Frequency of flooding: Frequent throughout the year

Clatsop Soil

Position on landscape: Tide-influenced flood plains
Slope range: 0 to 1 percent
Elevation: 5 to 10 feet
Native plants: Cattail, horsetail, rushes, sedges, skunkcabbage, grasses
Typical profile:
0 to 6 inches - very dark grayish brown muck
6 to 24 inches - very dark grayish brown and dark gray silt loam
24 to 60 inches - very dark gray silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Permeability: Slow
Available water capacity: 11 to 14 inches
Potential rooting depth: 60 inches or more for water tolerant plants
Runoff: Ponded
Hazard of erosion by water: Slight
Depth to water table: 24 inches above the surface to 24 inches below the surface throughout the year
Frequency of flooding: Frequent throughout the year

Included Areas

Soils that are organic between depths of 15 and 36 inches
Soils that are more than 35 percent clay between depths of 10 and 40 inches
Soils that are sandy between depths of 20 and 40 inches
Soils that are sandy throughout the profile

Major Use

Wetland wildlife habitat

Major Management Factors

Soil-related factors: Flooding, plant competition, wetness
Climatic factors (mean annual):
Precipitation - 70 to 100 inches
Soil temperature - 49 to 52 degrees F (varies less than 9 degrees from summer to winter).
Frost-free period - 180 to 220 days

12A—Coquille-Clatsop complex, protected, 0 to 1 percent slopes.

Composition

Coquille soil and similar inclusions - 60 percent
Clatsop soil and similar inclusions - 30 percent
Contrasting inclusions - 10 percent

Coquille Soil

Position on landscape: Tide-influenced flood plains
Slope range: 0 to 1 percent
Elevation: 5 to 10 feet
Native plants: Red alder, willow, sedges, rushes, grasses
Typical profile:
0 to 6 inches - very dark gray silt loam
6 to 30 inches - dark grayish brown, mottled silt loam
30 to 60 inches - dark gray silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Permeability: Slow
Available water capacity: 10 to 13 inches
Potential rooting depth: 60 inches or more for water tolerant plants
Runoff: Ponded
Hazard of erosion by water: Slight
Depth to water table: November through June - 6 inches above the surface to 24 inches below the surface
Frequency of flooding: Rare

Clatsop Soil

Position on landscape: Tide-influenced flood plains
Slope range: 0 to 1 percent
Elevation: 5 to 10 feet
Native plants: Rushes, sedges, cattail, skunkcabbage, grasses

Typical profile:
0 to 6 inches - very dark grayish brown muck
6 to 24 inches - very dark grayish brown and dark gray silt loam
24 to 60 inches - very dark gray silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Permeability: Slow
Available water capacity: 11 to 14 inches
Potential rooting depth: 60 inches or more for water tolerant plants
Runoff: Ponded
Hazard of erosion by water: Slight
Depth to water table: November through June - 6 inches above the surface to 24 inches below the surface
Frequency of flooding: Rare

Included Areas

Soils that are organic between depths of 15 and 36 inches
Soils that are more than 35 percent clay between depths of 10 and 40 inches
Soils that are sandy between depths of 20 and 40 inches
Soils that are sandy throughout the profile

Major Uses

Cropland, wildlife habitat

Major Management Factors

Soil-related factors: Flooding, inadequate drainage outlets, wetness, rooting depth, susceptibility of the upper layer to compaction
Climatic factors (mean annual):
Precipitation - 70 to 100 inches
Soil temperature - 49 to 53 degrees F (varies less than 9 degrees from summer to winter)
Frost-free period - 180 to 220 days

Cropland

General management considerations:
Most climatically adapted crops can be grown if adequate drainage and protection from flooding are provided.
Suitable crops for planting are grasses and legumes.
Wetness limits the period of time suitable for planting, the choice of plants, the period of grazing, and the production of deep-rooted crops.
Drainage should be maintained throughout the growing season.
Providing drainage is difficult because many areas have poor outlets.
Most crops respond to nitrogen, phosphorus, potassium, and lime.
Legumes respond to phosphorus and lime. Additions of potassium may also be needed.
Grazing when the soil is wet results in compaction of the upper layer, poor tilth, and excessive runoff.

Suitable management practices:
Select plants that tolerate wetness or provide drainage.
Prepare the seedbed only when the soil is adequately dry.
Provide water control structures to reduce the risk of flooding.
Install subsurface drains to reduce wetness if a suitable outlet is available.
Install surface drains to reduce the length of the periods of ponding and to inhibit the growth of the less palatable water tolerant plants.
Use open ditches or tile drains to remove water on or near the surface.
Irrigate during the dry period in summer.
Regulate the rate of irrigation to prevent a rise in the level of the water table.
Regulate the application of irrigation water to control runoff and erosion.
Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
Maintain the quality and quantity of forage by mowing and clipping, controlling weeds, applying fertilizer annually, limiting grazing to drier periods, and rotating grazing.

13A—Coquille Variant silt loam, 0 to 1 percent slopes.

Composition

Coquille Variant soil and similar inclusions - 80 percent
Contrasting inclusions - 20 percent

Coquille Variant Soil

Position on landscape: Tide-influenced flood plains
Slope range: 0 to 1 percent
Elevation: 5 to 15 feet
Native plants: Red alder, willows, sedges, rushes, grasses
Typical profile:
0 to 4 inches - dark brown silt loam
4 to 22 inches - dark grayish brown, mottled silt loam
22 to 35 inches - grayish brown, mottled silty clay loam and dark gray, mottled sandy clay loam
35 to 60 inches - dark gray, mottled fine sand and very dark grayish brown fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Slow
Available water capacity: 7 to 11 inches

ATTACHMENT 2

Site Management Agreement

BIOSOLIDS APPLICATION AGREEMENT

THIS IS AN AGREEMENT effective as of _________________, 2002 ("Effective Date") between the City of Warrenton, Oregon ("City") and _________________ ("Land Owner").

The Parties Agree as Follows:

The City will provide biosolids from digested municipal sludge as a beneficial soil amendment and for supplementing crop nitrogen requirements to the Land Owner, under terms and conditions hereinafter described.

1. Terms.

a. Beginning ___________, 2002, and continuing thereafter until _________, 20__ or until terminated in writing, the City shall provide and apply the biosolids on the Land Owner's application site as described below and under the conditions as set forth below in accordance with OAR Chapter 340, Division 50, relating to biosolids application

b. The application site which is the property of _______________ is located off of _______________ Road on _______________; Map No. ________ Index, Tax Lot ________. See attached map, Exhibit "A".

c. Because of the origin of the biosolids, it is necessary to take certain precautions with its application and disposal to prevent contamination of surface or groundwater and reduce the possibility of nuisance odor conditions. Care will be taken by the City to maintain a minimum 50 foot application setback from any ditch, channel, pond or waterway. A minimum application setback of 200 feet will be maintained from downgradient springs, infiltration galleries, and water withdrawal points from surface waters and wells.

d. The City will assume responsibility for the proper removal of the biosolids from the wastewater treatment facility for disposal, transport of the biosolids to the application site, and distribution of the biosolids on the property in accordance with an approved Department of Environmental Quality (DEQ) Application Site Permit which will be developed for this site.

e. The Land Owner agrees to limit public access to the biosolids application site for 12 months following application. Access is assumed to be controlled if the site remains rural, private, closed to the general public, undeveloped and is used only for cattle grazing or animal forage crop production.

f. The Land Owner agrees that he will not plant crops for direct human consumption (fresh market fruits and vegetables) sooner than 18 months after biosolids application.

g. The Land Owner agrees that he will not harvest crops for indirect human consumption (grains) sooner than 60 days after biosolids application. There shall be no time restrictions for non-edible crops such as grass seed and nursery stock.

h. The Land Owner agrees that he will prevent animals whose products are consumed by humans from grazing on the application site for at least 30 days after biosolids application.

i. The determination of the proper amount of biosolids to be applied is the responsibility of the City and is to be managed to utilize the fertilizer value of the biosolids. The recommended amount of biosolids to be applied at the application site will be based on the nitrogen requirements of the crops to be grown by the Land Owner. Therefore, the Land Owner agrees to provided accurate information regarding crops to be grown, so that proper correct application rates will be chosen.

j. It is important to apply only the amount of nitrogen, either from sludge or from commercial fertilizer, which can be taken up by the crops on the application site. If too much nitrogen is applied, whether from biosolids, or from commercial fertilizer, the nitrogen could leach into groundwater and cause pollution. Therefore, the Land Owner agrees to forego the application of commercial fertilizer on the application site for a period of 12 months after final biosolids application on the site.

k. Access by the City of Warrenton and its agents to the application site property shall unconditionally be permitted during application season. During non-application periods, non-vehicular access by the City of Warrenton and its agents will be permitted during daylight hours. Vehicular access will be permitted only during dry weather. The City will be liable for any damages arising to the Land Owner from failure of City personnel or its agents to secure gates.

2. Compensation. The application of biosolids in accordance with the terms of this Agreement allows the City to dispose of excess material accumulated at the City's wastewater treatment facility in order to operate the facility efficiently. The biosolids received by the Land Owner provide beneficial soil amendment and nitrogen. Therefore, application of biosolids in accordance with the terms of this Agreement is considered to be mutually and equally beneficial to both parties of the Agreement and no additional compensation will be required from or by either party.

a. The Hauling and Spreading Contractor's services shall be provided under a separate contract with the City and shall be under the general supervision of the City Administrator, ____________________, or his designee. Contractor shall be an independent contractor for all purposes and shall be entitled to no compensation from the Land Owner.

b. The Hauling and Spreading Contractor's contract with the City shall require the Contractor to acknowledge responsibility for liability arising out of its negligent performance for operations at the land application site and shall hold harmless and indemnify the City and the Land Owner, their officers, agents and employees for any and all liability, settlements, loss, costs, and expenses in connection with any action, suit, or claim resulting from Contractor's negligent performance of activities under or services provided pursuant to his contract with the City.

3. <u>Termination</u>.

a. This Agreement may be terminated by the Land Owner only upon a 12 month notice to the City, except by mutual written consent of the parties.

b Any termination of the Agreement shall be without prejudice to any obligation or liabilities of either party already accrued prior to such termination.

c. The City may cancel this contract, effective upon delivery of written notice to the Land Owner by certified mail or in person, if Land Owner fails to abide with conditions called for by this Agreement. Damages for breach shall be those allowed by Oregon law, reasonable and necessary attorney fees, and other costs of litigation at trial and upon appeal.

4. <u>Sale of Property or Transfer of Interest.</u>

The Land Owner agrees that any sale or transfer of interest in the application site property will include the terms of this Agreement as a covenant attached to the property. The Land Owner further agrees that he will provide notification, in writing, to the City of Warrenton regarding any sale or transfer of interest in the application site property.

5. <u>Access to Records</u>.

The City and the Land Owner shall both have access to all logs, books, documents, papers and records of the City which are pertinent to this Agreement for the purpose of making audit, examination, excerpts and transcripts.

6. <u>Work is Property of City</u>.

All records, plans, maps, and photographs produced by the City under this Agreement and in accordance with OAR Chapter 340, Division 50 shall be the property of City. The City will not be held liable for use of documents or specifications for any other project without the express written permission of the City. The City shall keep all original documents and deliver copies to the Land Owner of logs at the end of each year. Copies of other documents relating to biosolids shall be provided by the City as requested by the Land Owner.

7. <u>Modification, Supplements or Amendments</u>.

No modification, change, supplement or amendment of the provisions of this Agreement shall be valid unless it is in writing and signed by the parties hereto.

8. Indemnity and Insurance.

To the extent claims are made arising out of biosolids disposal, the City of Warrenton shall hold the Land Owner harmless from claims of alleged violations of state or federal laws relating to disposal of wastes.

9. Integration.

This Agreement contains the entire agreement between and among the parties, integrates all the terms and conditions mentioned herein or incidental hereto, and supersedes all prior written or oral discussions or agreements between the parties or their predecessors in interest with respect to all or any part of the subject matter hereof.

10. Legal Expenses.

In the event legal action is brought by the Land Owner or City against the other to enforce any of the obligations hereunder or arising out of any dispute concerning the terms and conditions hereby created, the losing party shall pay the prevailing party such reasonable amounts for attorneys fees, costs and expenses as may be set by the court. "Legal action" shall include matters subject to arbitration and appeals.

11. Severability.

The parties agree that if any term or provision of this Agreement is declared by a court to be illegal or in conflict with any law, the validity of the remaining terms and provisions shall not be affected.

12. Number and Gender.

In this Agreement, the masculine, feminine or neuter gender, and the singular or plural number shall be deemed to include the others whenever the context so requires.

13. Captions and Headings.

The captions and headings of this Agreement are for convenience only and shall not be construed or referred to in resolving questions of interpretation or construction.

14. Calculation of Time.

All periods of time referred to herein shall include Saturdays, Sundays and legal holidays in the State of Oregon, except that if the last day of any period falls on any Saturday, Sunday or legal holiday, the period shall be extended to include the next day which is not a Saturday, Sunday or such a holiday.

15. Notices.

Any notices, reports or other documents required by this Agreement shall be sent by the parties by United States mail, postage paid, or personally delivered to the addresses below. All notices shall be in writing and shall be effective when delivered. If mailed, notices shall be deemed effective forty-eight (48) hours after mailing, unless sooner received.

16. Nonwaiver.

The failure of the one party to insist upon or enforce strict performance by the other party of any of the terms of this contract or to exercise any rights hereunder shall not be construed as a waiver or relinquishment to any extent of its rights to assert or rely upon such terms or rights of any future occasion.

17. City's Responsibilities.

The City shall furnish the Land Owner with all available necessary information, data, and materials pertinent to the execution of this Agreement. The City shall cooperate with Land Owner in carrying out the work herein and shall provide adequate staff for liaison with the Land Owner.

18. Renewal.

This Agreement in continuous from the date of approval. Unless otherwise specified, any renewal of this Agreement shall also be continuous and shall commence immediately following the date of approval. If any changes in the scope, conditions or compensation are proposed, notice of such changes shall be in writing.

19. Exhibits Included.

A. Exhibit A, Site Application Map

20. Entire Agreement.

The parties agree that this Agreement (consisting of pages 1 to 6 inclusive, together with the Exhibits identified above) is the complete expression of the terms hereto and any oral representations or understandings not incorporated herein are excluded. Further, any modifications of this Agreement shall be in writing and signed by both parties. Failure to comply with any of the provisions stated herein shall constitute material breach of contract and cause for termination. Both parties recognize time is of the essence in the performance of the provisions of this Agreement. It is also agreed by the parties that the forgiveness of the nonperformance of any provision of this Agreement does not constitute a waiver of any other of the provisions of this Agreement.

LAND OWNER:

CITY:

CITY OF WARRENTON
2225 S. Main Avenue
P.O. Box 250
Warrenton, OR 97146

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, the Effective Date of which is indicated on page 1, by their duly appointed officers.

APPLICATION SITE LAND OWNER

By: ______________________________

Date: ______________________________

CITY OF WARRENTON

By:
______________________________(sign)

______________________________(print)

Title: ______________________________

Date: ______________________________

ATTACHMENT 3

Documentation of Public Notice

PUBLIC NOTIFICATION
CHECK LIST OF ADJACENT PROPERTIES

<u>SITE ONE</u>

TL 5202

ODOT District One 350 West Marine Drive Astoria OR 97101	503-325-7222

TL2201

Pacific Corps PP&L Attn: Operations Manager 2340 SE Dolphin Warrenton OR 97146	503-861-6001

TL 2300

Mr. Nygaard

TL 201

North Coast Industrial Park, (NCIP)

<u>SITE TWO</u>

TL 403

Mr. Neikes
35418 Hwy 105
Astoria OR 97103

TL 700

Mr. Nygaard

<u>SITE THREE</u>

TL 201

Clatsop County Animal Shelter 1315 SE 19th St. Warrenton, OR 97146	503-861-7387
North Coast Juvenile Correctional Institute 1250 SE 19th St. Warrenton OR 97146	503- 861-7190

<u>SITE FOUR</u>

TL 100, TL 200

Willamette Industries
1300 SW 5th Suite 3800
Portland OR 9720

TL 900

Mrs. Barbara Miller 43626 Hansen Lane Astoria, OR 97103	503-861-1023

Public Notification for Proposed New Biosolids Land Application Sites

Public notice and documentation of public notice is required for the site authorization of proposed new biosolids land application sites. The public notice should be completed and the documentation of the public notice should be submitted to the Department along with the other information needed for biosolids land application authorization (see biosolids site submittal checklist).

If the site has no adjacent occupants or property owners, then the only documentation needed is a statement that the site is not adjacent to property with occupants and/or property owners other than the owner/property manager of the property being proposed for biosolids land application.

To document public notice, we request the following information:

- A sample of the information given, in writing, to the adjacent occupant and/or property owner. The information should include the type of activity proposed, i.e. land application of biosolids; the exact location of the property in question, i.e. a map or the legal description of the property; and the name and phone number of a contact person for the project.

- A listing of the public notice contacts (all adjacent owners and/or occupants) including name, status (owner and/or occupant), address, telephone no. (if known), legal description, how contacted (door knocking, phone call and follow-up letter, or letter alone), and results of contact - e.g. occupant not home & information left under the doormat or letter undeliverable at address of record for owner.

- A map showing the location of the adjacent property owner and/or occupant in relation to the site proposed for biosolids land application.

It should be noted that:

- Public notice does not require that the adjacent property owner/occupant approve of the biosolids land application proposal.

- Although notification should occur first, there is no required minimum waiting period between notification and the start of biosolids land application.

- The notification is not required prior to repeat biosolids land application operations at the site.

ATTACHMENT 4

Lab Analysis

ANALYSIS REPORT

AMTEST OREGON L.L.C.
Professional Laboratory Services
13035 S.W. Pacific Hwy.
Tigard, OR 97223
Tel 503 639 9311
Fax 503 684 1588

Analysis by: Oregon Certified Lab #OR031

CLIENT
City of Warrenton
Attn: Terry Ager
P.O. Box 250
Warrenton, OR 97146

SLUDGE SAMPLE

Date Sampled: 1/26/00
Date Received: 1/27/00
Date Reported: 2/22/00
Lab Number: 028/09

Project Name: Wastewater Lagoon
Sample Type: Composite of 4 corners of primary cell

Laboratory Sample #		028/09 wet	dry
Contaminant	Method	ppm	mg/Kg
Arsenic	7060	< 0.2	< 1.7
Cadmium	7130	0.01	0.08
Chromium	7190	0.7	6
Copper	7210	17.6	147
Lead	7421	3.8	31.2
Mercury	7471	< 0.04	< 0.33
Molybdenum	6010	0.2	1.5
Nickel	7520	0.5	4.2
Selenium	7740	0.10	0.83
Zinc	7950	22	183
pH	150.1	6.7	pH units
Total Solids	160.0	12.0%	
Volatile Solids	160.4	27.0%	
Total Kjeldahl Nitrogen	351.3	1,500	1.25%
Ammonia Nitrogen	350.1	96	0.080%
Nitrate	4500NO3-D	< 5	< 0.004%
Phosphate (PO4-P)	365.3	2,300	1.92%
Potassium	7610	36	0.030%

Scott Dickman

Reviewed By
Scott Dickman

warrenton 2/22/00

ANALYSIS REPORT

AMTEST OREGON L.L.C.

Professional Laboratory Services

13035 S.W. Pacific Hwy.
Tigard, OR 97223

Tel 503 639 9311
Fax 503 684 1588

Analysis by: Oregon Certified Lab #ORO31

CLIENT

City of Warrenton
Attn: Terry Ager
P.O. Box 250
Warrenton, OR 97146

Date Sampled: 3/2/00
Date Received: 3/3/00
Date Reported: 3/20/00
Lab Number: 288863-869

Project Name: Lagoon Sludge
Sample Type: Sludge
Analysis: Fecal Coliform

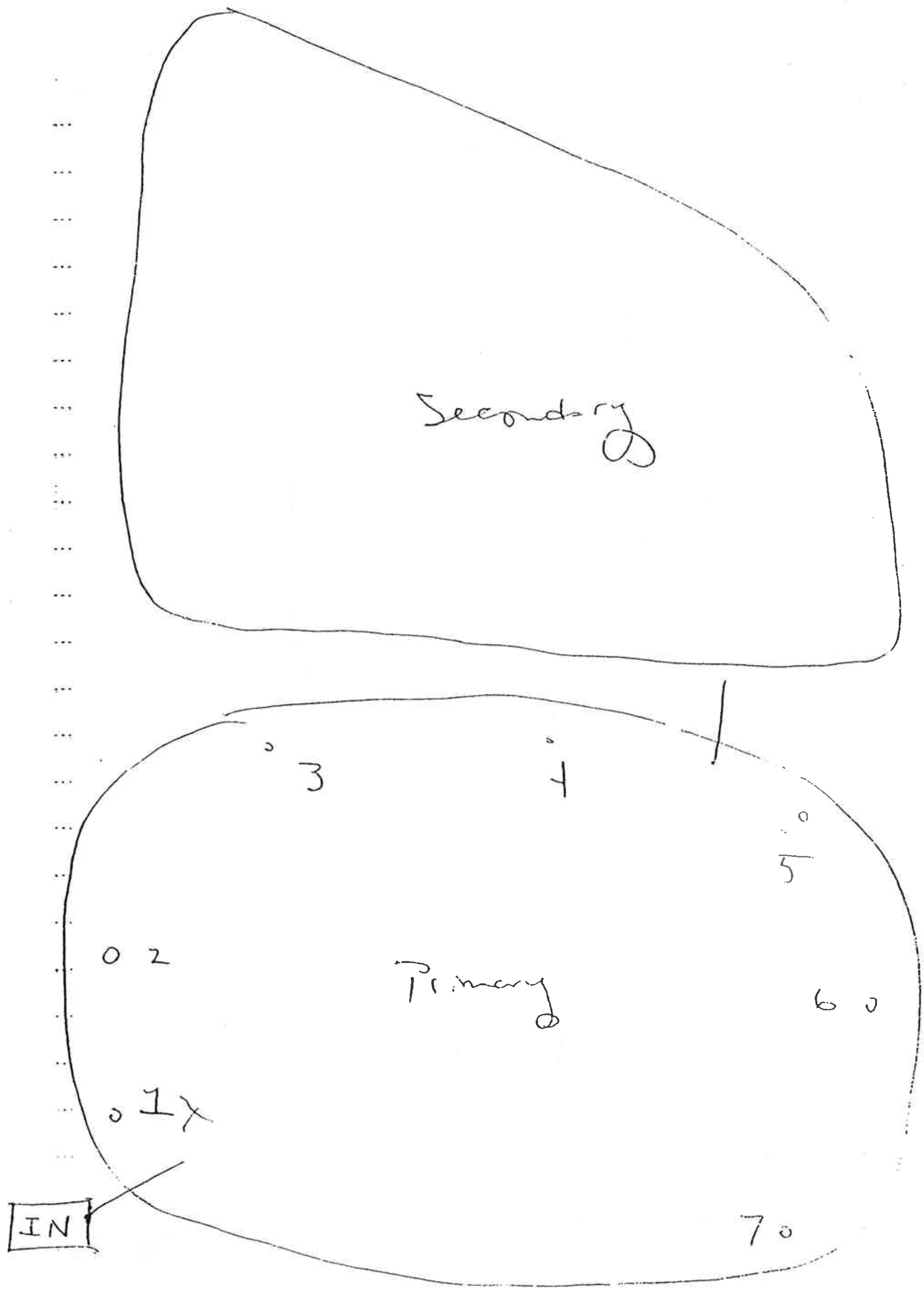
Client Sample ID	Lab ID #	MPN FC (100g wet wt)	gTS (100g wet wt)	MPN FC (gTS dry wt)
1	288863	300	0.217	1400
2	288864	500	0.197	2500
3	288866	80	0.178	450
4	288868	30	0.177	170
Primary	288867	30	0.168	180
6	288865	80	0.194	410
7	288869	22	0.228	100

Geometric Mean (7 samples) = 411 bacteria/gram dry wt.

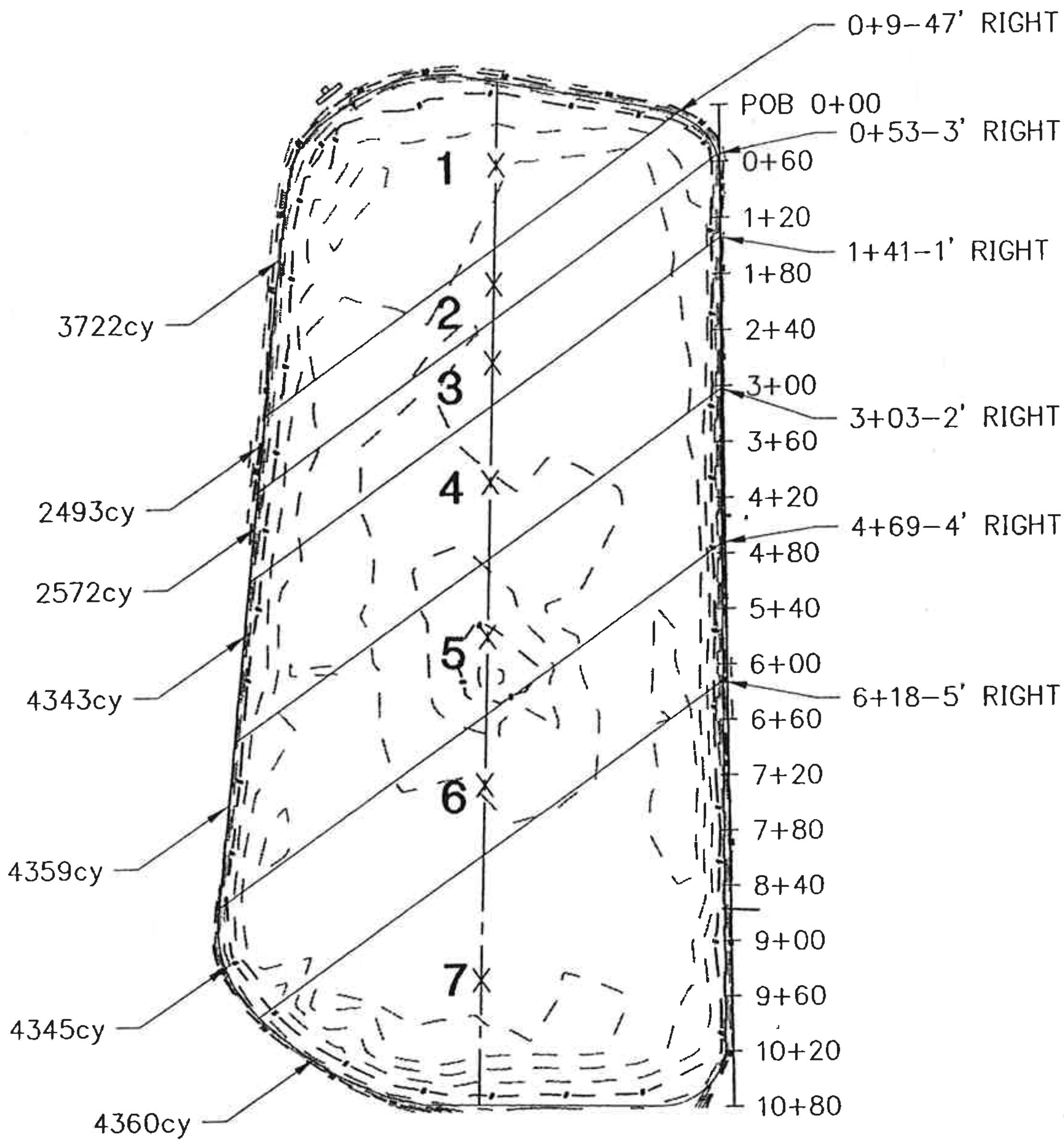
Method: SM9221E
Laboratory Reporting Limit: 2/100 mls

John Scholz

Reviewed By
John Scholz



Sample locations
3-2-2000 — Terry H., SR.



X SAMPLING POINTS

TOTAL = 26,194cy

PLAN

1"=200'

OWNER: CITY OF WARRENTON			LEE ENGINEERING, INC. 1300 JOHN ADAMS ST. OREGON CITY, OR, 97045
DWG TITLE: PRELIMINARY SAMPLING 12/20/02	DATE: JAN 2002 FILE NO: 2873FG3-X	REVISED:	FIGURE A-1

Report Date: January 14, 2002
Job Number: A11220BQ
PO Number: None Provided
Project No: None Provided
Project Name: None Provided

Susan Foreman
Lee Engineering Inc
1300 John Adams St
Oregon City, OR 97045

Analytical Narrative

The sample was received on 12/20/01 by Coffey Laboratories, Inc. (CLI) Sample Reception personnel under strict chain of custody protocol. The following information was provided at the time of sample reception:

Laboratory Sample ID	Field Identification	Matrix	Collection Date	Collection Time
A11220BQ-1	Q-1	Sludge	12/20/01	1245
A11220BQ-2	Q-2	Sludge	12/20/01	1245
A11220BQ-3	Q-3	Sludge	12/20/01	1245
A11220BQ-4	Q-4	Sludge	12/20/01	1245
A11220BQ-5	Q-5	Sludge	12/20/01	1245
A11220BQ-6	Q-6	Sludge	12/20/01	1245
A11220BQ-7	Q-7	Sludge	12/20/01	1245

Coffey Laboratories, Inc.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

Analytical Data

Lee Engineering Inc

Job Number: A11220BQ
Page Number: 3 of 9

Lab Sample ID: A11220BQ-1
Field ID: Q-1
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Microbiological

Parameter	Method	Analytical Result	Dry Weight	Units
Fecal Coliform	SM 9222-D	1410.	32,000.	/g solid

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.023	0.52	%
Total Solids	EPA 160.3	4.4	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.008	0.18	%
Total Kjeldahl Nitrogen	SM 4500-Nor g-B	0.11	2.5	%

Analytical Data

Lee Engineering Inc

Job Number: A11220BQ

Lab Sample ID: A11220BQ-2
Field ID: Q-2
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.015	0.39	%
Total Solids	EPA 160.3	3.8	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.008	0.21	%
Total Kjeldahl Nitrogen	SM 4500-Norg-B	0.08	2.1	%

Analytical Data

Lee Engineering Inc

Job Number: A11220BQ

Lab Sample ID: A11220BQ-3
Field ID: Q-3
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.018	0.34	%
Total Solids	EPA 160.3	5.3	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.015	0.28	%
Total Kjeldahl Nitrogen	SM 4500-Norg-B	0.15	2.8	%

Analytical Data

Lee Engineering Inc

Job Number: A11220BQ

Lab Sample ID: A11220BQ-4
Field ID: Q-4
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.02	0.22	%
Total Solids	EPA 160.3	9.3	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.011	0.12	%
Total Kjeldahl Nitrogen	SM 4500-Norg-B	0.13	1.4	%

Coffey Laboratories, Inc.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

Analytical Data

Lee Engineering Inc

Lab Sample ID: A11220BQ-5
Field ID: Q-5
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.014	0.41	%
Total Solids	EPA 160.3	3.4	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.011	0.32	%
Total Kjeldahl Nitrogen	SM 4500-Norg-B	0.09	2.6	%

Analytical Data

Lee Engineering Inc

Job Number: A11220BQ

Lab Sample ID: A11220BQ-6
Field ID: Q-6
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.017	0.37	%
Total Solids	EPA 160.3	4.6	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.005	0.1	%
Total Kjeldahl Nitrogen	SM 4500-Nor g-B	0.1	2.2	%

Analytical Data

Lee Engineering Inc

Lab Sample ID: A11220BQ-7
Field ID: Q-7
Date/Time: 12/20/01 1245
Matrix: Sludge

EPA Category: Inorganic Chemicals

Parameter	Method	Analytical Result	Dry Weight	Units
Ammonia Nitrogen	SM4500NH3BC	0.015	0.33	%
Total Solids	EPA 160.3	4.6	---	%
Nitrate-Nitrite Nitrogen	SM 418-E	0.015	0.33	%
Total Kjeldahl Nitrogen	SM 4500-Norg-B	0.1	2.2	%

Profile Management

New Profile | | Get Profile

1171 12 Assigned Tests. Total: $300

Save Changes | RESET

Expired: 01/31/1997 Rushcode: STANDARD Type: Kit

PName50: Expanded Sludge Profile

PName35: Expanded Sludge Profile

Kit Instructions:

	Test	**Methodno**	**Test Days**	**Price ($300)**	**Working Branch**	**Delete**
36	**Nitrogen: NH4-N**	SM4500NH3BC	8	20.00	Port	
66	**Nitrogen: Total Kjeldahl (TKN)**	SM 4500-Norg-B	8	35.00	Port	
221	**pH: Non Aqueous Samples**	EPA 9045	1	10.00	Port	
311	**Mercury-CV: Total Hg solid/sludge**	EPA 7471	8	25.00	Port	
461	**Solids: VS**	EPA 160.4	5	20.00	Port	
503	**Solids: TS**	EPA 160.3	5	20.00	Port	
504	**Nitrate-Nitrite: Solids & Sludges**	SM 418-E	5	20.00	Port	
684	**Digestion Fee: ICP-solid matrix**	EPA 3050	8	15.00	Port	
3184	**ICP-Total Ag**	EPA 6010b	8	10.00	Port	
3299	**ICP-Total AsCdCrCuKMoNiPSeZn**	EPA 6010b	8	90.00	Port	
3352	**ICP-Total Pb**	EPA 6010b	8	10.00	Port	
4961	**Fecal Coliform: MF Count (Liquid)**	SM 9222-D	2	25.00	Port	

Add Test to Profile: 9

Add Test

Save Changes | Reset

ATTACHMENT 5

Calculations: Agronomic Application Rate

DATA FROM SAMPLING 12/20/02								
SAMPLE	DEPTH	SLUDGE	CONC.		MASS	TKN	NH4	NO3-NO2
#	Ft	Ft.	%	CY	tons	%	%	%
1	8	2	4.4	3722	142.16	2.5	0.52	0.18
2	7.6	2	3.8	2492	82.20	2.1	0.39	0.21
3	7.1	1.3	5.3	2572	118.33	2.8	0.34	0.28
4	6.4	1.5	9.3	4343	350.61	1.4	0.22	0.12
5	6.1	1.5	3.4	4359	128.65	2.6	0.41	0.32
6	6	1	4.6	4345	173.50	2.2	0.37	0.1
7	8	1.7	4.6	4360	174.10	2.2	0.33	0.33
Ave Depth		1.57	5.06		1169.57	2.26	0.37	0.22

CALCULATIONS FOR DETERMINING
AGRONOMIC RATE

TKN Biosolids Total Organic Nitrogen (% dry wt)
AN Biosolids Ammonium (% dry wt)
NN Biosolids Nitrate-Nitrite (% dry wt)

Available Nitrogen
[(TKN - AN) M + AN · R + NN] C
R = Ammonium Retained use 0.5
M = Mineralization use 0.225
C = Conversion from % to lbs/dry ton use 20

Available Nitrogen =
[(2.26 - 0.37) 0.225 + 0.5 (0.37) + 0.22] 20
= 16.605 lbs N / DT

Application Rate

140 lbs N/ Acre / Yr / 16.605
= 8.43 DT/Acre/Yr
120 lbs N/ Acre/ Yr / 16.605
= 7.23 DT/Acre/Yr

Mass of Biosolids At 5.06 % TS
(26,200 CY (27)(5.06/100)(8.345) 7.481) 1.03 (1/2000)
= 1150 DT = 1044 MT

Agronomic Application Rate
at 140 lbs N/Acre/ Yr = 1150 DT/ 8.43 DT/Acre/ Yr
= 136 Acres
at 120 lbs N/ Acre/ Yr = 1150 DT/ 7.23 DT/ Acre/ Yr
= 159 Acres

[illegible]

LEE ENGINEERING, INC.
1300 JOHN ADAMS ST.
OREGON CITY, OR 97045
(503) 655-1342 FAX (503) 655-1360

MADE BY ________ DATE ________ SHEET NO. ________
CLIENT ________ FILE NO. ________
PROJECT ________

AGRONOMIC APPLICATION RATES

Assuming 3% TS Concentration after rehydration

$140 \text{ lbs N/Acre/Yr} \rightarrow (8.43 \text{ DT/Acre/Yr})(2000)\left(\frac{100}{3}\right)\left(\frac{1}{8.345}\right)\left(\frac{1}{1.03}\right)$

$= 65{,}384 \text{ gal/Acre/Yr}$

$120 \text{ lbs N/Acre/Yr} \rightarrow (7.23 \text{ DT/Acre/Yr})(2{,}000)\left(\frac{100}{3}\right)\left(\frac{1}{8.345}\right)\left(\frac{1}{1.03}\right)$

$= 56{,}076 \text{ gal/Acre/Yr}$

Assuming 6% TS

$140 \text{ lbs N/Acre/Yr} \rightarrow (8.43 \text{ DT/Acre/Yr})(2{,}000)\left(\frac{100}{6}\right)\left(\frac{1}{8.345}\right)\left(\frac{1}{\text{[illegible]}}\right)$

$= 32{,}692 \text{ gal/Acre/Yr}$

$120 \text{ lbs N/Acre/Yr} \rightarrow (7.23 \text{ DT/Acre/Yr})(2{,}000)\left(\frac{100}{6}\right)\left(\frac{1}{8.345}\right)\left(\frac{1}{1.0\text{[illegible]}}\right)$

$= 28{,}038 \text{ gal/Acre/Yr}$

sign and date

LEE ENGINEERING, INC.
1300 JOHN ADAMS ST.
OREGON CITY, OR 97045
(503) 655-1342 FAX (503) 655-1360

MADE BY ________ DATE ________ SHEET NO. ________
CLIENT ________ FILE NO. ________
PROJECT ________

APPENDIX – K

(City of Warrenton Sewer Use Ordinance and State Parks Agreement)

Matt Howard
1369 S. Main Ave.

ORDINANCE NO. 853-A

AN ORDINANCE ESTABLISHING REGULATIONS FOR PUBLIC AND PRIVATE SEWER SYSTEMS; PROVIDING PENALTIES; REPEALING ORDINANCE 524-A AND ANY OTHER CONFLICTING ORDINANCES.

The city of Warrenton, Oregon, ordains as follows:

Section 1. Definitions. Unless the contest specifically indicates otherwise, the meaning of terms used in this ordinance shall be as follows:

(1) Sewage works means all facilities for collecting, pumping, treating, and disposing of sewage.

(2) Supervisor means the public work supervisor of the city, or his authorized deputy, agent or representative.

(3) Sewage means a combination of the water-carried wastes from residences, business buildings, institutions, and industrial establishments.

(4) Sewer means a pipe or conduct for carrying sewage.

(5) Public sewer means a sewer in which all owners of abutting properties have equal rights, and is controlled by the city.

(6) Combined sewer means a sewer receiving both surface runoff and sewage.

(7) Sanitary sewer means a sewer which carries sanitary sewage and industrial waste and to which storm, surface and ground waters are not intentionally admitted.

(8) Storm sewer or storm drain means a sewer which carries storm and surface waters and drainage, but excludes sewage and polluted industrial wastes.

(9) Sewage treatment plant means any arrangement of devices and structures used for treating sewage.

(10) Industrial wastes means any arrangement of devices and structures used for treating sewage.

(11) Garbage means solid wastes from the preparation, cooking, and dispensing of food, and from the handling, storage and sale of produce.

(12) Properly shredded garbage means the wastes from the preparation, cooking and dispensing of foods that have been shredded to such degree that all particles will be carried freely under the flow conditions normally prevailing in public sewers, with no particle greater than 1/2 inch in any dimension.

(13) Building sewer means that part of the lowest horizontal piping of a plumbing system which receives the discharge from soil, waste and other drainage pipes inside the walls of the building and conveys it to the property line of the abutting street, alley or right-of-way.

trunk line is located. Where property is more than 100 feet from a city sewer main, the city may then extend the standard 4-inch service from the nearest main along an available right-of-way for a distance not to exceed 100 feet. The selection of the right-of-way to be used for extending the 4-inch service shall be made by the city.

(5) The provision for the installation of a 4-inch service by the city shall be available to all property owners whether or not they are required to be connected to the sewer system. However, when the cost of such installation exceeds $1,050.00 as determined by the city engineer, the property owners shall be required to pay the basic $750.00 connection fee plus all costs of installation in excess of $1,050.00 when they require connection to the city sewer. The connection and hook-up fees must be paid as set forth by resolution, prior to commencement of work by the city.

Section 3. Private Sewage Disposal.

(1) Where a public sanitary sewer is not available under the provisions of section 2(3) and (4), the building sewer shall be connected to a private sewage disposal system complying with the provisions of the article and with requirements of the state plumbing code and rules and regulations of the State Health Division and Oregon's D.E.Q.

(2) Before commencement of construction of a private sewage disposal system, the owner shall first obtain a written permit signed by the supervisor. The application for such permit shall be made on a form furnished by the city which the applicant shall supplement by any plans, specifications and other information as are deemed necessary by the supervisor. A permit and inspection fee as set forth by resolution shall be paid to the city at the time the application is filed.

(3) A permit for a private sewage disposal system shall not become effective until the installation is completed to the satisfaction of the supervisor. He shall be allowed to inspect the work at any stage of construction and, in any event, the applicant for the permit shall notify the supervisor when the work is ready for final inspection and before any underground portions are covered. The inspection shall be made within forty-eight (48) hours of the receipt of notice by the supervisor.

(4) The type, capacities, location and layout of a private sewage disposal system shall comply with the requirements of the Oregon D.E.Q. and the State Health Division.

(5) At such time as a public sewer becomes available to a property served by a private sewage disposal system, as provided in section 2(3) and (4), a direct connection shall

be done in accordance with specifications prescribed by the city and subject to the approval of the city.

(5) If the city approves the application and the charges are paid as herein provided, the city auditor, accounting supervisor or their designate, shall thereupon issue a sewer connection permit for the premises covered in said application, and said permit shall be in the form prescribed by the city.

(6) Sewer connections and house laterals shall be so constructed as to conform with provisions of the Oregon State Plumbing Code, and the physical connection to sewer mains, trunk sewers or lateral sewers shall be made only by a licensed plumber of the State of Oregon or an individual approved by the city of Warrenton as competent to make sewer hookups.

(7) All costs and expense incident to the installation and connection of the building sewer shall be borne by the owner. The owner shall indemnify the city from any loss or damage that may directly or indirectly be occasioned by the installation of the building sewer.

(8) A separate and independent building sewer shall be provided for every building; except where one building stands at the rear of another on an interior lot and no private sewer is available or can be constructed to the rear building through an adjoining alley, court, yard or driveway, the building sewer from the front building may be extended to the rear building.

(9) Old building sewers may be used in connection with new buildings only when they are found, on examination and test by the supervisor, to meet all requirements of this ordinance.

(10) The building sewer shall be cast iron, ductile iron, extra strength concrete, polyvinyl chloride or extra strength clay pipe. All shall have "O" ring rubber gasket joints. Joints shall be tight and water proof. Any part of the building sewer that is located within 10 feet of a water service pipe shall meet State Health Division requirements.

(11) The size and slope of the building sewer shall be subject to the approval of the supervisor, but in no event shall the diameter be less than four (4) inches. The slope of such 4-inch pipe shall be not less than one-eighth inch (1/8") per foot, unless a flatter grade is absolutely necessary and approved by the supervisor.

(12) Whenever possible, the building sewer shall be brought to the building at an elevation below the basement floor. The depth shall be sufficient to afford protection from frost. The building sewer shall be laid at uniform grade and in straight alignment in so far as possible.

Changes in direction shall be made only with properly curved pipe and fittings.

(13) In all buildings in which any building sewer is too low to permit gravity flow to the public sewer, sanitary sewage carried by such sewer shall be lifted by approved artificial means and discharged to the building sewer. Facilities necessary to accomplish this objective shall be installed, maintained and operated by the owner of the building.

(14) All excavations required for the installation of a building sewer shall be open trench work unless otherwise approved by the supervisor. Pipe laying and backfill shall be performed in accordance with regulations of the D.E.Q. and state plumbing code.

(15) All joints and connections shall be made water-tight and gas-tight. Rubber "O" ring joint cast iron, vitrified clay, concrete or PVC pipe may be used. Other jointing materials and methods may be used only upon approval by the supervisor.

(16) The connection of the building sewer into the public sewer shall be made at the property line where the city side sewer terminates. If no "T" or "Y" branch is available at a suitable location, a new hole may be cut into the public sewer to receive the side sewer. A 45 degree ell may be used to make such connection with the spigot end cut so as not to extend past the inner surface of the public sewer. The invert of the side sewer at the point of connection shall be at the same or at the point of connection shall be at the same or at a higher elevation than the invert of the public sewer. A smooth, neat joint shall be made secure and watertight with a saddle connection designed for this purpose.

(17) The applicant for the building sewer permit shall notify the supervisor when the building sewer is ready for inspection and connection to the public sewer. The connection shall be made only under the supervision of the supervisor or his representative.

(18) All excavations for building sewer installation shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the city.

(19) All property owners shall maintain, at their own expense, the sanitary sewer service lateral line on their property. They shall also be financially responsible for any blockage between the sewer service lateral and the sewer main, whether or not on private or public property.

Section 5. Use of Public Sewers.

(1) No person shall discharge or cause to be discharged any storm water, surface water, ground water, roof runoff, subsurface discharge, cooling water or unpolluted industrial process waters to any sanitary sewer.

(2) Storm water and all other unpolluted drainage shall be discharged to such sewers as are specifically designated as storm sewers or to a natural outlet approved by the supervisor.

(3) Except as hereinafter provided, no person shall discharge or cause to be discharged any of the following described waters or wastes to any public sewer:

(a) Any liquid or vapor having a temperature higher than 150 deg. F.

(b) Any water or waste which may contain more than 10 mg/l of fat, oil or grease.

(c) Any gasoline, benzene, naphtha, fuel oil or other flammable or explosive liquid, solid or gas.

(d) Any household garbage that has not been properly shredded.

(e) Any ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, paunch manure or any other solid or viscous substance capable of causing obstruction to the flow in sewers or other interference with the proper operation of the sewage collection facilities, pumping stations, pipelines and treatment works.

(f) Any waters or wastes having a pH lower than 6.0 or higher than 8.5 or having any other corrosive property capable of causing damage or hazard to structures, equipment and personnel of the sewage works.

(g) Any waters or wastes containing a toxic or poisonous substance in sufficient quantity to injure or interfere with any sewage treatment process, constitute a hazard to humans, animals or fish life, or create any hazard in waters receiving the effluent from the treatment works.

(h) Any waters or wastes containing suspended solids of such character and quantity that unusual attention or expense is required to handle such material at the sewage treatment plant.

(i) Any noxious or malodorous gas or substance capable of creating a public nuisance.

(4) Grease, oil and sand interceptors shall be provided when, in the opinion of the supervisor, they are necessary for the proper handling of liquid wastes containing grease in excessive amounts, or any flammable wastes, sand and other harmful ingredients, except that such interceptors shall be of a type and capacity approved by the

supervisor and shall be located as to be readily and easily accessible for cleaning and inspection.

(5) Grease and oil interceptors shall be constructed of impervious materials capable of withstanding abrupt and extreme changes in temperature. They shall be of substantial construction, watertight and equipped with easily removable covers which, when bolted in place, shall be gastight and watertight.

(6) Where installed, all grease, oil and sand interceptors shall be maintained by the owner, at his expense, in continuously efficient operation at all times.

(7) The admission into the public sewers of any waters or wastes having (a) a five-day biochemical oxygen demand greater than 300 parts per million by weight, or (b) containing any quantity of substances having the characteristics described in section 5(3), or (c) containing more than 350 parts per million by weight of suspended solids, or (d) having an average daily flow greater than 2% of the average daily sewage flow of the city, shall be subject to the review and approval of the supervisor. Where necessary in the opinion of the supervisor, the owner shall provide, at his expense, such preliminary treatment as may be necessary to, (a) reduce the biochemical oxygen demand to 300 parts per million and the suspended solids to 350 parts per million by weight, or (b) reduce objectionable characteristics or constituents to within the maximum limits provided for in section 5(3), or (c) control the quantities and rates of discharge of such waters or wastes. Plans, specifications and any other pertinent information relating to proposed preliminary treatment facilities shall be submitted for the approval of the supervisor and of the D.E.Q. and no construction of such facilities shall be commenced until said approvals are obtained in writing.

(8) Where preliminary treatment facilities are provided for any waters or wastes, they shall be maintained continuously in satisfactory and effective operation, by the owner at his expense.

(9) When required by the supervisor the owner of any property served by a building sewer carrying quantities of wastes as described in section 5(7), shall install a suitable manhole in the building sewer to facilitate observation, sampling and measurement of the wastes. Such manhole, when required, shall be accessible and safely located, and shall be constructed in accordance with plans approved by the supervisor. The manhole shall be installed by the owner at his expense, and shall be maintained by him so as to be safe and accessible at all times.

(10) All measurements, tests, and analyses of the characteristics of water and wastes to which reference is made in subsections 3 and 7, of this section, in accordance

with American Public Health Association Standard Methods and shall be determined at the city laboratory from a sample taken at the control manhole.

(11) No statement contained in this section shall be construed as preventing any special agreement or arrangement between the city and any industrial concern whereby an industrial waste of unusual strength or character may be accepted by the city for treatment, subject to payment therefor by the industrial concern and under such conditions and circumstances as the city may specify.

Section 6. Protection From Damage.

(1) No unauthorized person shall maliciously, willfully, or negligently break, damage, destroy, uncover, deface or tamper with any structure, appurtenance or equipment which is a part of the municipal sewage works. Any person violating this provision shall be subject to immediate arrest.

Section 7. Powers and Authority of Inspectors.

(1) The supervisor and other duly authorized employees of the city bearing proper credentials and identification shall be permitted to enter upon all properties for the purposes of inspection, observation, measurement, sampling and testing, in accordance with the provisions of this ordinance.

Section 8. Monthly Service Charges - Billing.

(1) The city of Warrenton shall bill the monthly sewer charge, bi-monthly, along with the bi-monthly billing of the water charge. Where payment is delinquent for either the sewer service charge or other sewer charges, including hook-up charges, the water may be shut off according to the schedule set out in the city's water ordinance. The city of Warrenton, Oregon may use such means for collection of rates and charges for sewer service and hook-up charges as may be provided by the laws of the State of Oregon or permitted by the charter and ordinances of the city of Warrenton, Oregon; and any monthly service charge to actual users' delinquencies may be certified to the tax assessor of Clatsop County for collection in the manner and as provided by ORS 454.225; and, after collection, these charges shall be paid over to the city in the same manner as other taxes are certified, assessed, collected and paid over; and ORS 454.225 is made a part hereof as fully as if set out herein and is hereby referred to.

(2) Any charge due hereunder which shall not be paid when due may be recovered by an action at law by the city of Warrenton, Oregon. In such action, suit or proceeding the court may award to the prevailing party such sums as the

court may adjudge reasonable as attorney's fees at trial or on appeal of such suit or action, in addition to all other sums provided by law.

Section 9. Fees, Charges and Monthly Service Charges.

(1) All fees, charges and monthly service charges will be established by resolution and approved by the Warrenton city commission.

(2) To assist the town of Hammond in its federal funding for its sewer system, the city of Warrenton shall review its sewer rates biennially and periodically revise them in light of the requirements of the United States Environmental Protection Agency regulations.

Section 10. Penalties.

(1) Any person found to be violating any provisions of this ordinance, except section 6(1), shall be served by the city with written notice stating the nature of the violation and providing a reasonable time limit for satisfactory correction. The offender shall, within the period of time stated in such notice, permanently cease all violations.

(2) Any person who shall continue any violation beyond the time limit provided for in section 10(1) shall be guilty of a misdemeanor and upon conviction before the Municipal Judge, shall be punished by a fine in an amount not exceeding $300.00 for each violation, or imprisonment in the county jail for a period not exceeding 100 days, or by both such fine and imprisonment.

Section 11. Validity.

(1) In case any portion of the ordinance shall be held to be invalid for any reason whatsoever by any court, then all other provisions of this ordinance shall be held and considered to be independent of and separate from such invalid portions and shall not be affected or rendered void by the invalidity of such other portions.

Section 12. Repealing.

(1) Ordinance No. 524-A, adopted May 19, 1989; 535-A, adopted November 3, 1969; 536-A, adopted December 1, 1969; 626-A adopted June 21, 1976; 538-A, adopted January 19, 1970; 603-A, adopted May, 1974; 687-A, adopted April 2, 1980; 713-A, adopted July 7, 1981; 753-A, adopted September 26, 1983; 778-A, adopted March 12, 1985; 805-A, adopted August 19, 1987; and any other ordinances in conflict, are repealed.

Passed by the city commission and approved by the mayor May 17, 1989.

COPY

RESOLUTION NO. 1003

Introduced by Commissioner Scott Holman

ADOPTING NEW SEWER FEES AND SERVICE CHARGES AND REPEALING RESOLUTION NO. 961

The City of Warrenton, Oregon, resolves as follows:

Section 1. Sanitary sewer rates shall be determined as follows:

A. Residential User: Single-family residences, multi-family dwellings, apartments, modular/manufactured homes used for permanent residential dwelling purposes, whether on owned, rented or leased land): Each living unit will be charged a flat fee of $13.00 per month

B. Commercial and industrial Users, RV Parks, Motels and Other Transient Accommodation users: $5.75 for each individual business, plus $1.50 per month per 1000 gallons of water usage as determined by the metered water use for the month, with a minimum charge of $13.25 per month.

Section 2. Under certain circumstances, where substantial amounts of water are not discharged to the sewer, the City may agree to establish a sewer rate based on alternative methods, if the following conditions are met:

A. The customer requests, in writing, an alternative billing method.
B. The alternative method provides a reliable estimate of the amount of sewerage being contributed to the system.

Section 3. Connection and hook-up fees listed below shall include the cost of inspection of materials and workmanship.

A. Single-family dwelling	$1,575
B. Apartment, multi-family dwelling	1,575
Additional 3 bedroom units each	1,350
Additional 2 bedroom units each	1,200
C. Motels, commercial buildings, schools, Industrial plants*	
(1) First 18 fixture units	$1,575
(2) Each additional 10 to 18 fixture units	1,350

*Those structures which contain one separate and distinct business. A commercial building containing more than one business separated by a common wall shall be considered as a separate sewer connection and a determination of fixture units will be separate for each business contained therein.)

D. Trailer Parks, Mobil home Parks	
(1) Trailer Pads (each)	$1,575
(2) Recreational and Service Buildings	
(a) First 18 fixture units	1,575
(b) Each additional 10 to 18 fixture units	1,350

E. System administration fees: When all improvements for complete installation have been provided by owner:

(1) Per sewer connection for each subdivision lot, for single family and manufactured dwellings	$ 340
(2) Per sewer connection for each RV space	210
(3) Industrial, recreational and service buildings	
(a) First 18 fixture units	340
(b) Each additional 10 to 18 fixture units	340
(4) Each apartment or multi-family dwelling, including duplex	340

F. Service charge fee: Locating sewer laterals, installing clean-out and inspecting customer connections to city sewer $ 210

G. Fixture Units: To calculate fixture units under Section 3. "C", "D" and "E", the following shall apply:

1 toilet	= 6 fixture units
1 urinal	= 5 fixture units
1 shower	= 2 fixture units
1 tub/shower	= 2 fixture units
1 sink or wash basin	= 2 fixture units
1 washing machine	= 2 fixture units
1 Bradley sink	= 8 fixture units
1 garbage grinder in commercial building	= 12 fixture units

The connection and hook-up fees are $1,575 or as set out above for other than single-family dwellings, or the actual cost for the sewer connection. Said fees to be payable with the application or in payment of not less than one-fifth of the appropriate sum to be paid in advance, with the balance to be paid annually in four equal annual installments with interest at nine per cent (9%).

If payment for connection and hook-up charges is made in full within 30 days of date of application or within 30 days of notice that application should be made, a discount of four per cent (4%) for cash will be made.

__Section 4.__ The provision for the installation of a 4 inch service by the City shall be available to all property owners whether or not they are required to be connected to the sewer system. However, when the cost of such installation exceeds $1,575, as determined by the City Engineer, the property owner shall be required to pay the basic $1,575 connection fee, plus all costs of installation in excess of $1,575 when connection to the city sewer is required.

__Section 5.__ A surcharge of 10% of the sewer fees charged for services to all users of the City's sanitary sewer system, will be charged for storm sewer. The purpose of the surcharge revenue will be to partially fund mandated federal legislation expounded in the Department of Environmental Quality National Pollutant Discharge Elimination System waste discharge permit issued to the City of Warrenton. This permit requires the City to identify and reduce infiltration and inflow of storm water into the sanitary sewer collection system.

__Section 6.__ Any fees, charges, taxes or penalties that are assessed, requested or required by this resolution are deemed by the Warrenton City Commission to not be subject to the limits of Section 11b, Article XI of the Oregon Constitution and will be adopted according the Section 1(b)(e) and Section 2 of ORS 310.145.

__Section 7.__ This resolution shall become effective on May 1, 1999. Resolution No. 961 is hereby repealed as of that date.

First Reading March 17, 1999

Second Reading March 31, 1999

PASSED by the City Commission of the City of Warrenton, Oregon, this 31st day of March,

1999

APPROVED AND ADOPTED by the Mayor of the City of Warrenton, Oregon, this 31st day of

'arch, 1999

Barbara Balensifer
Mayor

ATTEST:

Gilbert Gramson
City Manager/Auditor

CITY OF WARRENTON
WARRENTON, OREGON 97146
P. O. BOX 250 • PHONE 861-2233

21 June 1979

Mr. John E. Hollingsworth
Parks Engineering Supervisor
Parks and Recreation Branch
Oregon State Dept. of Transportation
525 Trade Street S. E.
Salem - OREGON - 97310

Re: Sewer Agreement

Dear Mr. Hollingsworth:

At its meeting of 20 June 1979, the Warrenton City Commission approved the Fort Stevens - Warrenton sewer agreement with the attached amendment. I assume you will obtain the approval of the Oregon State Department of Transportation and return a fully-executed copy of the agreement for city records.

Your efforts in finalizing this lengthy process and in reaching an agreement are appreciated.

Sincerely,

CITY OF WARRENTON

Gilbert Gramson

Gilbert G. Gramson
Auditor & Police Judge

GG:jb
encl.

AMENDMENT TO SEWAGE DISPOSAL SERVICES AGREEMENT

This Amendment to that certain Sewage Disposal Services Agreement entered into between the STATE OF OREGON, by and through its Department of Transportation, Parks and Recreation Branch and the City of Warrenton, is entered into this 20th day of June, 1979, said amendments being as follows:

1. The existing trailer holding dump tank station will remain in place for disposal of solid waste with the effluent line from the existing drain field attached to the City sewer.

2. Paragraph 7 is amended to provide that the maintenance yard and Park Manager's residence will be moved from their existing location and will not add to the contemplated load on the system. That the proposed visitor's center and the proposed historical area will not have more than ten (10) additional units.

APPROVED:

____
Engineering Supervisor, State Parks and Recreation Branch

STATE OF OREGON, by and through its Department of Transportation, Parks and Recreation Branch

By

____
State Parks Superintendent

APPROVED AS TO FORM:

____
Assistant Attorney General

Subscribed and sworn to before me this _______ day of June, 1979.

____
Notary Public for Oregon
My Commission Expires: ______________

CITY OF WARRENTON, By and through its

City Commission

By

[illegible signature]
Mayor

Gilbert Granson
City Auditor

Subscribed and sworn to before me this 20th day of June, 1979.

[illegible signature]
Notary Public for Oregon
My Commission Expires: 6-11-82

SEWAGE DISPOSAL SERVICES
AGREEMENT

THIS AGREEMENT, made and entered into this 26th day of June 1979, by and between the STATE OF OREGON, by and through its Department of Transportation, Parks and Recreation Branch, hereinafter referred to as "STATE"; and the City of Warrenton, a municipal corporation of the State of Oregon, by and through its City Commission hereinafter referred to as "CITY":

W I T N E S S E T H:

WHEREAS, STATE has determined that it is necessary to contract with CITY for the provision of sewer services necessary to the proper operation of Fort Stevens State Park in Clatsop County, Oregon; and

WHEREAS, STATE is authorized to enter into a cooperative agreement to secure such services by ORS 366.400, 366.005(10), and ORS 390.110; and

WHEREAS, CITY has determined that it is equipped to, and may provide such services, and is authorized to enter into a cooperative agreement to do so by ORS 190.110;

NOW, THEREFORE, based upon the foregoing recitals, it is hereby agreed by and between the parties as follows:

1. CITY agrees to provide, own, operate and maintain the necessary sewage disposal service facilities required to furnish adequate sewer services to Fort Stevens State Park, and to continue to supply sewer service to the Park for present and future uses of the Park.

2. During the first twelve months in which CITY provides sewage disposal services to Fort Stevens State Park pursuant to this agreement, STATE shall pay to CITY the following monthly user fees based upon anticipated sewage flows.

During the months of June, July, August, and September of this first year, the monthly user fee shall be $520. In all other months of the first twelve months the monthly service fee shall be $208.

a. These service charges are based on average estimated sewage flow converted to Equivalent Dwelling Units (EDU) at the rate of 270 gallons per EDU. The average daily use is determined to be 35,000 gallons during the months of June, July, August and September, and 14,000 gallons per day for the remaining months.

3. The monthly service rate shall be $4 for each EDU.

4. At the end of one year from date of initial connection to the sewage system, the average daily use figures in 2a shall be adjusted to reflect actual average sewage flow based on meter readings at the park point of connection to the system.

5. At the end of a five year period from time of conversion to actual sewage flow and at five year intervals thereafter, the parties to this agreement shall review the average daily use figures and readjust as determined appropriate by both parties.

6. The monthly service rate established pursuant to paragraph 3 above shall remain in effect until city determines that rising costs require a general rate increase. Provided, however, the Equivalent Dwelling Unit rate increase charged to state may not exceed the increase charged to other private, non-commercial users of the city's sewage disposal system.

7. STATE agrees to participate financially in an anticipated one-time expansion of the Warrenton lagoon system's capacity. This one-time expansion is necessitated in part by the increased need for capacity caused by the provision of sewage disposal services to Fort Stevens State Park. This agreement contemplates that sewage disposal services will be provided to the existing Park and facilities, to the existing and proposed historical area facilities,

proposed visitors center, maintenance yard and park manager's residence (shown in Exhibit C which is attached hereto and incorporated by reference into this agreement). Apart from the sewage load caused by serving the above-mentioned facilities, no additional increase in the sewage load at Fort Stevens State Park is anticipated. The parties hereby aoree that the estimated local share of the costs of such an expansion, computed according to projected 1985 construction costs, will be $140,000. STATE in reliance upon such estimate, agrees to contribute 10 percent of the local share of the costs of that one-time lagoon expansion.

8. This agreement shall remain in full force and effect, and shall bind the parties hereto, their successors and assigns, until terminated by one of the parties to this agreement, or its successors or assigns. Termination

may be made by giving one year's written notice to all of the parties to the agreement or their successors or assigns.

IN WITNESS WHEREOF, the parties hereto have signed their names on the day and year hereinabove written.

The Oregon Transportation Commission, by a duly adopted delegation order, authorized its Chairman or Vice Chairman to act in its behalf in approving this agreement. Approval was given for the agreement on ________________________, 197___, by ______________________________, which approval is on file in the Commission Records. The delegation order authorizes the State Parks Superintendent to execute the contract on behalf of the Commission.

APPROVED:

John E. Hollingsworth
Engineering Supervisor,
State Parks and Recreation Branch

APPROVED AS TO FORM:

____
Assistant Attorney General,

STATE OF OREGON, by and through its Department of Transportation, Parks and Recreation Branch

By

____
State Parks Superintendent

Subscribed and sworn to me this ______ day of ______________, 197___.

____
Notary Public for Oregon
My Commission Expires:______________

CITY OF WARRENTON
By and through its
City Commission

By

Leslie W. Newton
Mayor

Gilbert Granson
City Auditor

Subscribed and sworn to me this ___ day of ________, 1972

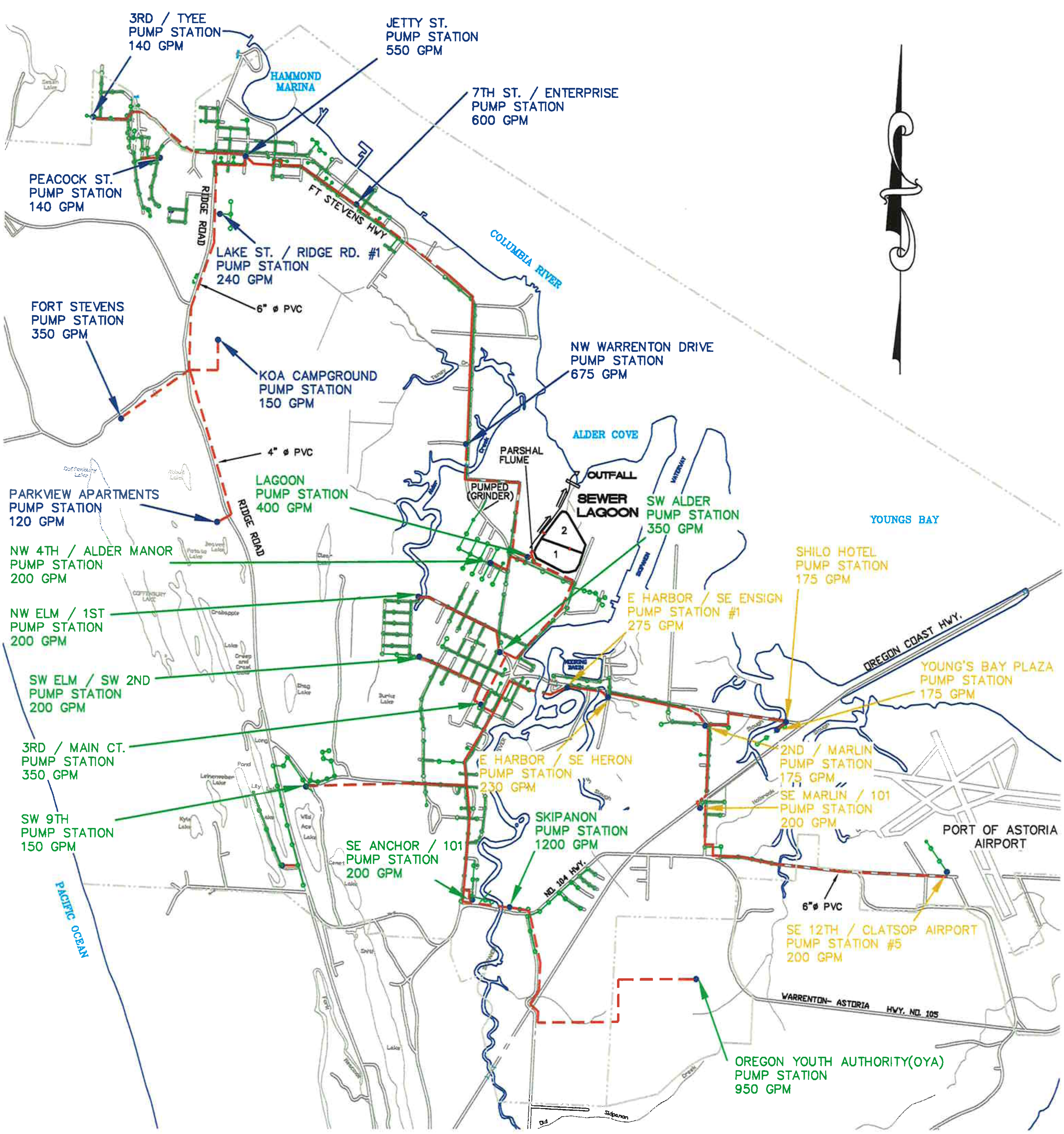
____
Notary Public for Oregon
My Commission Expires: 6-1-82

APPENDIX – L

(Pump Station Reports)

City of Warrenton – Pump Station Index

Name	Location
3rd / Main Court	Warrenton
S.W. Alder	Warrenton
Lagoon	Warrenton
S.E. Anchor / 101	Warrenton
N.W. Elm / 1st Street	Warrenton
S.W. Elm / S.W. 2nd	Warrenton
N.W. 4th / Alder Manor	Warrenton
S.W. 9th	Warrenton
Skipanon	Warrenton
Oregon Youth Authority	Warrenton
N.W. Warrenton Drive	Hammond
7th / Enterprise	Hammond
Jetty Street	Hammond
3rd / Tyee	Hammond
Fort Stevens	Hammond
Lake Street / Ridge Road # 1	Hammond
KOA Campground	Hammond
Parkview Apartments	Hammond
Peacock Street	Hammond
E. Harbor / S.E. Ensign	E. Warrenton Interceptor
E. Harbor / S.E. Heron	E. Warrenton Interceptor
2nd / Marlin Ave.	E. Warrenton Interceptor
Young's Bay Plaza	E. Warrenton Interceptor
Shilo Hotel	E. Warrenton Interceptor
S.E. Marlin / 101	E. Warrenton Interceptor
S.E. 12th / Clatsop Airport	E. Warrenton Interceptor



PUMP STATION REFERENCE MAP

LEGEND

- URBAN GROWTH
- CITY LIMITS
- FORCE MAIN
- GRAVITY MAIN
- PUMP STATION
- GRAV. COLL. SYS.

NOTE: THE URBAN GROWTH BOUNDARY IS THE SAME AS THE CITY LIMITS, UNLESS OTHERWISE SHOWN.

THIS MAP IS A GENERAL REPRESENTATION OF THE SEWAGE COLLECTION SYSTEM FROM INFORMATION PROVIDED BY THE CITY OF WARRENTON. NO WARRANTY, EXPRESSED OR IMPLIED, REGARDING THE ACCURACY OF THIS MAPPING SHOULD BE UNDERSTOOD.

HLB & ASSOCIATES, INC., SEASIDE, OR.
DRAWING NAME: PUMP STATION REFERENCE MAP.DWG

LIST OF SEWER LIFT STATIONS

CURRENT NAME	ORIGINAL DESIGNATION
SE ANCHOR /101	(LID #1)
NW ELM / 1ST	(NW ELM / NW 1ST STREET STATION)
OREGON YOUTH AUTHORITY(OYA)	(NCIP STA.-"C")
3RD / MAIN CT.	(ORIGINAL #1)
SW ALDER	(ORGINAL #2)
LAGOON	(ORGINAL #3)
SKIPANON	(NCIP STA.-"A")
NW 4TH / ALDER MANOR	-
SW ELM / SW 2ND	-
SW 9TH	-
NW WARRENTON DRIVE	(HAMMOND "A")
7TH ST. / ENTERPRISE	(HAMMOND "B")
JETTY ST.	(HAMMOND "C")
3RD / TYEE	(HAMMOND "D")
FORT STEVENS	(HAMMOND "E")
LAKE ST. / RIDGE ROAD #1	(KRILL ST.)
KOA CAMPGROUND	-
PARKVIEW APARTMENTS	(PARKVIEW APARTMENTS)
PEACOCK ST.	(BATTERY RUSSELL)
E HARBOR / SE ENSIGN	(EAST WARRENTON INTERCEPTOR P/S #1)
E HARBOR / SE HERON	(EAST WARRENTON INTERCEPTOR P/S #2)
2ND / MARLIN	(EAST WARRENTON INTERCEPTOR P/S #3)
SE MARLIN / 101	(EAST WARRENTON INTERCEPTOR P/S #4)
SE 12TH / CLATSOP AIRPORT	(EAST WARRENTON INTERCEPTOR P/S #5)
SHILO HOTEL	-
YOUNG'S BAY PLAZA	-

WARRENTON - PUMP STATION EQUIPMENT INVENTORY

PUMP STATION	3rd / Main Court (Original #1)	S.W. Alder (Original #2)	Lagoon (Original #3)	S.E. Anchor / 101 (L.I.D. #1)	N.W. Elm / 1st Street	S.W. Elm / S.W. 2nd	N.W. 4th / Alder Manor	S.W. 9th	Skipanon (NCIP STA - A)	Oregon Youth Authority (OYA) (NCIP STA - C)
Location	Intersection	Intersection	Cell #1 WWTP	Intersection	Intersection	Intersection	Mobile Home Park	SW 9th	N.E. of bridge, on Spur 104	W. of facility along road
Date Constructed	1969	1969	1969	1978	-	-	1974	1995	1998	1998
Type	Wet Well / Submersible	Wet Well / Submersible	Wet Well / Submersible	Duplex/Suction Prime	Duplex/Suction Prime	Duplex/Suction Prime	Duplex/Suction Prime	Wet Well / Submersible	Wet Well / Submersible	Wet Well / Submersible
Pump Manufacturer	Enpo / Cornell	Enpo/Cornell	Enpo/Cornell	Hydronix	Hydronix	Hydronix	Hydronix	Paco	Flgyt	Yeoman
Model #	4DNDH-SS?	4DNDH-SS?	4DNDH-SS?	#40 MMPC	#40 MMPC	#40 MMPC	#40 MMPC	Paco 480-01	CP3127-411	4123
Rated Cap. (EA) @ TDH	Original = 340 GPM	Original = 350 GPM	Original = 400 GPM	Original = 200 GPM	Original = 200 GPM	Original = 200 GPM	Original = 200 GPM	150 GPM @ 45' TDH	1200 GPM @ 22' TDH	950 GPM @ 75' TDH
Pump Hp (EA)	10	10	10	5	5	5	5	10	10	30
Impeller	Unknown	10 - 0" Trim	Original = Unknown	9 - 7/8" Trim	9 - 1/8" Trim	7 - 1/2" Trim	8 - 0" Trim	7 - 7/8" Trim	-	10 - 0" Trim
Level Control	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float
Wet Well Dimensions	96" Dia. 204" Deep	96" Dia. 215" Deep	96" Dia. 204" Deep	72" Dia. 199" Deep	72" Dia. 147" Deep	72" Dial. 138" Deep	72" Dia. 126" Deep	72" Dia. 144" Deep	120" Dia. 150" Deep	120" Dia. 211" Deep
OVERFLOW										
O. Point	-	-	-	-	-	-	-	-	-	-
O. Discharge	-	-	-	-	-	-	-	-	-	-
O. Elevation	Ground	Ground	Ground	Ground	Ground	Ground	Not possible-see report	Ground	Ground	Ground
O. Alarm Elevation	-	-	-	-	-	-	-	-	-	-
AUXILIARY POWER										
Type	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator
Location	City Shops	City Shops	City Shops	City Shops	City Shops	City Shops	City Shops	City Shops	City Shops	City Shops
Transfer Switch	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FORCE MAIN										
Diameter, Length	8" Dia. 1400'	6" Dia. 250'	6" Dia. 11'	4" Dia. 575'	4" Dia. 775'	4" Dia. 575'	4" Dia. 510'	4" Dia. 3500'	10" Dia. 1100'	8" Dia. 6150'
Material	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Profile	-	-	-	-	-	-	-	-	-	-
Discharge Manhole	Tees Into Force Main	Tees Into Force Main	Flume at WWTP	S Main + SE 15th Street	NW First + Date St	SW 2nd St	Near intersection of NW 4th + NW Warrenton Dr.	Near SW 9th and Cedar	Intersection of S. Main + Spur 104	Intersection of Dolphin Rd., + Spur 104
Air Release Valves	None	None	None	None	None	None	None	None	None	Yes
Vacuum Release Valves	None	None	None	None	None	None	None	None	None	Yes
SULFIDE CONTROL										
Back Drainage System	None	None	None	None	None	None	None	None	None	None
Air Injection Comp.	None	None	None	None	None	None	None	Yes	Yes	Yes
Chemical Feed	None	None	None	None	None	None	None	None	None	None

*(Original Name or Tributary Connection)

green

<u>3rd / Main Court
Pump Station</u>

(Original #1)

PUMP STATION REPORT

3^{RD} & MAIN COURT
(Original #1 of 3)

DESCRIPTION:

This is one of the three (3) original pump stations constructed in 1969. It is a 2 component station, wet well, and control building. It handles gravity tributary flows from central and south Warrenton, which include the Skipanon, OYA and the Harbor/Ensign pump stations. It then conveys the sewage north, by shared force main (with the Second & Alder station) to the sewage lagoons.

It is a concrete wet well, duplex station, with submersible 10.0 hp Enpo/Cornell brand pumps. No rail system exists for the submersible pumps. Pumps are serviced via a cable retrieval system. The wet well cover is concrete with an aluminum hatch cover, and two (2) vented manhole covers, see photo 3MC-1. The interior of the wet well, grate and ladder assembly were in place, see photo 3MC-2. See recommendations below.

No outside gate valve vault was evident, outside of the wet-well nor is any shown in the as-built plans. The force main, a dual pipe, "y" assembly inside the wet well did not have the required test ports or gauges, see photos 3MC-3. Shut-off gate valves on the discharge piping/header assembly operated properly. In this case, both pumps were tested by the drawdown method, rather than the pressure/flowrate method. Both pumps were found to be operational, when tested for drawdown. A DEQ Flowrate spreadsheet is provided as part of this report for future testing of this station.

The electrical and telemetry controls are separate from the wet well and contained in a dedicated building of brick construction, above ground. The original bubbler system (for wet well level control) has been removed and replaced with mechanical float/switch assemblies. The electrical controls were inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any component. See photo 3MC-4. The controls were tested through operational cycling during the draw down testing. The control panel appears to be a NEMA 4, coated panel, with the proper sealing and panel latch, see photo 3MC-4. A small 110v heater operates to control moisture in the shelter building.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, located just below the control panel, inside the brick shelter building. It is looped over the alarm telemetry panel in photo 3MC-5.

The alarm is mounted on the top of the brick shelter building, which is shown on photo 3MC-6. The alarm appeared to function properly. The alarm is clearly visible from 3^{RD} or Main Court, and other locations. The station's alarm system is also tied into a central alarm console, which is located in the City of Warrenton Public Works Shop.

PUMP FLOWRATE/EFFICIENCIES:

Technical information on this pump station is limited to original plan layout and pump curve from the City archives. No pump station O&M manual was found in records.

See attached pump curve. Based upon a design maximum flow rate of 340 gpm, the calculated TDH is 38 feet for a new pump. I nfluent control, normally lacking during pump testing was not a factor during drawdown testing. All pumps that feed the shared force main and flume assembly were shut down, via radio control, and only this pump station was allowed to operate. The operator would wait until he had enough liquid in the wet well to pump, and then operate the pump. Only one pump was allowed to run per test. Measured pump flows were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump Chamber
#1	312 gpm	92 %	8 %
#2	220 gpm	65 %	35 %

Explanation of the columns: Percentage of new pump capacity is: New pump flow divided by measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing. Measured flow is typically from a DEQ Flow rate test. However, since this particular pump was tested by actual flume flow, those results are presented here. The test instrument was a Milltronics OCM-III transducer and electronic flow totalizer located in the equipment shelter at the lagoons.

Flow rates will likely decrease with multiple pump stations operating simultaneously.

It should be noted that the common force main that is currently used by this station is also shared with another original station, #2, which is the Second and Alder Station. The shared force main is not operating in accordance with current DEQ guidelines. The pump stations, depending on pumping cycles tend to run longer when all (or more than one) pump station is operating. Hence, there is more electrical use, more pump wear, maintenance, and the resulting lower flows.

FORCE MAIN:

The pump station force main length is approximately 1,400 feet from the wet well discharge flange to a tee near the Second and Alder Station. It is constructed of 8"ϕ PVC. It has a very flat profile, with no vacuum break or air release appurtenances. The tee enables the SW Alder pump station and 3rd/Main Ct pump station to share a 10"ϕ transite force main. This 10"ϕ force main changes to a 12"ϕ force main near the corner of NE Harbor and Main, runs north, and terminates at the Lagoon influent parshall flume.

HYDROGEN SULFIDE:

Because pump station discharge is to the shared existing 10"ϕ transite force main, no discharge manhole exists. The interior of the wet well showed some damage from hydrogen sulfide. The wet well was found to be in fair condition, with some hydrogen sulfide damage to the wet well interior. The influent manhole to the wet well is located at the center pavement near the intersection of 3rd and Main Court. This influent manhole has some evidence of surcharging.

OVERFLOWS/BYPASS:

Should the pump station wet well surcharge to the point of flooding, the overflow would come out of the influent manhole in the center of the intersection. It would then run toward a drainage ditch to the west, then into the storm drain system. The influent manhole location is at the lowest ground elevation, which is the centerline of pavement near the intersection of 3rd and Main Court. This influent manhole has some evidence of surcharging. Especially is the foregoing true during periods of high rainfall (winter storm events).

RECOMMENDATIONS:

This station is in poor condition.

- □ Immediate investigation should be made of pump #2. Also, this station has difficulty keeping up with upstream stations. It should be remembered that this station's capacity is ***340 gpm***, while serving the downtown area, it also serves the East Warrenton, Interceptor (275 gpm), and the Skipanon River station (1200 gpm). Therefore, a 340 gpm station is asked to keep up with flows that could be as high as 1,475 gpm. The main gravity sewage trunk line that starts near the high school and continues downtown is being used for storage of the rainfall peaks, and when the system has reached capacity, some manholes surcharge. It is important to repair pump #2.

- □ Investigation of alternatives/routes/costs to multiple connections to force main.

- □ If in the foreseeable future, no upgrades are planned for this station, the flow characteristics of the area that this station serves should be examined, and the pumps/impellers should be upgraded to more realistically handle the flows. See additional recommendation below.

- □ Continued regular maintenance, cleaning, as the City is doing. Wet well safety chains/cables should be added inside the wet well grate area for the safety of maintenance personnel.

- □ The pump discharge gate valves and check valves located inside the wet well should be exercised and lubricated during the maintenance program. One check valve may not be returning to its closed position, which adds a quantity of liquid back into the wet well after it has been evacuated through a pumping cycle. This additional quantity of liquid must be pumped again, further adding cost to station operation.

- Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this critical station, and make it possible to use the DEQ flow rate methodology for future testing.

- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance. If a program to track Costs/Personnel time for this pump station is not in place, it should be implemented. The inefficiencies of this station are well documented with City forces.

- A recommendation made elsewhere in the Facilities Plan recommended that this station and the one at Second and Alder be removed, and one large station added west of the intersection of NW Warrenton Drive and South Main.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUBMERSIBLE PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	________	inches	(Datum typically lid of wetwell/vault)
Depth of pump eye to datum	________	inches	(Datum typically lid of wetwell/vault)
Impeller eye elevation	________	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	________	inches	
Depth of fluid to guage (for start)	________	inches	**START**
Depth of fluid to guage (for stop)	________	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*
Shutoff head, direct guage reading,	________ psig	________ psig
SO HEAD, trans. to eye of pump, then up to midpool	**0.00** FT	**0.00** FT
Discharge head		
Guage reading @ pump start, psig	38 psig	________ psig
Reading adj. to impeller eye (add guage off.)	87.78 FT	0.00 FT
Guage reading @ pump stop	________ psig	________ psig
Reading adj. to impeller eye (add guage off.)	0.00 FT	0.00 FT

(psi*2.31) + avg pumped distance: this calculation is the mid-pool for max pump capacity
(TRACE SHUTOFF HEAD INTO CURVE)

(psig*2.31) + guage offset only

(psig*2.31) + guage offset only

Total Dynamic Head, (feet)

TDH @ pump start, (discharge head - wtr over eye)	FT	FT
TDH @ pump stop, (discharge head - wtr over eye)	FT	FT

BACK OUT THE WETWELL WATER LEVEL:
discharge head @ start - water over pump eye @ start
discharge head @ stop - remaining water over pump eye @ stop
(TAKE THESE NUMBERS INTO CURVE)

FLOWRATE DATA @ Pump RPM of: ________ RPM

Flowrate @ pump start (curve interpolation)	________ *GPM*	________ *GPM*
Flowrate @ pump stop (curve interpolation)	________ *GPM*	________ *GPM*
Average Flow, gpm, (mid-pool)	**0** *GPM*	**0** *GPM*

Mean average

STATION: 3RD/MAIN COURT **(orig. #1)**
CURVE Yes No
DATE OF FIELD TESTING:
FIELD PERSON: GGL CHECKED BY:
DATE OF OFFICE CALCS:

Design GPM	________ *GPM*	________ *GPM*
% of new capacity	#DIV/0!	#DIV/0!

Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

Note:
This spreadsheet and the notes that follow are off of the worksheet and published DEQ Guidelines; "O&M NOTES FOR GAUGES ON SEWAGE PUMPS".

Design: QQQ gpm FT' TDH
Impeller: 00.0"
HP = 00

3rd & MAIN COURT P/S

4000 SERIES MODEL NUMBER EXAMPLE:

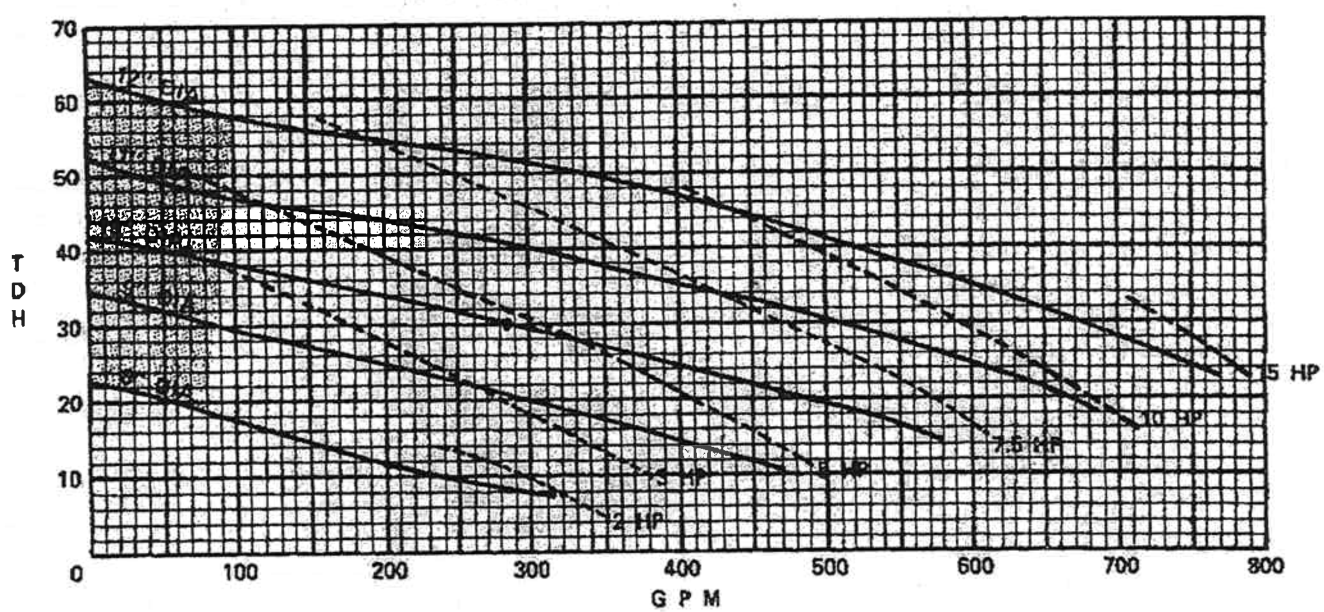
4 (DISCHARGE SIZE) — 6 (PUMP TYPE) — 05 (IMPELLER BLADE DIA.) — 05 (HORSE POWER)

HORSE POWER: 05=5HP, 72=7.5HP, 10=10HP, 15=15HP

01=8D	17=9D	33=10D	49=11D
02=8-1/16D	18=9-1/16D	34=10-1/16D	50=11-1/16D
03=8-1/8D	19=9-1/8D	35=10-1/8D	51=11-1/8D
04=8-3/16D	20=9-3/16D	36=10-3/16D	52=11-3/16D
05=8-1/4D	21=9-1/4D	37=10-1/4D	53=11-1/4D
06=8-5/16D	22=9-5/16D	38=10-5/16D	54=11-5/16D
07=8-3/8D	23=9-3/8D	39=10-3/8D	55=11-3/8D
08=8-7/16D	24=9-7/16D	40=10-7/16D	56=11-7/16D
09=8-1/2D	25=9-1/2D	41=10-1/2D	57=11-1/2D
10=8-9/16D	26=9-9/16D	42=10-9/16D	58=11-9/16D
11=8-5/8D	27=9-5/8D	43=10-5/8D	59=11-5/8D
12=8-11/16D	28=9-11/16D	44=10-11/16D	60=11-11/16D
13=8-3/4D	29=9-3/4D	45=10-3/4D	61=11-3/4D
14=8-13/16D	30=9-13/16D	46=10-13/16D	62=11-13/16D
15=8-7/8D	31=9-7/8D	47=10-7/8D	63=11-7/8D
16=8-15/16D	32=9-15/16D	48=10-15/16D	64=11-15/16D
			65=12D

4000 SERIES SUBMERSIBLE
TYPE 6
(ALSO MODEL 4DNDH-SS WITH RELIANCE MOTOR)
SPEED – 1150 RPM
IMPELLER – HIGH HEAD DELTA
DIAMETER – VARIOUS
MAX. DIA. SOLIDS – 3"
DISCHARGE SIZE – 4"

NOT RECOMMENDED FOR APPLICATIONS IN SHADED AREA.



Enpo-Cornell Pump Company A DIVISION OF Roper Industries, Inc. (Ohio)
420 EAST THIRD STREET, PIQUA, OHIO 45356

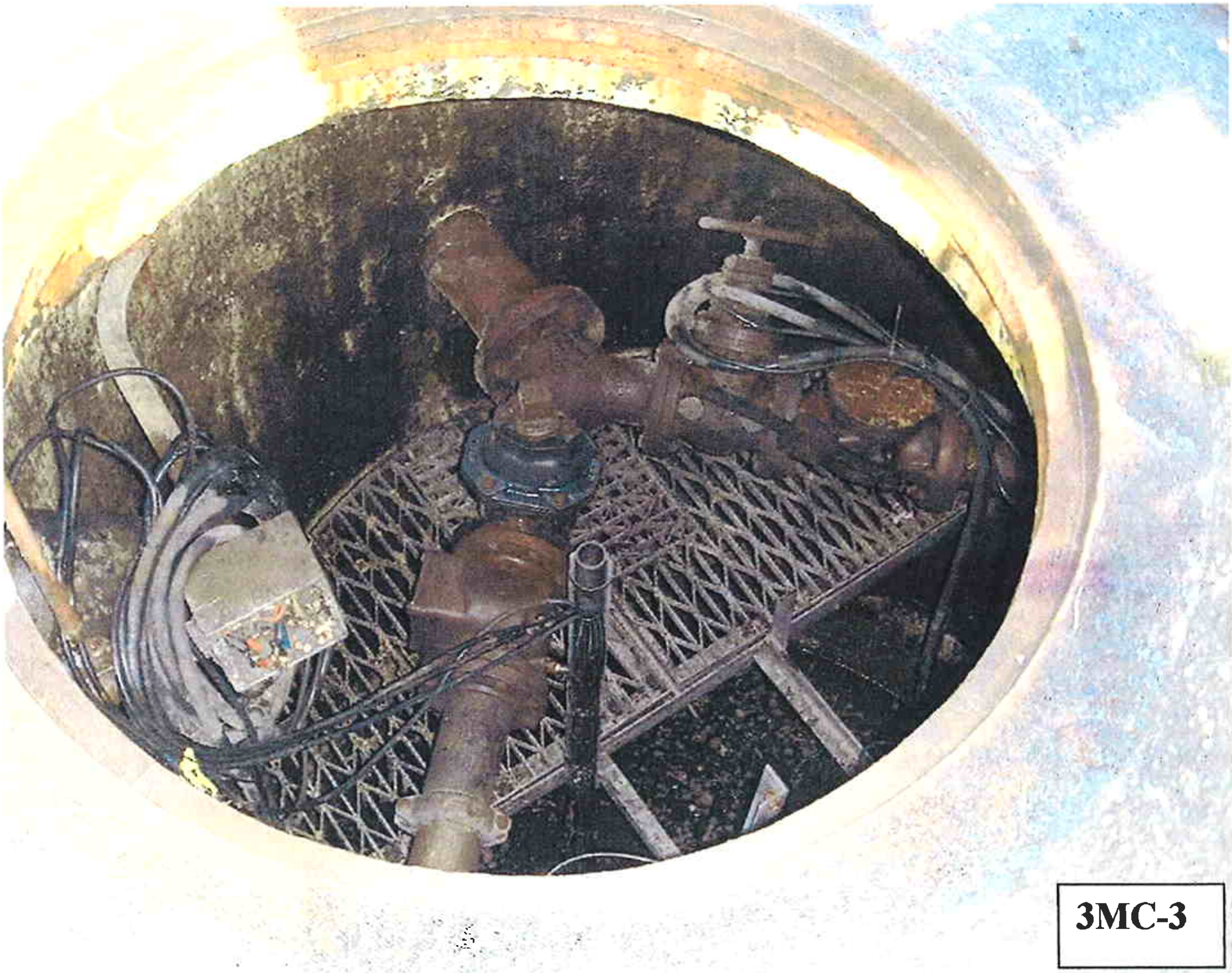
4000 SERIES SUBMERSIBLE PUMPS – 1150 RPM
TYPE 6 – DOUBLE SEAL, LEAK SENSOR
(ALSO MODEL 4DNDH-SS WITH RELIANCE MOTOR)

8/78

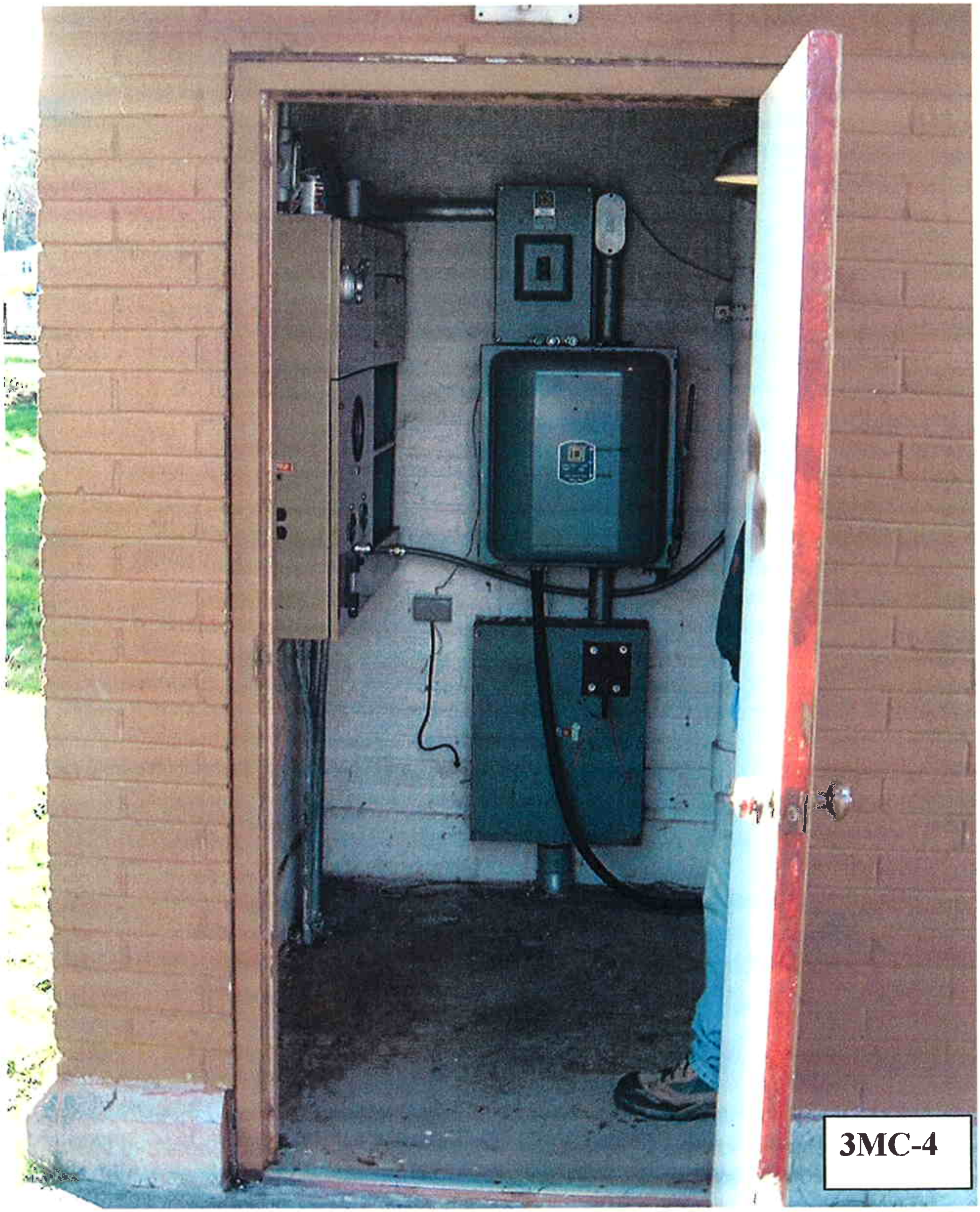
2040-4


3MC-1

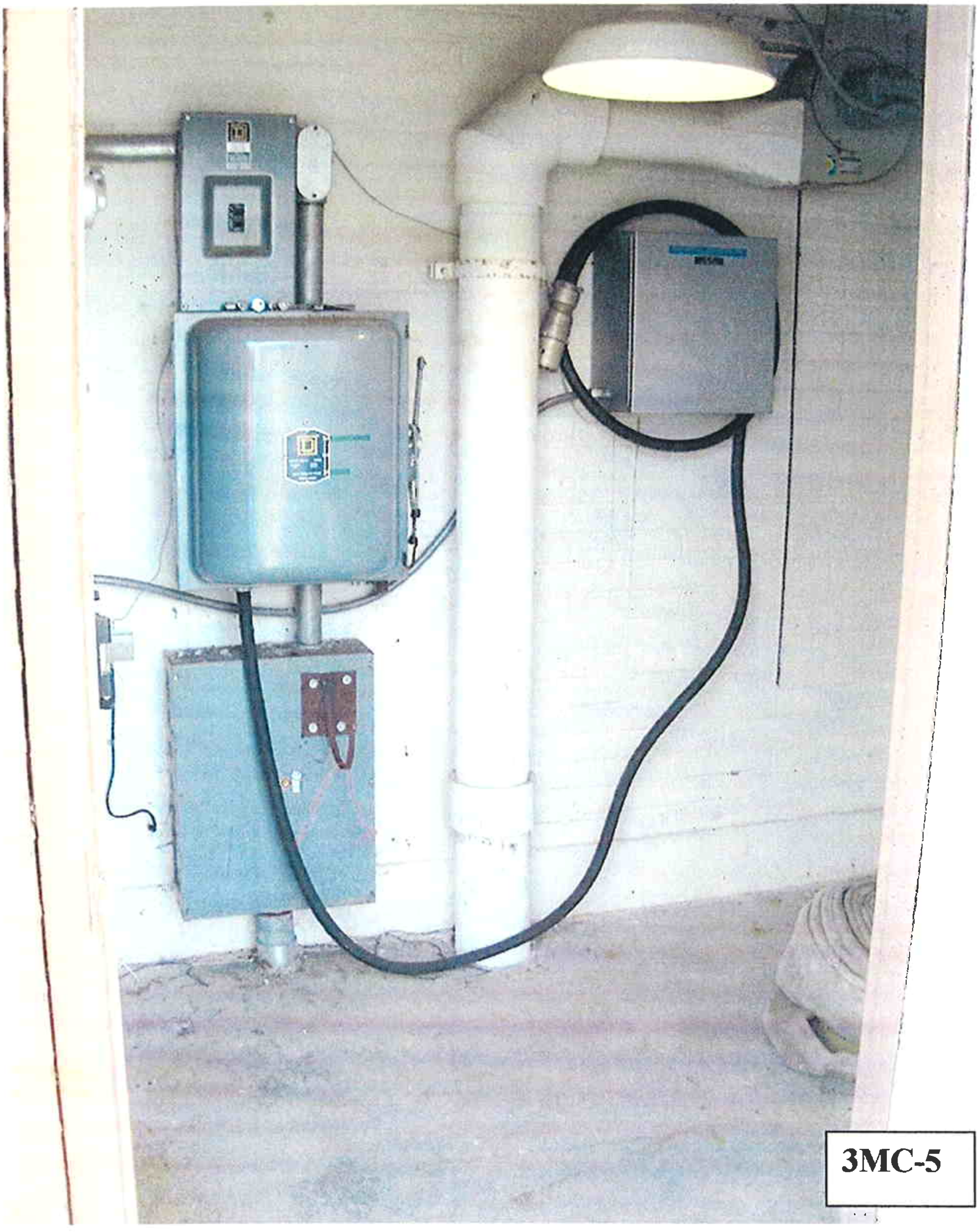
3MC-2



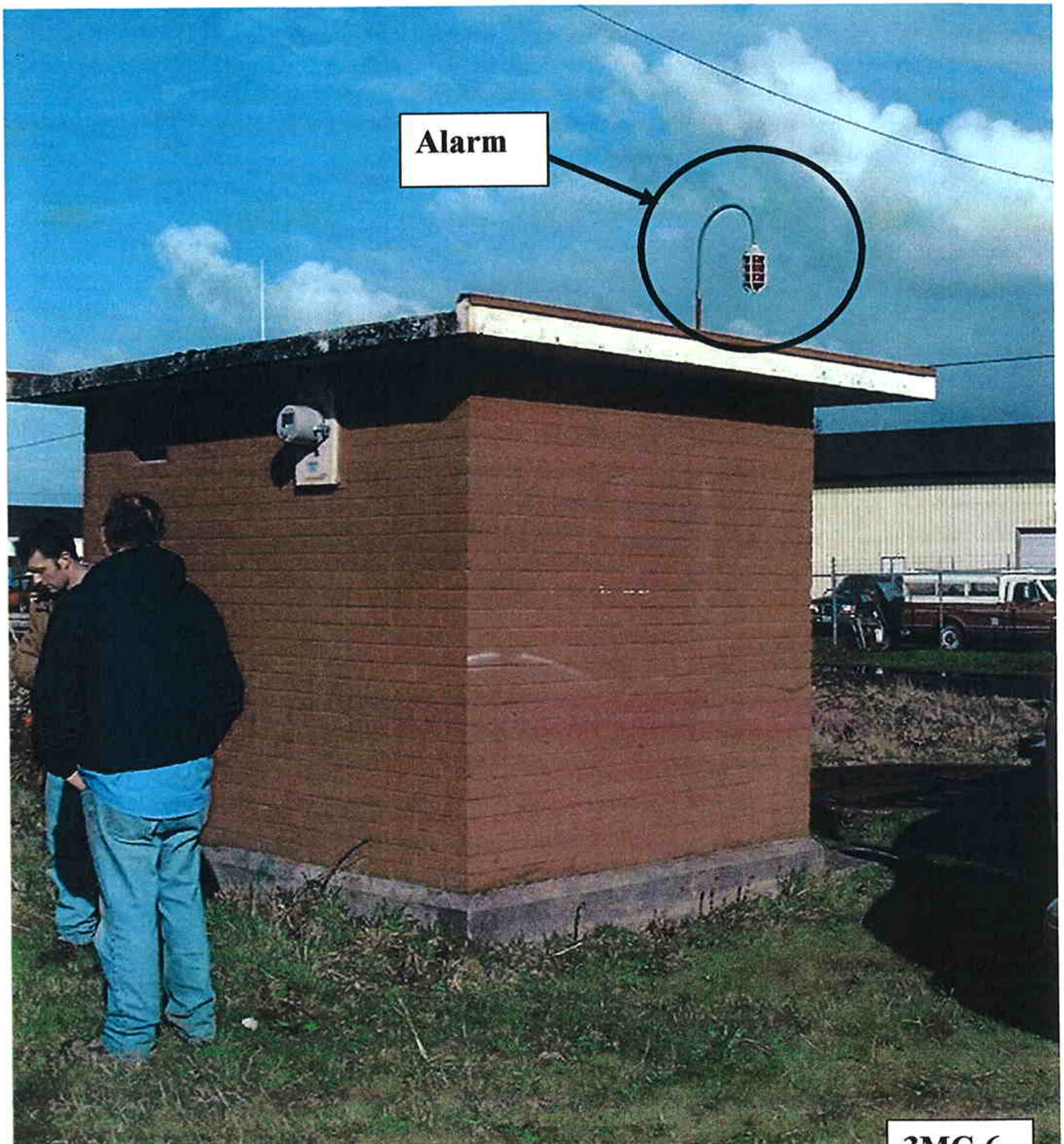
3MC-3



3MC-4



3MC-5


Alarm
3MC-6

SW Alder Pump Station

(Original #2)

PUMP STATION REPORT

SW ALDER & SECOND
(Original #2 of 3)

DESCRIPTION:

This is one of the three (3) original pump stations constructed in 1969. It is a 2 component station, wet well, and control building. It handles gravity tributary flows from NW Warrenton and West Warrenton. It then conveys the sewage north, by shared force main (with the 3rd/Main Court station) to the sewage lagoons.

It is a concrete wet well, duplex station, with submersible 10.0 hp Enpo/Cornell brand pumps. No rail system exists for the submersible pumps. Pumps are serviced via a cable retrieval system. The wet well cover is concrete with an aluminum hatch cover, and two (2) vented manhole covers, see photo ALD-1. Inside the wet well, the grate assembly was in place, see photo ALD-2. See recommendations below.

No outside gate valve vault was evident, outside of the wet-well nor is any shown in the as-built plans. The force main, a dual pipe, "y" assembly inside the wet well did not have the required test ports or gauges, see photo ALD-2. Shut-off gate valves on the discharge piping/header assembly operated properly. Both pumps were tested per the DEQ Flow rate method, rather than the drawdown method. Both pumps were found to be operational, when tested. A DEQ Flowrate spreadsheet is provided as part of this report for future testing of this station.

The electrical and telemetry controls are separate from the wet well and contained in a dedicated building of brick construction, above ground. The original bubbler system (for wet well level control) has been removed and replaced with mechanical float/switch assemblies. The electrical controls were inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any component. The controls were tested through operational cycling during the flow rate testing. The control panel appears to be a NEMA 4, coated panel, with the proper sealing and panel latch, see photo ALD-3. A small 110v heater operates to control moisture in the shelter building.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, located just to the right of the control panel, inside the brick shelter building. It is looped over the manual transfer switch in photo ALD-3.

The alarm is mounted on the top of the brick shelter building, which is shown on photo ALD-4. The alarm appeared to function properly. The alarm is clearly visible from SW ALDER, and other locations. The alarm telemetry panel is inside the brick shelter building, and shown on photo ALD-5. The station's alarm system is tied into a central alarm console, which is located in the City of Warrenton Public Works Shop.

OVERFLOWS/BYPASS:

Should the pump station wet well surcharge to the point of flooding, the overflow would come out of the influent manhole near the station. It would then run toward a drainage ditch to the south, then into the storm drain system. The influent manhole location is at the lowest ground elevation. The influent manhole to the wet well is located at the center pavement near the station in SW Alder. This influent manhole showed no evidence of surcharging.

RECOMMENDATIONS:

This station is in poor condition.

- Immediate investigation and repair should be made to pump #1.
- Continued regular maintenance, cleaning, as the City is doing. Wet well safety chains/cables should be added inside the wet well grate area for the safety of maintenance personnel.
- The pump discharge gate valves and check valves located inside the wet well should be exercised and lubricated during the maintenance program.
- Investigation of alternatives/routes/costs to multiple connections to force main.
- Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this station, and make it possible to use the DEQ flow rate methodology for future testing.
- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance. If a program to track Costs/Personnel time for this pump station is not in place, it should be implemented.
- A recommendation made elsewhere in the Facilities Plan recommended that this station and the one at Second and Alder be removed, and one large station added west of the intersection of NW Warrenton Drive and South Main.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUBMERSIBLE PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	141	inches	(Datum typically lid of wetwell/vault)
Depth of pump eye to datum	129	inches	(Datum typically lid of wetwell/vault)
Offset of pressure guage to datum	32	inches	
Offset of pressure guage to pump eye	161	inches	(Pump eye elevation = 0.0 typically)
Depth of fluid to datum (for start)	75	inches	**START**
Depth of fluid to datum (for stop)	101	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*
Shutoff head, direct guage reading,	12 psig	17 psig
Shutoff head, translated to eye of pump, then mid-pool.	**37.72** FT	**49.27** FT
Discharge head		
Guage reading @ pump start, psig	10 psig	10 psig
Reading adj. to impeller eye (add guage off.)	36.52 FT	36.52 FT
Guage reading @ pump stop	9 psig	9 psig
Reading adj. to impeller eye (add guage off.)	34.21 FT	34.21 FT

Total Dynamic Head, (feet)

TDH @ pump start, (discharge head - wtr over eye)	**32.02** FT	**32.02** FT
TDH @ pump stop, (discharge head - wtr over eye)	**31.87** FT	**31.87** FT

FLOWRATE DATA @ Pump RPM of: 1150 RPM

Flowrate @ pump start (curve interpolation using TDH)	140 *GPM*	390 *GPM*
Flowrate @ pump stop (curve interpolation using TDH)	140 *GPM*	390 *GPM*
Average Flow, gpm, (mid-pool)	**140** *GPM*	**390** *GPM*
Design GPM	350 *GPM*	350 *GPM*
% of new capacity	40%	111%

Note: The above box is added to assist report writer.

Note: No suction gauges on City of Warrenton Pump Stations.

SPREADSHEET CALCS DATE: Dec. 31, 2001
STATION: SW ALDER/2ND (Orig. PS #2)
CURVE Y N (maybe, have 2)
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

Note:
This spreadsheet and the notes that follow are off of the worksheet and published DEQ Guidelines; "O&M NOTES FOR GAUGES ON SEWAGE PUMPS".

SUBMERSIBLE:

(psig x 2.31) + (avg pumped distance)
(TRACE SHUTOFF HEAD INTO CURVE)

(psig@start x 2.31) + (guage offset)

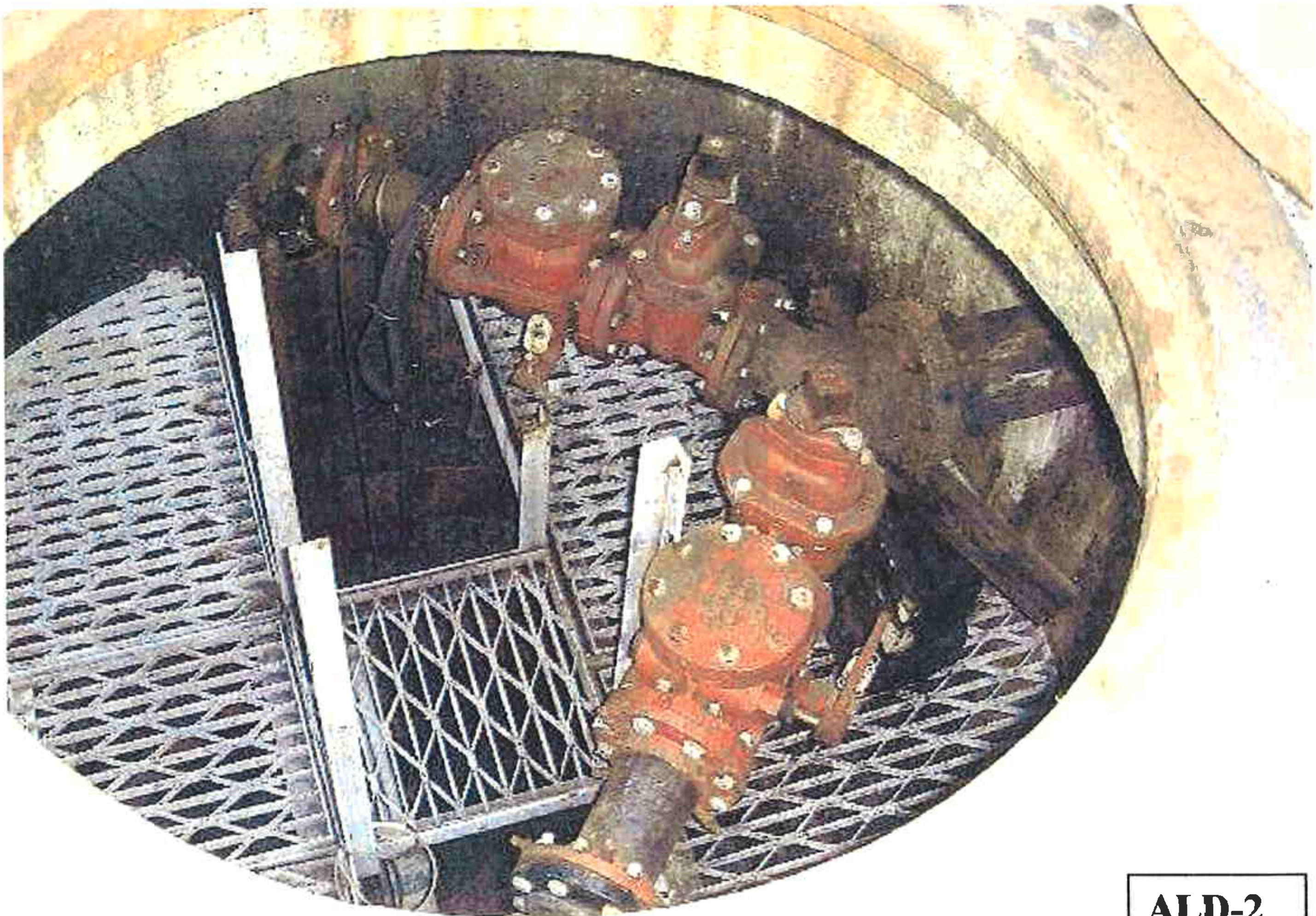
(psig@stop x 2.31) + (guage offset)

BACK OUT THE WETWELL WATER LEVEL:
discharge start, head total - water over pump eye
discharge stop, head total - remaining water over pump eye
(TAKE THESE NUMBERS INTO CURVE)

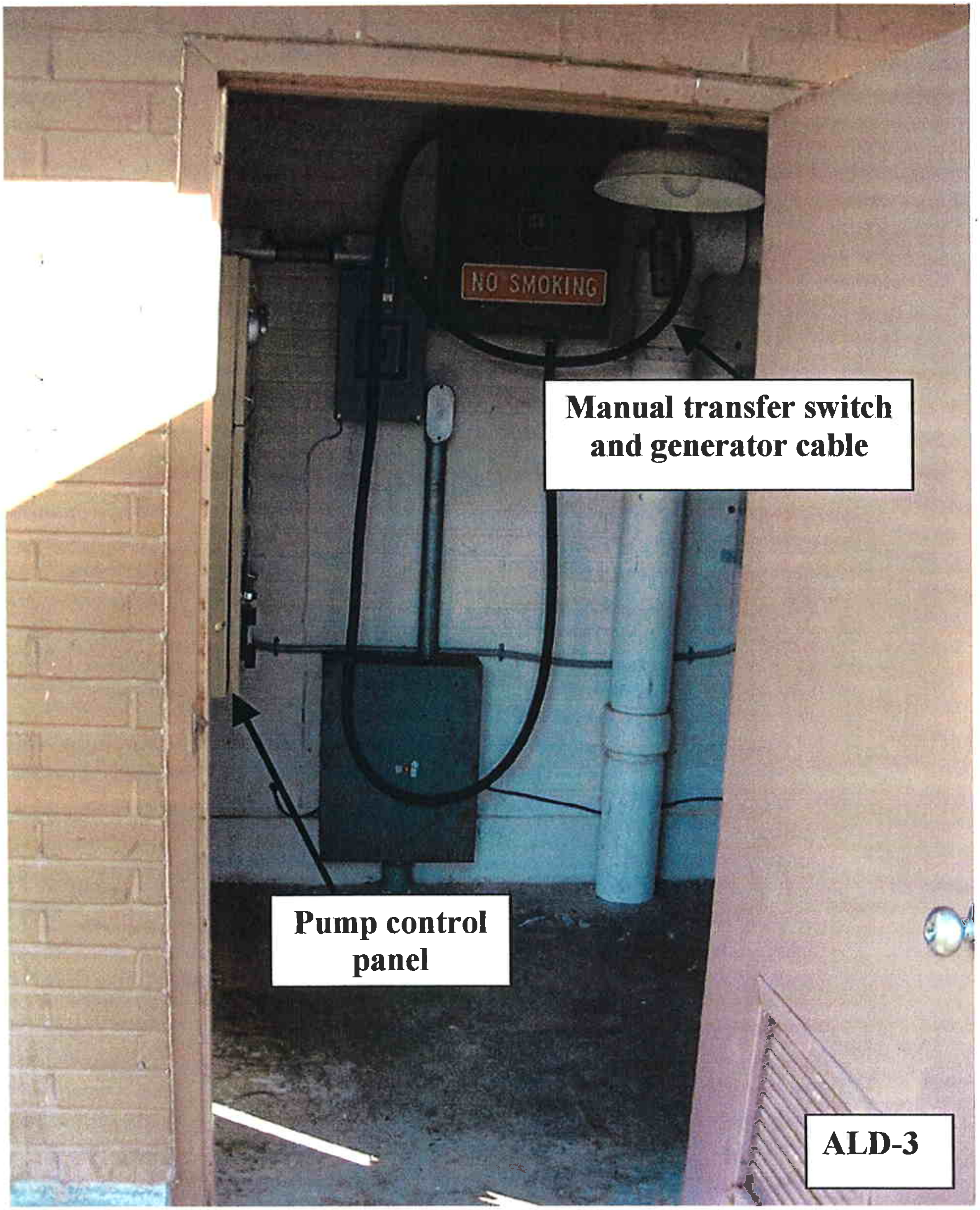
Mean average

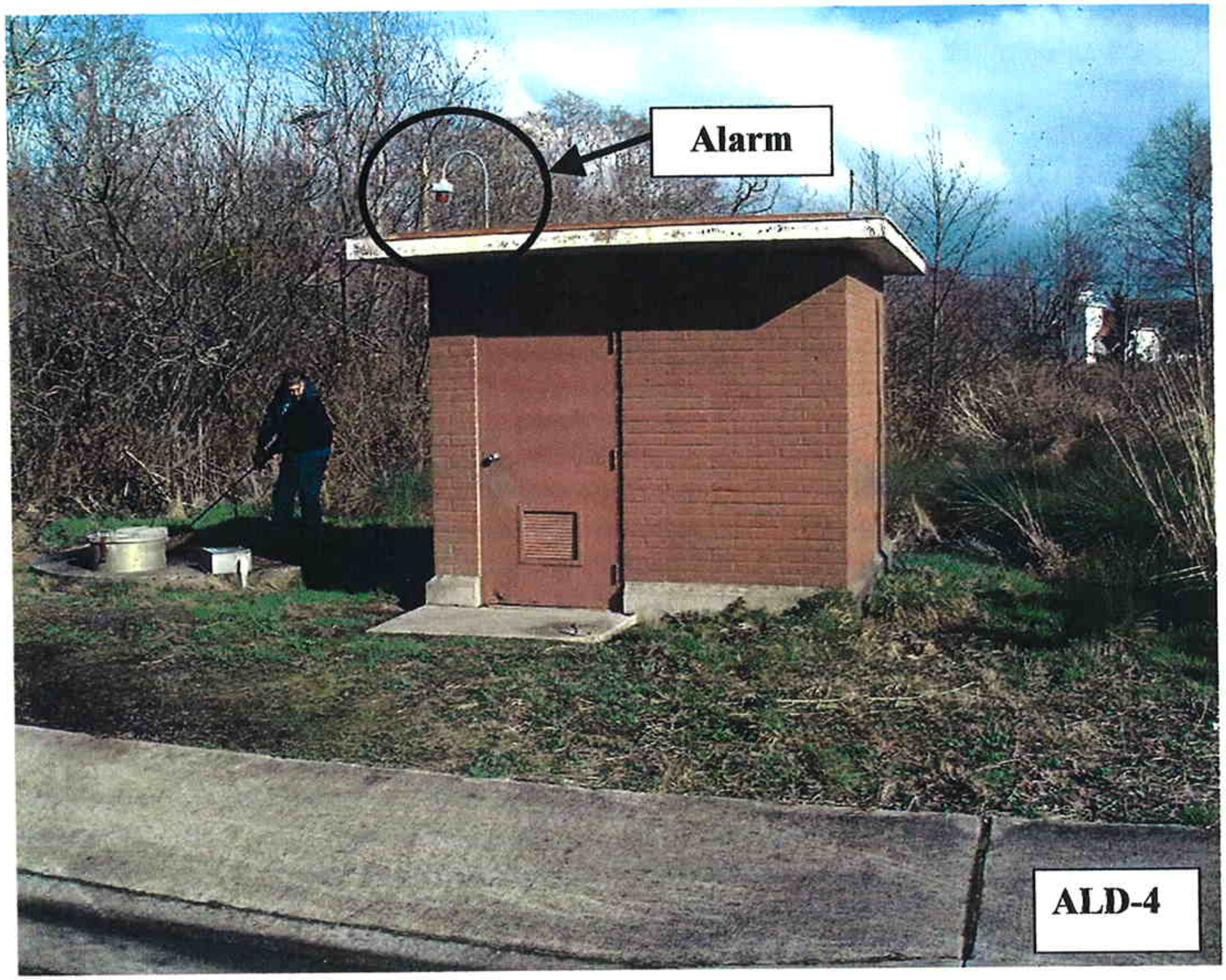
DESIGN: 350 gpm
DESIGN: Unknown TDH
DESIGN: Impeller: 10.0"
DESIGN: 10 HP

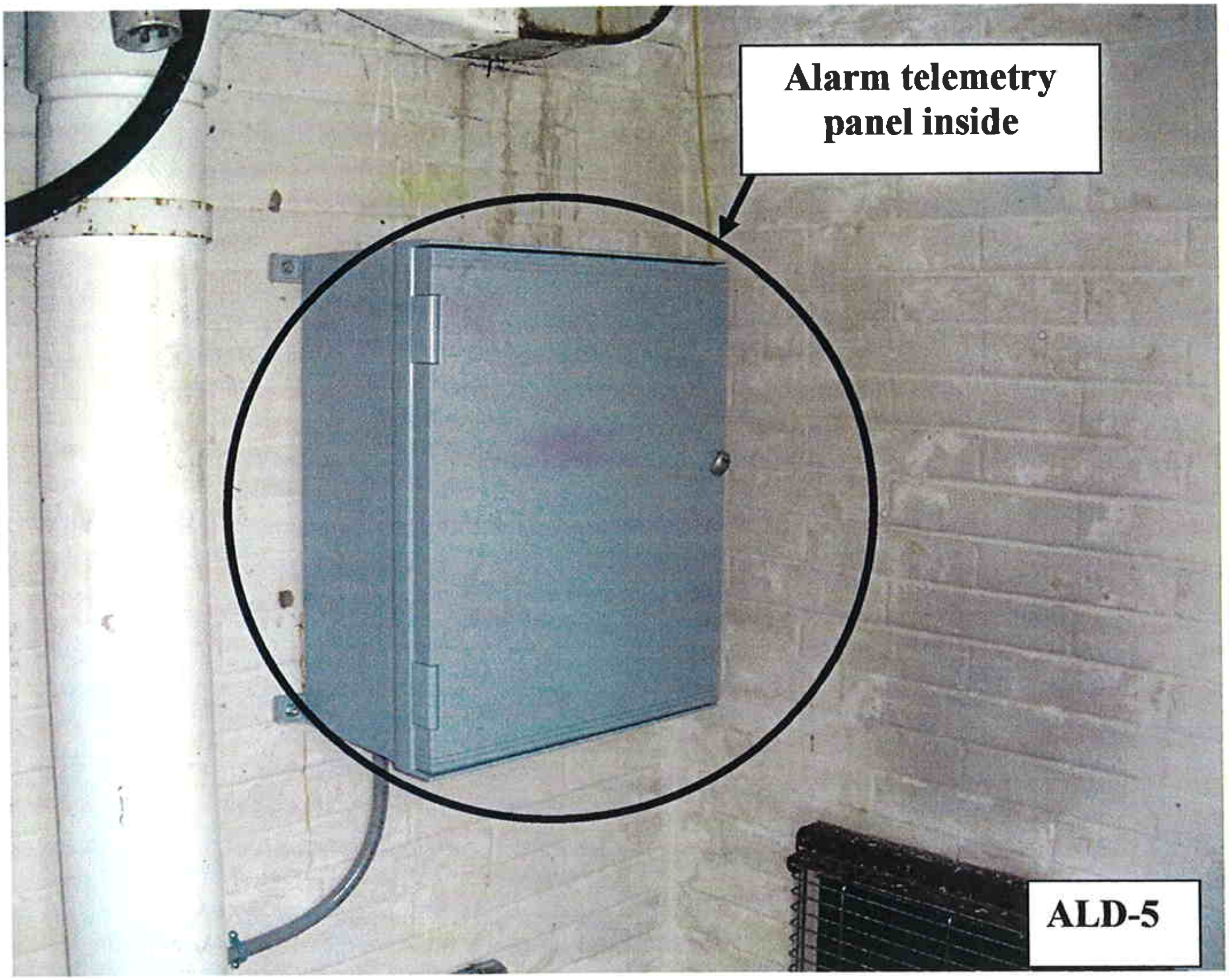

ALD-1



ALD-2


NO SMOKING
Manual transfer switch and generator cable
Pump control panel
ALD-3


Alarm
ALD-4


Alarm telemetry panel inside
ALD-5

Lagoon Pump Station

(Original #3)

PUMP STATION REPORT

LAGOON STATION
(Original #3 of 3)

DESCRIPTION:

This is one of the three (3) original pump stations constructed in 1969. It is a 2 component station, wet well, and control building. It is located at the southwest corner of Cell #1 of the Lagoon system. It handles gravity tributary flows from the northern 1/3 of Warrenton. It then conveys the sewage by a very short force main (approximately 20.0 feet) into the 12"ϕ force main that feeds the flume.

It is a concrete wet well, duplex station, with submersible 10.0 hp Enpo/Cornell brand pumps. No rail system exists for the submersible pumps. Pumps are serviced via a cable retrieval system. The wet well cover is concrete with an aluminum hatch cover, and two (2) vented manhole covers, see photo LAG-1. The interior of the wet well, grate and ladder assembly were in place. See recommendations below.

No outside gate valve vault was evident, (outside of the wet-well) nor is any shown in the as-built plans. The force main, a dual pipe, "y" assembly inside the wet well did not have the required test ports or gauges. Check valves were internal, and correct operation could not be independently verified. The shut-off gate valves on the discharge piping/header assembly were rusted open, however, and shut with great effort and penetrant application. In this case, both pumps were tested by the drawdown method, rather than the pressure/flowrate method. Both pumps were found to be operational, when tested for drawdown. A DEQ Flowrate spreadsheet is provided as part of this report for future testing of this station.

The electrical and telemetry controls are separate from the wet well and contained in a dedicated building of brick construction, above ground. The original bubbler system (for wet well level control) has been removed and replaced with mechanical float/switch assemblies. The electrical controls were inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any component. The controls were tested through operational cycling during the draw down testing. The control panel appears to be a NEMA 4, coated panel, with the proper sealing and panel latch. A small 110v heater operates to control moisture in the shelter building. See photo LAG-2 and LAG-3.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, located inside the brick shelter building.

The alarm is mounted on the top of the brick shelter building, which is shown on photo LAG-2. The alarm appeared to function properly. The alarm is clearly visible from NW Fifth. The station's alarm system is also tied into a central alarm console by telemetry, which is located in the City of Warrenton Public Works Shop.

PUMP FLOWRATE/EFFICIENCIES:

Technical information on this pump station is limited to original plan layout and pump curve from the City archives. No pump station O&M manual was found in records.

See attached pump curve. Based upon a design maximum flow rate of 400 g.p.m., the calculated TDH is 35 feet for a new pump, (using the supplied curve). Influent control, normally lacking during pump testing was not a factor during the drawdown testing. All pumps that feed the shared force main and flume assembly were shut down, via radio control, and only this pump station was allowed to operate. The operator would wait until he had enough liquid in the wet well to pump, and then operate the pump. Only one pump was allowed to run per test. Measured pump flows were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump Chamber
#1	350 g.p.m.	88 %	12 %
#2	456 g.p.m.	100 %	None apparent

Explanation of the columns: Percentage of new pump capacity is: New pump flow divided by Measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing. Measured flow is typically from a DEQ Flow rate test. However, since this particular pump was tested by actual flume flow, those results are presented here. The test instrument was a Milltronics OCM-III transducer and electronic flow totalizer located in the equipment shelter at the lagoons.

Flow rates will likely decrease with multiple pump stations operating simultaneously and sharing a force main. This station has two stations that are currently sharing the force main. They are 3rd/Main Court and the SW Alder stations.

It should be noted that the foregoing flow rates are estimated from the original curve, which may not be accurately reflecting the current pump conditions. See recommendations section below.

FORCE MAIN:

The pump station force main length is approximately 10.5 feet from the wet well flange to the "tee" on the 12"ϕ PVC force main feeding the flume. It is constructed of 6"ϕ PVC. It has a very flat profile, with no vacuum break or air release appurtenances

HYDROGEN SULFIDE:

Because pump station discharge is to the shared existing 12"ϕ PVC force main, no discharge manhole exists. The wet well was found to be in fair condition, with some hydrogen sulfide damage to the wet well interior.

OVERFLOWS/BYPASS:

Should the pump station wet well surcharge to the point of flooding, the overflow would come out of the vented wet well covers. It would then run south and west toward a drainage ditch, then continue north through the drainage area that is parallel to the man made ditch that the effluent is currently being discharged into.

RECOMMENDATIONS:

This station is in fair condition.

- Immediate investigation should be made of pump #1. It is important to repair pump #1.

- The pump discharge gate valves and check valves located inside the wet well should be exercised and lubricated during the maintenance program.

- Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this station, and make it possible to use the DEQ flow rate methodology for future testing.

- Continued regular maintenance, cleaning, as the City is doing. Wet well safety chains/cables should be added inside the wet well grate area for the safety of maintenance personnel. Float Elevations should be researched and documented for each station.

- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance. If a program to track Costs/Personnel time for this pump station is not in place, it should be implemented.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUBMERSIBLE PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	______ inches	(Datum typically lid of wetwell/vault)	
Depth of pump eye to datum	______ inches	(Datum typically lid of wetwell/vault)	
Offset of pressure guage to datum	______ inches		
Offset of pressure guage to pump eye	______ inches	(Pump eye elevation = 0.0 typically)	
Depth of fluid to datum (for start)	______ inches	**START**	
Depth of fluid to datum (for stop)	______ inches	**STOP**	

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	______ psig	______ psig	**SUBMERSIBLE:**
Shutoff head, translated to eye of pump, then mid-pool.	**0.00** FT	**0.00** FT	(psig x 2.31) + (avg pumped distance) **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	______ psig	______ psig	
Reading adj. to impeller eye (add guage off.)	0.00 FT	0.00 FT	(psig@start x 2.31) + (guage offset)
Guage reading @ pump stop	______ psig	______ psig	
Reading adj. to impeller eye (add guage off.)	0.00 FT	0.00 FT	(psig@stop x 2.31) + (guage offset)

Total Dynamic Head, (feet)

TDH @ pump start, (discharge head - wtr over eye)	**0.00** FT	**0.00** FT	BACK OUT THE WETWELL WATER LEVEL: discharge start, head total - water over pump eye
TDH @ pump stop, (discharge head - wtr over eye)	**0.00** FT	**0.00** FT	discharge stop, head total - remaining water over pump eye **(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: ______ RPM

Flowrate @ pump start (curve interpolation using TDH)	______ *GPM*	______ *GPM*	
Flowrate @ pump stop (curve interpolation using TDH)	______ *GPM*	______ *GPM*	
Average Flow, gpm, (mid-pool)	**0** *GPM*	**0** *GPM*	Mean average
Design GPM	400 *GPM*	400 *GPM*	W/0 CURVE, ESTIMATE DESIGN FLOW
% of new capacity	0%	0%	W/0 CURVE, ESTIMATE TDH @ 35.0'

Note: The above box is added to assist report writer.

Note: No suction gauges on City of Warrenton Pump Stations.

SPREADSHEET CALCS DATE: Dec. 31, 2001
STATION: LAGOON (Orig. PS #3)
CURVE Y N
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

Note:
This spreadsheet and the notes that follow are off of the worksheet and published DEQ Guidelines; "O&M NOTES FOR GAUGES ON SEWAGE PUMPS".

LAGOON P/S

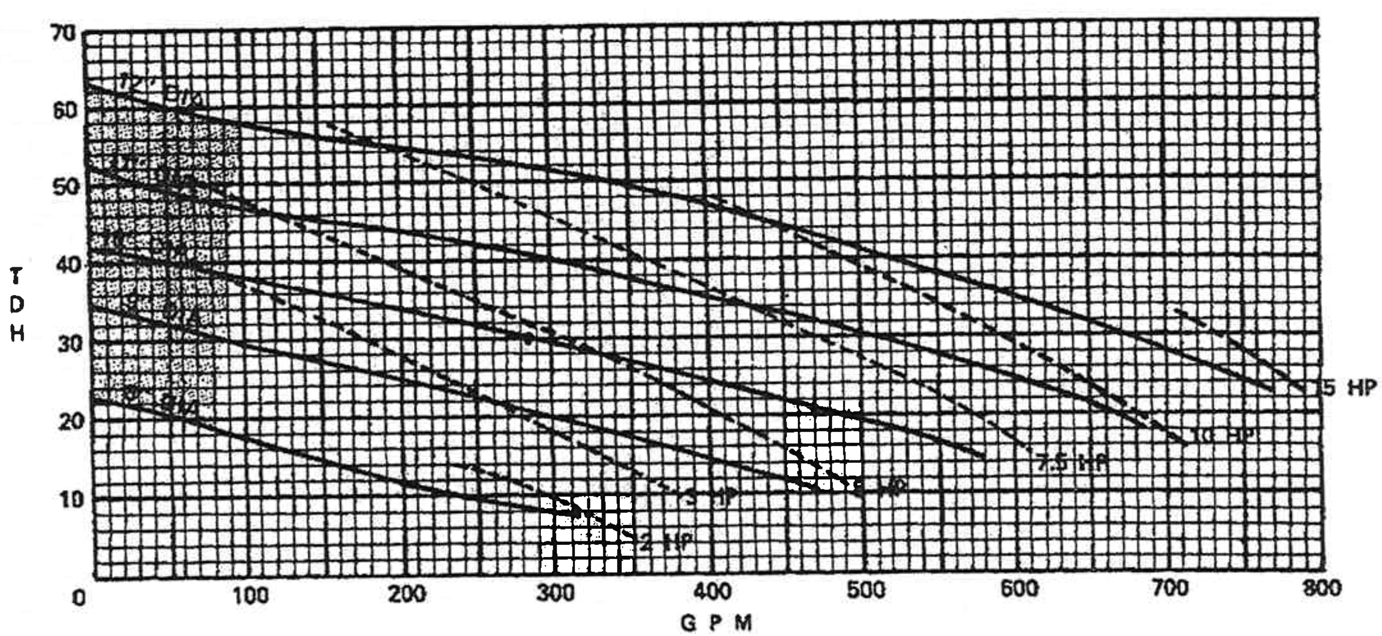
4000 SERIES MODEL NUMBER EXAMPLE:

4 — DISCHARGE SIZE
6 — PUMP TYPE
05 — IMPELLER BLADE DIA.
05 — HORSE POWER: 05=5HP, 72=7.5HP, 10=10HP, 15=15HP

01=8D	17=9D	33=10D	49=11D
02=8-1/16D	18=9-1/16D	34=10-1/16D	50=11-1/16D
03=8-1/8D	19=9-1/8D	35=10-1/8D	51=11-1/8D
04=8-3/16D	20=9-3/16D	36=10-3/16D	52=11-3/16D
05=8-1/4D	21=9-1/4D	37=10-1/4D	53=11-1/4D
06=8-5/16D	22=9-5/16D	38=10-5/16D	54=11-5/16D
07=8-3/8D	23=9-3/8D	39=10-3/8D	55=11-3/8D
08=8-7/16D	24=9-7/16D	40=10-7/16D	56=11-7/16D
09=8-1/2D	25=9-1/2D	41=10-1/2D	57=11-1/2D
10=8-9/16D	26=9-9/16D	42=10-9/16D	58=11-9/16D
11=8-5/8D	27=9-5/8D	43=10-5/8D	59=11-5/8D
12=8-11/16D	28=9-11/16D	44=10-11/16D	60=11-11/16D
13=8-3/4D	29=9-3/4D	45=10-3/4D	61=11-3/4D
14=8-13/16D	30=9-13/16D	46=10-13/16D	62=11-13/16D
15=8-7/8D	31=9-7/8D	47=10-7/8D	63=11-7/8D
16=8-15/16D	32=9-15/16D	48=10-15/16D	64=11-15/16D
			65=12D

4000 SERIES SUBMERSIBLE
TYPE 6
(ALSO MODEL 4DNDH-SS WITH RELIANCE MOTOR)
SPEED – 1150 RPM
IMPELLER – HIGH HEAD DELTA
DIAMETER – VARIOUS
MAX. DIA. SOLIDS – 3"
DISCHARGE SIZE – 4"

NOT RECOMMENDED FOR APPLICATIONS IN SHADED AREA.



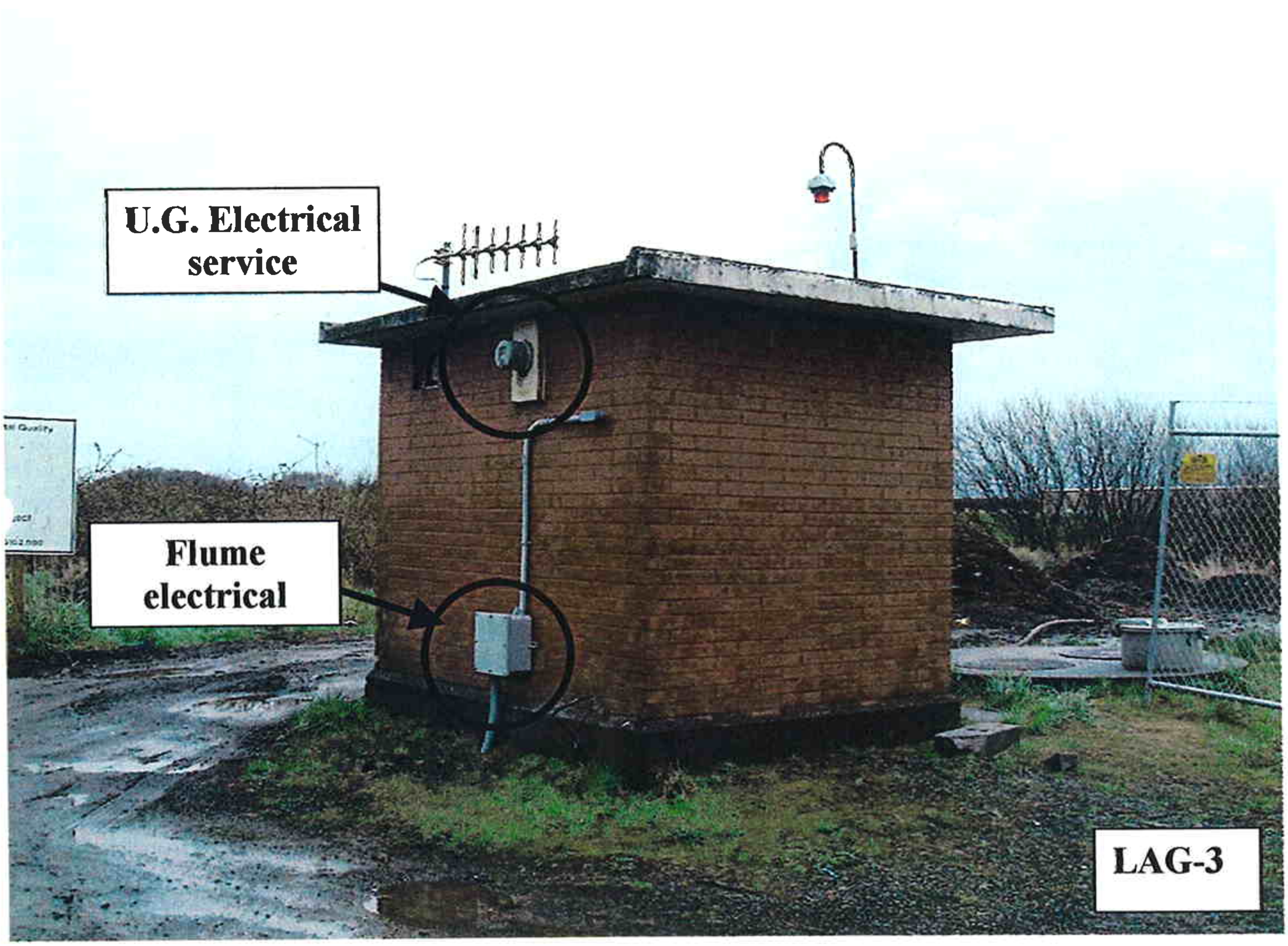
Enpo-Cornell Pump Company A DIVISION OF Roper Industries, Inc. (Ohio)
420 EAST THIRD STREET, PIQUA, OHIO 45356

4000 SERIES SUBMERSIBLE PUMPS – 1150 RPM
TYPE 6 – DOUBLE SEAL, LEAK SENSOR
(ALSO MODEL 4DNDH-SS WITH RELIANCE MOTOR)

9/78

2040-4


LAG-2



U.G. Electrical service
Flume electrical
LAG-3

<u>SE Anchor / 101 Pump Station</u>

(L.I.D. #1)

PUMP STATION REPORT

SE ANCHOR/101 STATION
(Originally – L.I.D #1)

DESCRIPTION:

This pump station transfers flows from a small basin (approximately five (5) City blocks adjacent to the northeast corner of the intersection of SE Anchor and the Old Coast Highway) just north of the Warrenton High School. This station was constructed in 1978. In addition to serving the residential area just mentioned, it also served a restaurant next to the Skipanon River, which has since been removed.

This pump station is a HYDRONIX fiberglass pre-fabricated unit station with a split, locking fiberglass cover, mounted on top of a concrete wet well, see attached photo ANC-1. It is a duplex station with 5.0 hp direct coupled, Model 40 MMPC pumps. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational. The discharge gate valves/force main header assembly did not have the required gauges. See photo ANC-2. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines, see attached Flowrate check sheet. Testing and measurements were conducted in accord with these guidelines. It should be noted that this station was tested 2 times, once with draw down testing on May 31, 2000, then tested according to the DEQ Flow rate testing procedure on December 12, 2001. Only the DEQ Flow rate testing procedure is reported on here.

The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The main pump controls (inside the station) were tested through operational cycling during flowrate testing. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident. See photo ANC-3. It should be noted that the electrical service panel was mounted on a separate pole, outside of the pump station enclosure, and with the proper sealing and panel latch, (see attached photo, ANC-1). No odor control equipment or air compressor is used at this pump station.

A provision for alternate power is made by a manual transfer switch panel and the plug assembly for the portable generator. It is to the left of the station control panel in photo ANC-3 under the split covers.

The alarm system is mounted on a separate pole, which is shown on photo ANC-1. The alarm light is mounted on a pole just south of the station and appeared to function properly. This alarm light is visible from Spur 104 (Old Coast Highway). The station alarm system is also tied into a central alarm console, located in the City of Warrenton Public Works Shop.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found in the beginning of the Warrenton section. The pump curve is attached. Photos of the pump station are attached.

As-built drawings and technical specifications for this pump station were available in the City of Warrenton archives.

PUMP FLOWRATE/EFFICIENCIES:

It was possible to apply the original pump curve to the DEQ flowrate spreadsheet. See attached pump curve, obtained from the O&M manual.

From the O&M manual, the station had 5.0 hp motors with 9-1/8" impellers, running at 1150 rpm. Flow rates are based upon a design maximum flow rate of 200 g.p.m. a TDH of 32.0 feet for a new pump. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	173 g.p.m.	87 %	13 %
#2	123 g.p.m.	62 %	38 %

Explanation of the columns: Measured flow is typically from a DEQ Flow rate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by Measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

FORCE MAIN:

The force main length is approximately 575.0 feet from plan measurements and is constructed of 4"ϕ PVC. The force main discharges into a manhole at the intersection of S Main and SE 15th Street. One unusual feature is that the discharge is approximately 3.0 feet above the flow channel.

HYDROGEN SULFIDE:

No hydrogen sulfide damage was observed in this manhole. However, it should be noted that the force main comes into the manhole at 90 degrees, or perpendicular to its flow path. If this force main were to be up-sized, it should be re-layed to come in at an angle greater than 90 degrees and at the flow channel elevation. No visible cracks at sections. The manhole steps were sound. When probed, the concrete was solid.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. This station is near the Skipanon River. If the station wet-well was surcharged, the overflow would come out the top of the pump station wet well, flowing over and into the sandy ground surface toward the Skipanon River. This condition is not anticipated, due the low cycle times of the pump station, and the availability of a portable generator set.

RECOMMENDATIONS:

This station is in fair condition hydraulically.

- Regular maintenance, cleaning.
- The grounds around the station should be treated with a herbicide to keep the area immediately adjacent to the station open and clear. The road into the station should be better marked and maintained with consideration given to rock and drainage.
- One side of the split cover has been damaged and should be repaired. Since this is near an apartment complex, consideration should be given to fencing this station.
- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	199	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	193	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	8	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	25	inches	
Depth of fluid to pump eye (suction lift to start)	129	inches	**START**
Depth of fluid to pump eye (suction lift to stop)	163	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*	Notes
Shutoff head, direct guage reading,	8 psig	7 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	32.69 FT	30.38 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	4 psig	4 psig	
Reading adj. to impeller eye (add guage off.+start)	22.03 FT	22.03 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	4 psig	3 psig	
Reading adj. to impeller eye (add guage off.+stop)	24.87 FT	22.56 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

	Pump #1	*Pump #2*	Notes
TDH @ pump start (at midpool)	23.45 FT	23.45 FT	taken at mid-pool, with water column moving
TDH @ pump stop	24.87 FT	22.56 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1150 RPM

	Pump #1	*Pump #2*	Notes
Flowrate @ pump start (curve interpolation)	205 *GPM*	120 *GPM*	
Flowrate @ pump stop (curve interpolation)	140 *GPM*	130 *GPM*	
Average Flow, gpm	**173** *GPM*	**125** *GPM*	Mean
Design GPM	200 *GPM*	200 *GPM*	DESIGN: 200 GPM
% of new capacity	86%	63%	DESIGN: 32.0' TDH
			DESIGN: 9-1/8" Impeller

STATION: SE ANCHOR/101 **(orig. LID #1)**
CURVE Y N
DATE OF FIELD TESTING: Dec. 12, 2001
FIELD PERSON: GGL CHECKED BY:

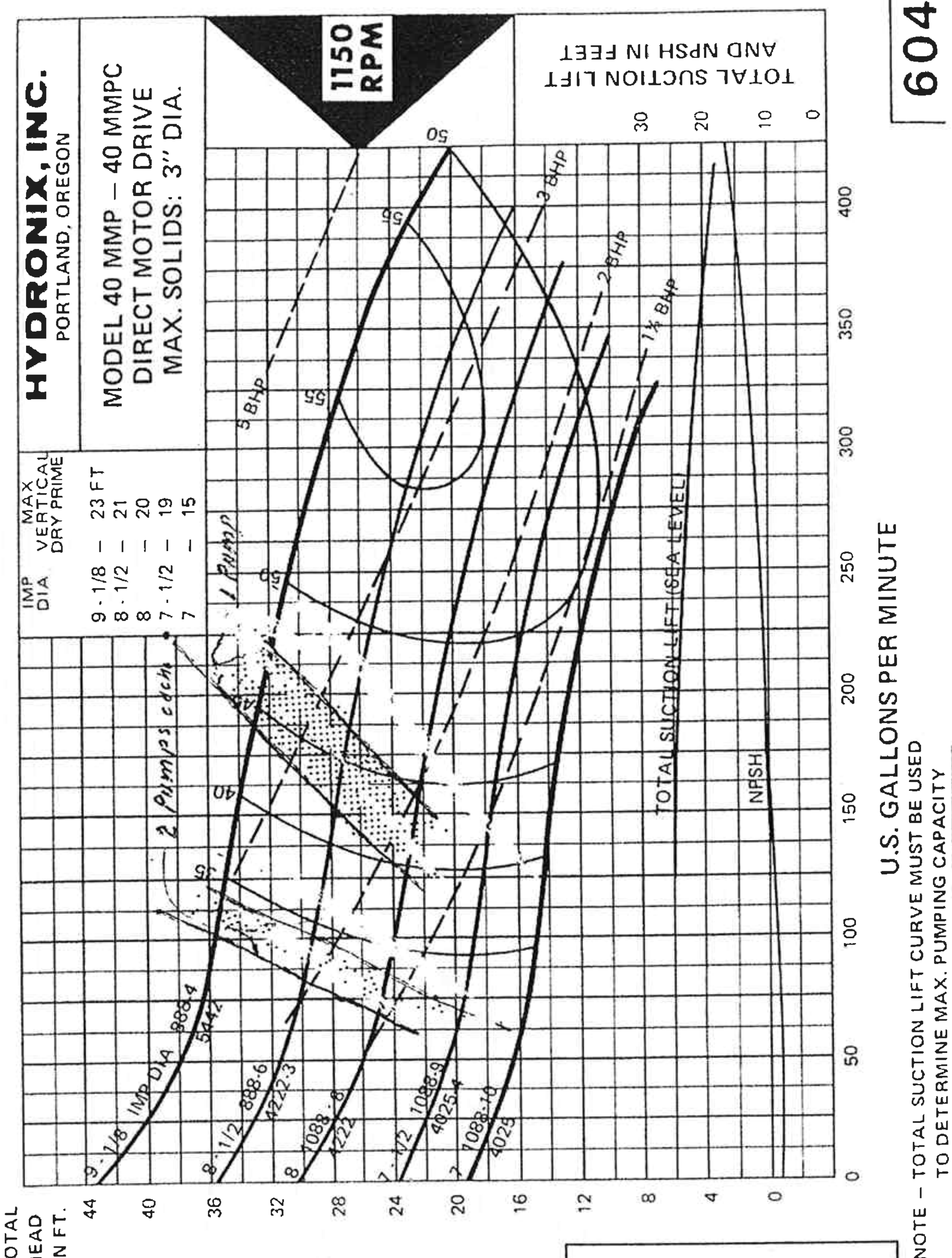
Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

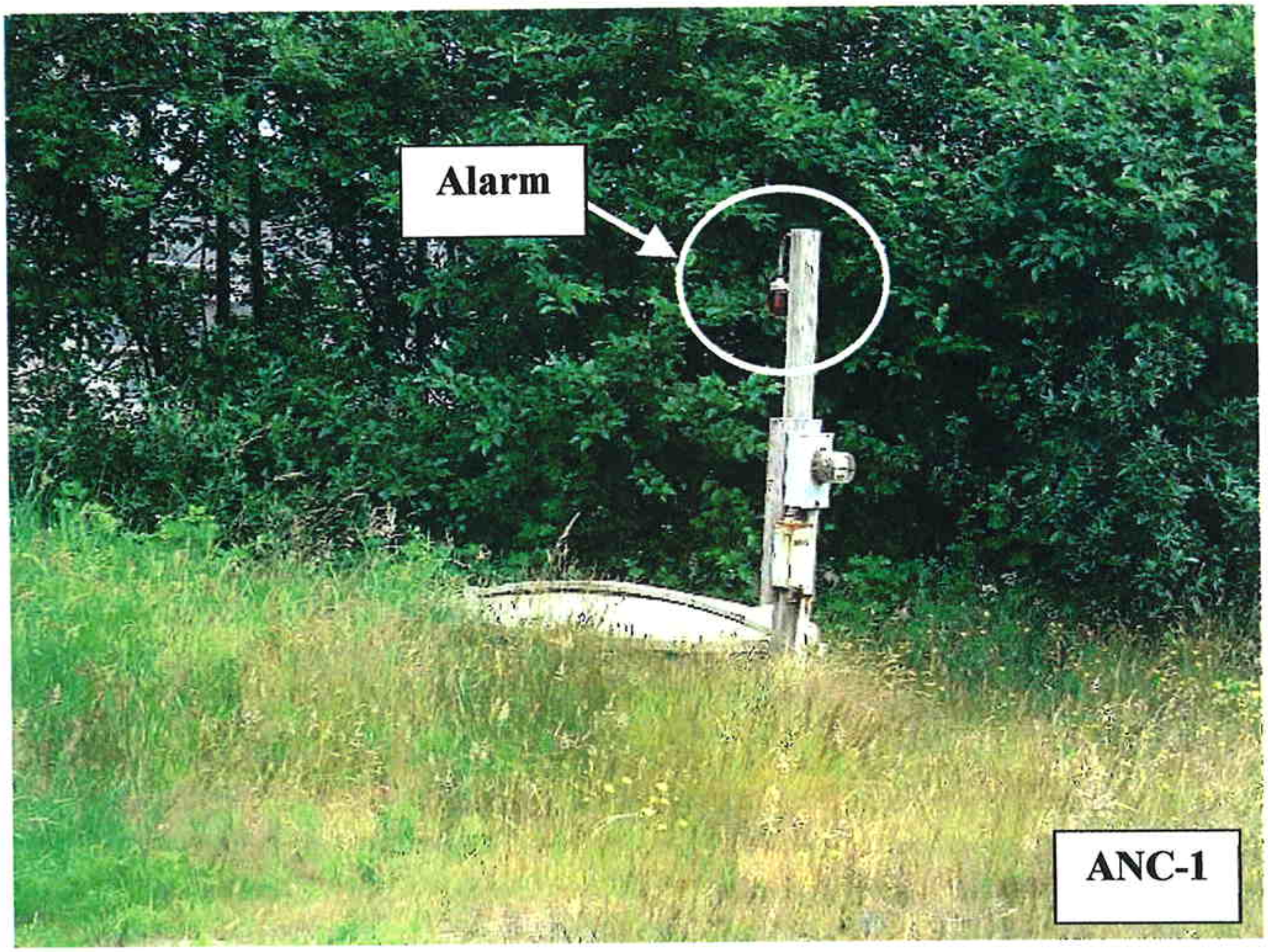
SE ANCHOR & 101 P/S

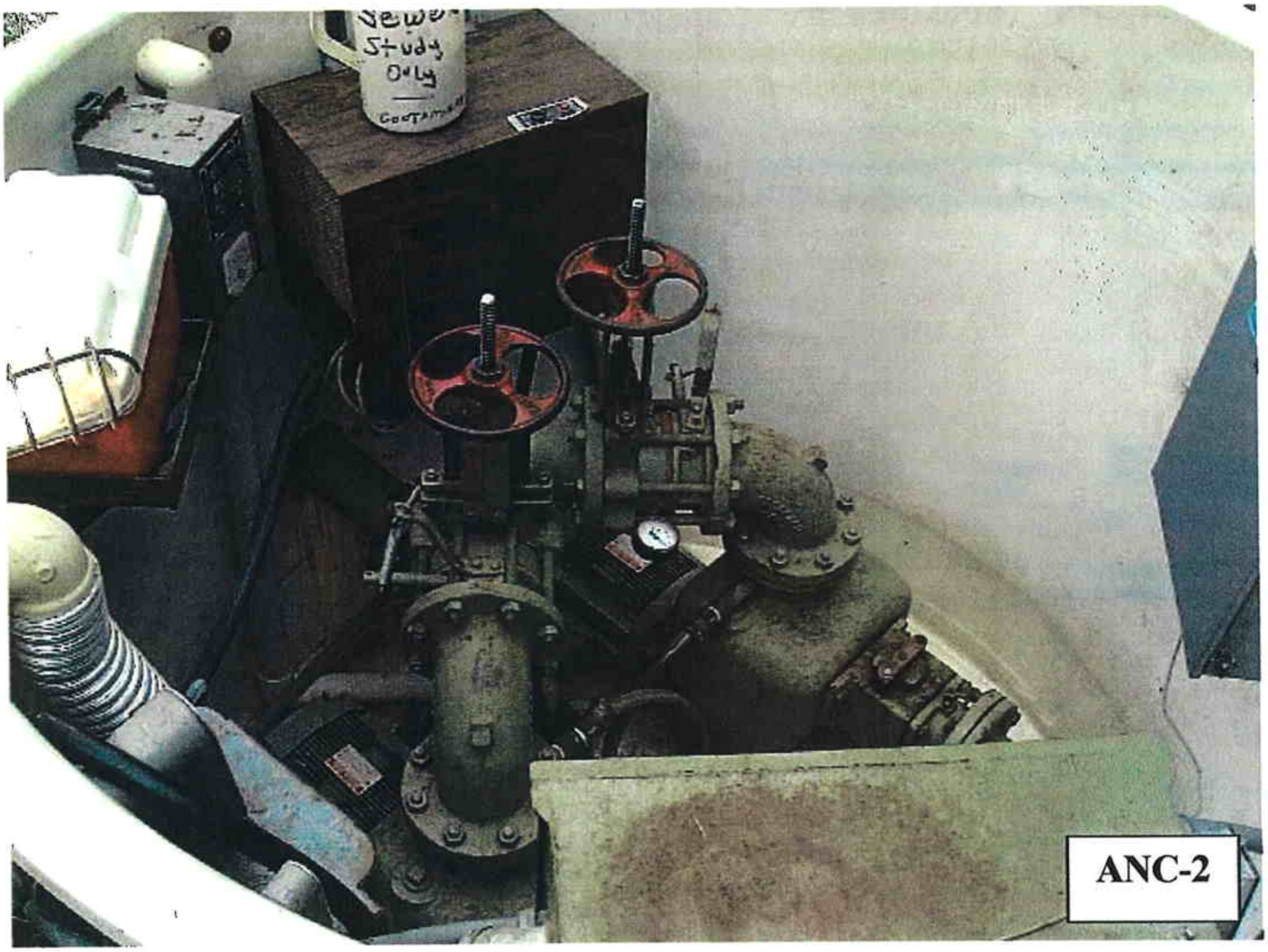
(This curve from plan-set)

6042

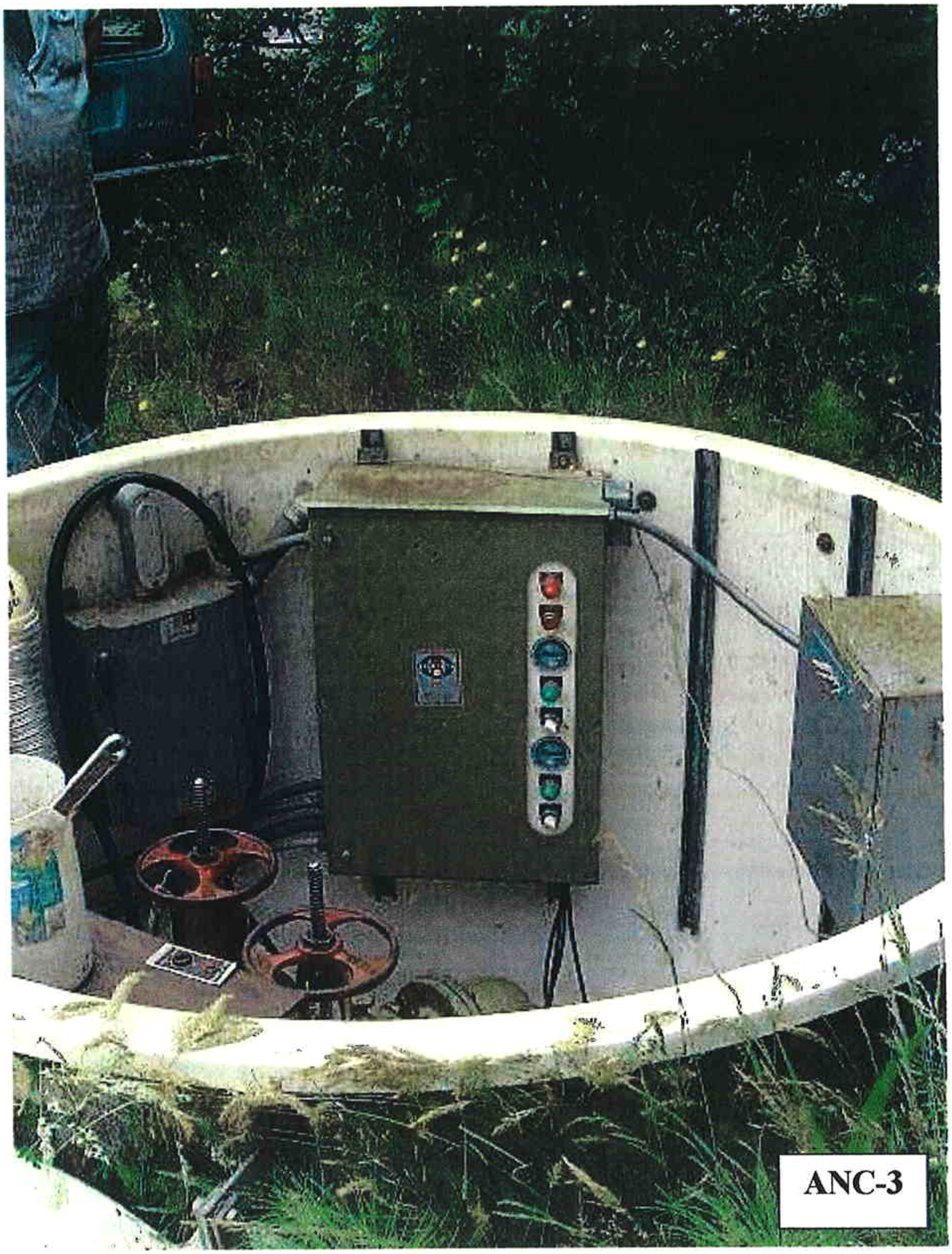


Near High School


Alarm
ANC-1



ANC-2


ANC-3


ANC-4

NW Elm / 1st Street Pump Station

PUMP STATION REPORT

NW ELM & NW 1ST STATION

DESCRIPTION:

This pump station handles the flows from approximately ½ of the newer subdivision areas immediately NW of the downtown area. (The other approximately ½ of the flows from the newer subdivision areas are handled by the SW Elm & SW 2nd station)

This pump station is a HYDRONIX fiberglass pre-fabricated unit station with a split, locking fiberglass cover, mounted on top of a concrete wet well, see attached photo NE1-1. It is a duplex station with 5.0 hp direct coupled, Model 40 MMPC pumps. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational. The discharge gate valves/force main header assembly did not have the required gauges. See photo NE1-2. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines, see attached Flowrate check sheet. Testing and measurements were conducted in accord with these guidelines. It should be noted that this station was tested 2 times, once with the draw down method on May 31, 2000, then re-tested according to the DEQ Flow rate testing procedure on December 12, 2001. Only the DEQ Flow rate testing procedure is reported on here.

The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The main pump controls (inside the station) were tested through operational cycling during flowrate testing. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident. See photo NE1-3. It should be noted that the electrical service panel was mounted on a separate pole, outside of the pump station enclosure, and with the proper sealing and panel latch, see attached photo, NE1-1. No odor control equipment or air compressor is used at this pump station.

A provision for alternate power is made by a manual transfer switch panel and the plug assembly for the portable generator. It is just above the station control panel in photo NE1-3 and under the split covers.

The alarm system is mounted on a separate pole, which is shown on photo NE1-1. The alarm light is mounted on a pole just south of the station and appeared to function properly. This alarm light is visible from NW 1st Street. The station alarm system is also tied into a central alarm console, located in the City of Warrenton Public Works Shop.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found in the beginning of the Warrenton section. "A typical pump curve" is attached. Photos of the pump station are attached.

No construction plans, as-built drawings or technical specifications for this pump station were available in the City of Warrenton archives. We have made an effort to obtain a pump curve from the supplier, and they have supplied us with a "typical curve" for this station.

PUMP FLOWRATE/EFFICIENCIES:

It was possible to apply the typical pump curve to the DEQ flowrate spreadsheet. See attached typical curve, obtained from the supplier.

From the draw down testing/interview with City personnel, it was noted that this station had 5.0 hp motors with 9-1/8" impellers, running at 1150 rpm. Flow rates are based upon a design maximum flow rate of 200 gpm at a calculated TDH of 32-34 feet for a new pump. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	106 gpm	53 %	47 %
#2	244 gpm	100+ %	None apparent

Explanation of the columns: Measured flow is typically from a DEQ Flow rate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

It has been noted that pump stations using the 40 MMPC type pump and impellers, have had impellers/motors changed without proper testing and flow recording procedures. This may explain why pump #2 appears to have higher pump capacity. See recommendations below.

FORCE MAIN:

The force main length is approximately 775 feet and is constructed of 4"ϕ PVC. This force main has a relatively flat profile, with no vacuum break or air release appurtenances. By visual inspection, of both the force main header assembly at the pump station, discharge manhole and the discharge manhole while pump station was operating, the force main appears in good condition.

HYDROGEN SULFIDE:

The force main from this pump station discharges into a shallow concrete manhole in the center of NW 1st Street, near the intersection of NW 1st Street & Date Street. Sewage then flows out of the discharge manhole by 8"ϕ gravity sewer main and becomes tributary to an original pump station #2, located at SW 2nd & Alder, which then pumps into the force main going to the wastewater lagoons.

The interior of the discharge concrete manhole and steps were probed with a steel rod. The discharge manhole was found to be in good condition, with only slight hydrogen sulfide damage apparent. There were no signs of surcharging in this discharge manhole.

The influent manhole is located in the center of NW 1st Street, approximately 150 feet north of the intersection of NW 1st Street and NW Elm Street. This manhole is connected to the station by approximately 70 feet of 6"ϕ PVC gravity main. There are no signs of surcharging in the influent manhole.

The interior of the influent concrete manhole and steps were probed with a steel rod. Little to no hydrogen sulfide damage was found at the influent manhole. However, it should be noted that the 12" deep grade ring at the top of the manhole has shifted and the mortar joint near the top is breaking out.

OVERFLOWS/BYPASS:

No profile of manholes adjacent to the pump station could be located in City archives. However, should the station surcharge, sewage would come out of the influent manhole or the pump station, both of which would run into Alder Creek, then into the Columbia. This condition is not anticipated, due the low cycle times of the pump station, (typically 8 cycles per day) and the availability of a portable generator set.

RECOMMENDATIONS:

This station is in fair condition hydraulically.

- □ Regular maintenance, cleaning.
- □ The grounds around the station should be treated with a herbicide to keep the area immediately adjacent to the station open and clear. The road into the station should be better marked and maintained with consideration given to rock and drainage.
- □ As soon as possible, through coordination with the City's pump supplier, the 5.0 hp motors should be tested and the results should indicate whether or not a change should be made. Both impellers should be matched. This is indicated by the lower pumping rates and wear one of the pump chambers, and the higher than curve rates for pump #2.
- □ Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have

the information recorded. This will establish new flow baseline measurements for this critical station, and make it possible to use the DEQ flow rate methodology for future testing.

- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

- The influent manhole, although unrelated to the pump station, should receive maintenance attention from the public works department.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	147	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	149	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	8	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	23	inches	
Depth of fluid to pump eye (suction lift to start)	96	inches	**START**
Depth of fluid to pump eye (suction lift to stop)	128	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	10 psig	14 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	34.35 FT	43.59 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	7 psig	9 psig	
Reading adj. to impeller eye (add guage off.+start)	26.09 FT	30.71 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	6 psig	8 psig	
Reading adj. to impeller eye (add guage off.+stop)	26.44 FT	31.06 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

TDH @ pump start (at midpool)	27.42 FT	32.04 FT	taken at mid-pool, with water column moving
TDH @ pump stop	26.44 FT	31.06 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1150 RPM

Flowrate @ pump start (curve interpolation)	100 GPM	238 GPM	
Flowrate @ pump stop (curve interpolation)	113 GPM	250 GPM	
Average Flow, gpm	**106** GPM	**244** GPM	Mean

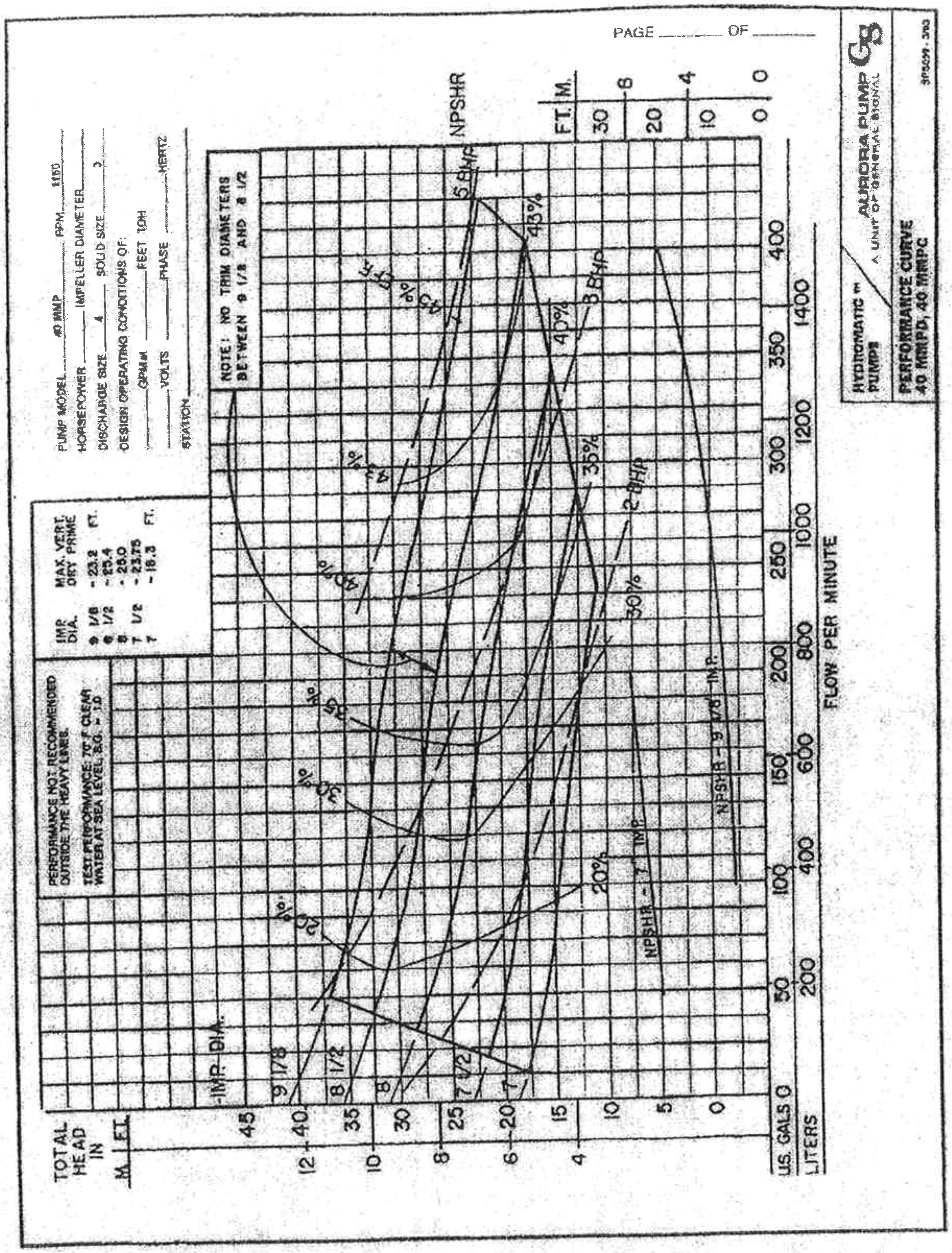
Design GPM	200 GPM	200 GPM	EST. FROM TYPICAL CURVE
% of new capacity	53%	122%	

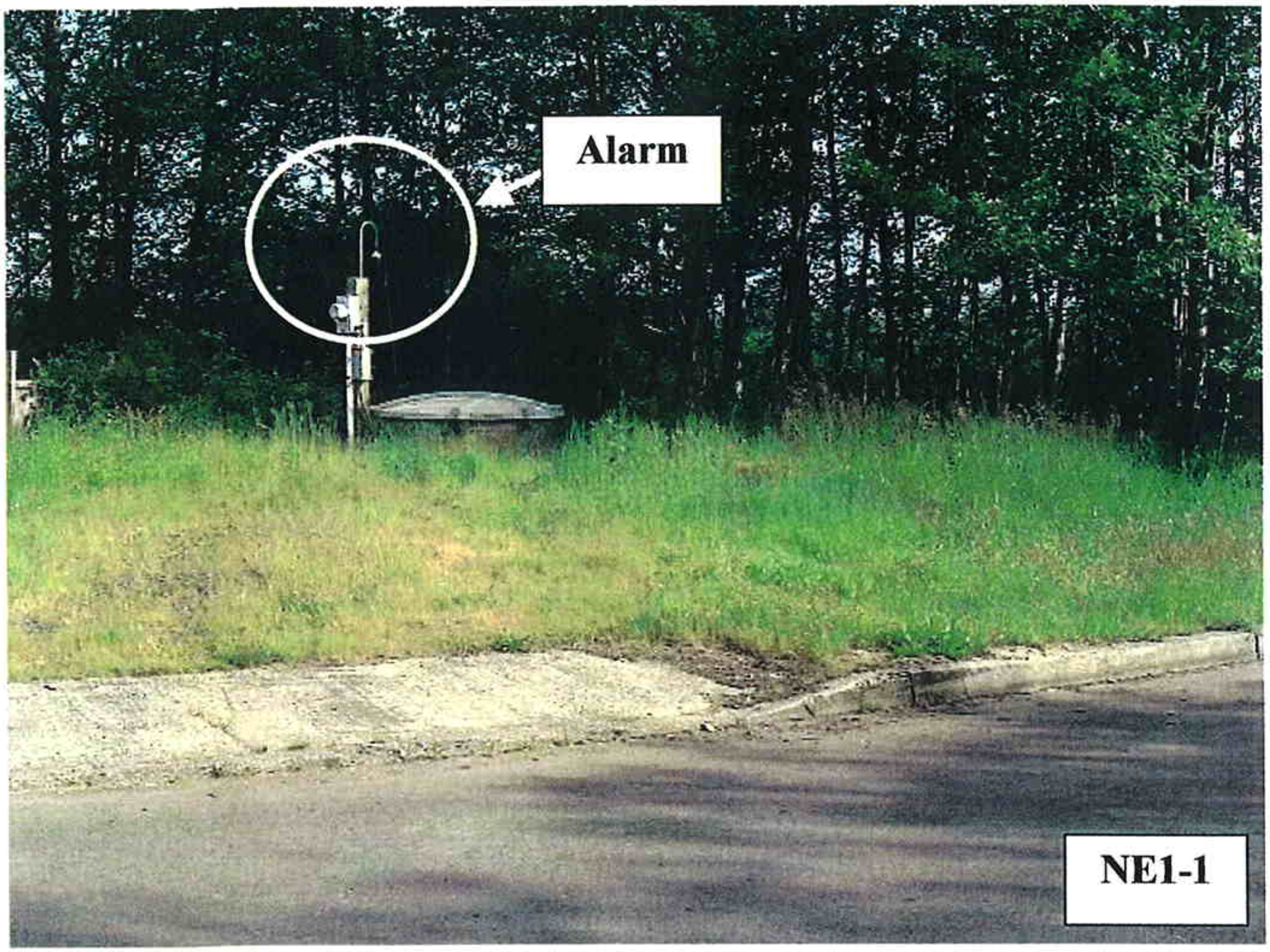
Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

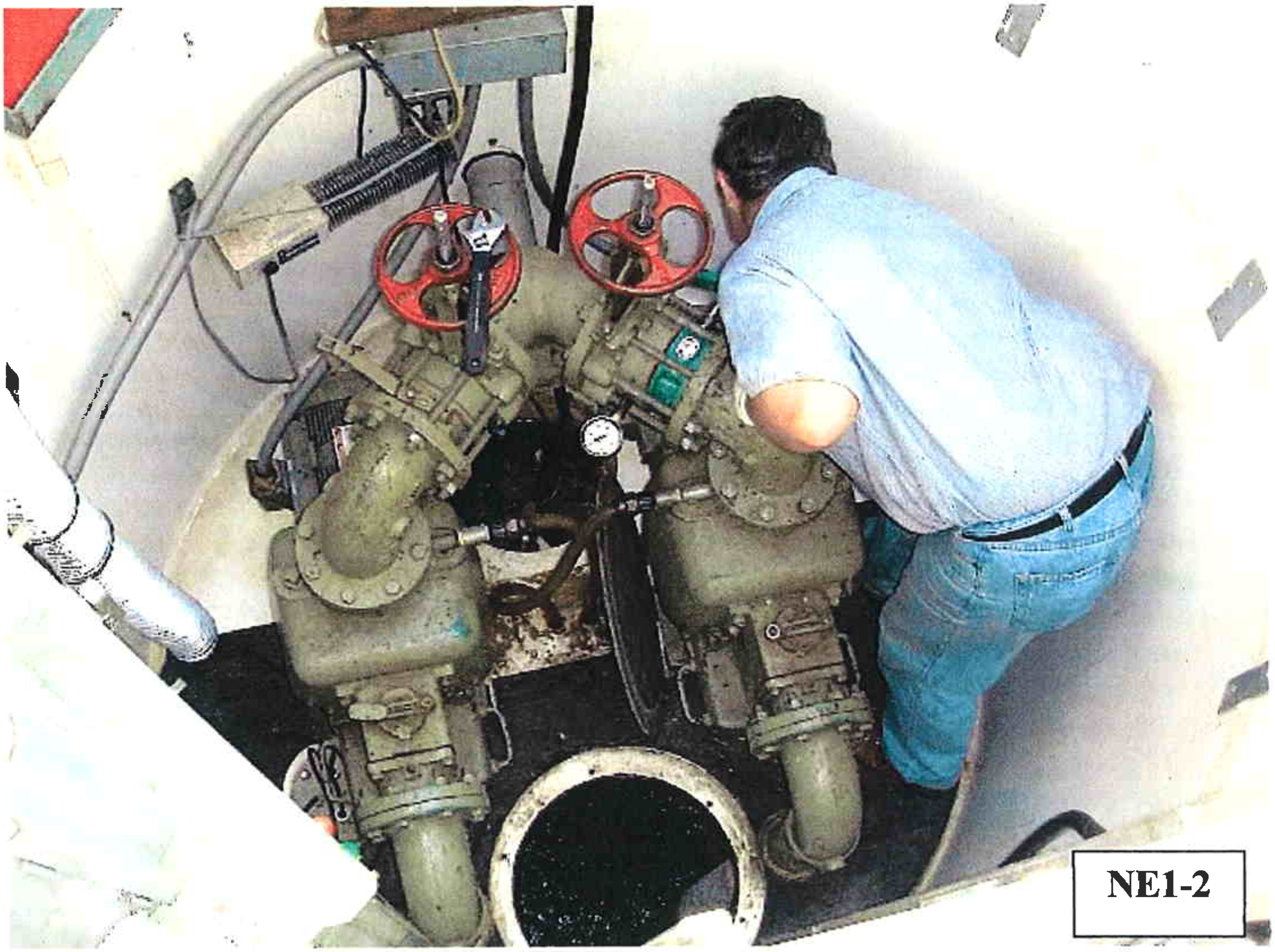
STATION: **NW ELM-NW 1ST**
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 12, 2001
FIELD PERSON: GGL CHECKED BY:

Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

NW ELM & NW 1st P/S




Alarm
NE1-1



NE1-2

NE1-3

SW Elm / SW 2nd Pump Station

PUMP STATION REPORT

SW ELM & SW 2ND STATION

DESCRIPTION:

This pump station handles the flows from approximately ½ of the newer subdivision areas immediately NW of the downtown area. (The other approximately ½ of the flows from the newer subdivision areas are handled by the NW Elm & NW 1ST station)

This pump station is a HYDRONIX fiberglass pre-fabricated unit station with a split, locking fiberglass cover, mounted on top of a concrete wet well, see attached photo SW2-1. It is a duplex station with 5.0 hp direct coupled, Model 40 MMPC pumps. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational. The discharge gate valves/force main header assembly did not have the required gauges. See photo SW2-2. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines, see attached Flowrate check sheet. Testing and measurements were conducted in accord with these guidelines. It should be noted that this station was tested 2 times, once with the draw down method on May 31, 2000, then re-tested according to the DEQ Flow rate testing procedure on December 12, 2001. Only the DEQ Flow rate testing procedure is reported on here.

The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The main pump controls (inside the station) were tested through operational cycling during flowrate testing. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident. See photo SW2-2. It should be noted that the electrical service panel was mounted on a separate pole, outside of the pump station enclosure, and with the proper sealing and panel latch, see attached photo, SW2-1. No odor control equipment or air compressor is used at this pump station.

A provision for alternate power is made by a manual transfer switch panel and the plug assembly for the portable generator. It is just to the right of the station fan and humidifier photo SW2-3 and under the split covers.

The alarm system is mounted on a separate pole, which is shown on photo SW2-4. The alarm light is mounted on a pole just south of the station and appeared to function properly. This alarm light is visible from SW 2nd Street. The station alarm system is also tied into a central alarm console, located in the City of Warrenton Public Works Shop.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found in the beginning of the Warrenton section. "A typical pump curve" is attached. Photos of the pump station are attached.

No construction plans, as-built drawings or technical specifications for this pump station were available in the City of Warrenton archives. We have made an effort to obtain a pump curve from the supplier, and they have supplied us with a "typical curve" for this station.

PUMP FLOWRATE/EFFICIENCIES:

It was possible to apply the typical pump curve to the DEQ flowrate spreadsheet. See attached typical curve, obtained from the supplier.

From the draw down testing/interview with City personnel, it was noted that this station had 5.0 hp motors with 7-1/2" impellers, running at 1150 rpm. However, the typical design curve indicates that it should be a 9-1/8" impeller. Therefore, flow rates are based upon a design maximum flow rate of 200 gpm at a calculated TDH of 32-34 feet for a new pump. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	196 gpm	98 %	2 %
#2	255 gpm	100+ %	None apparent

Explanation of the columns: Measured flow is typically from a DEQ Flow rate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by Measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

It has been noted that pump stations using the 40 MMPC type pump and impellers, have had impellers/motors changed without proper testing and flow recording procedures. This may explain why pump #2 appears to have higher pump capacity, and is noisy when operating. Note attached photos SW2-5 and SW2-6. They are of different motors, but both are 5.0 hp. See recommendations below.

FORCE MAIN:

The force main length is approximately 575 feet and is constructed of 4"ϕ PVC. This force main has a relatively flat profile, with no vacuum break or air release appurtenances. By visual inspection, of both the force main header assembly at the pump station, and the discharge manhole while pump station was operating, the force main appears in good condition. The force main from this pump station discharges into a shallow concrete manhole in the center of SW 2nd Street, approximately 50 west of the intersection of SW 2nd Street & Cedar Street. Sewage then flows out of the discharge manhole by 8"ϕ gravity sewer main and becomes tributary to an original pump station #2, located at SW 2nd & Alder, which then pumps into the force main going to the wastewater lagoons.

HYDROGEN SULFIDE:

There appeared to be some slight hydrogen sulfide damage at the discharge manhole. The interior of the discharge concrete manhole and steps were probed with a steel rod. The discharge manhole was found to be in good condition, with only slight hydrogen sulfide damage apparent. There were no signs of surcharging in this discharge manhole.

The influent manhole is located in the center of SW 2nd Street, approximately 50 feet southeast of the pump station. This manhole is connected to the station by approximately 50 feet of 6"ϕ PVC gravity main. There are no signs of surcharging in the influent manhole.

The interior of the influent concrete manhole and steps were probed with a steel rod. Little to no hydrogen sulfide damage was found at the influent manhole. However, it should be noted that mortar is coming out of the grade rings at the top of the manhole.

OVERFLOWS/BYPASS:

No profile of manholes adjacent to the pump station could be located in City archives. However, should the station surcharge, sewage would come out of the influent manhole or the pump station, both of which would run into the Alder Creek drainage, then into the Columbia. This condition is not anticipated, due the low cycle times of the pump station and the availability of a portable generator set.

RECOMMENDATIONS:

This station is in fair condition hydraulically.

- Regular maintenance, cleaning.

- The grounds around the station should be treated with a herbicide to keep the area immediately adjacent to the station open and clear. The road into the station should be better marked and maintained with consideration given to rock and drainage.

- As soon as possible, through coordination with the City's pump supplier, the 5.0 hp motors should be tested and the results should indicate whether or not a change should be made. Both impellers should be matched. This is indicated by the lower pumping rates and wear one of the pump chambers, and the higher than curve rates for pump #2.

- Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this critical station, and make it possible to use the DEQ flow rate methodology for future testing.

- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

- The influent manhole, although unrelated to the pump station, should receive maintenance attention from the public works department.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	138	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	139	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	7	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	25	inches	
Depth of fluid to pump eye (suction lift to start)	65	inches	**START**
Depth of fluid to pump eye (suction lift to stop)	99	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	16 psig	14 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	45.88 FT	41.26 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	12 psig	8 psig	
Reading adj. to impeller eye (add guage off.+start)	35.22 FT	25.98 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	11 psig	8 psig	
Reading adj. to impeller eye (add guage off.+stop)	35.74 FT	28.81 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

TDH @ pump start (at midpool)	36.64 FT	27.40 FT	taken at mid-pool, with water column moving
TDH @ pump stop	35.74 FT	28.81 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1150 RPM

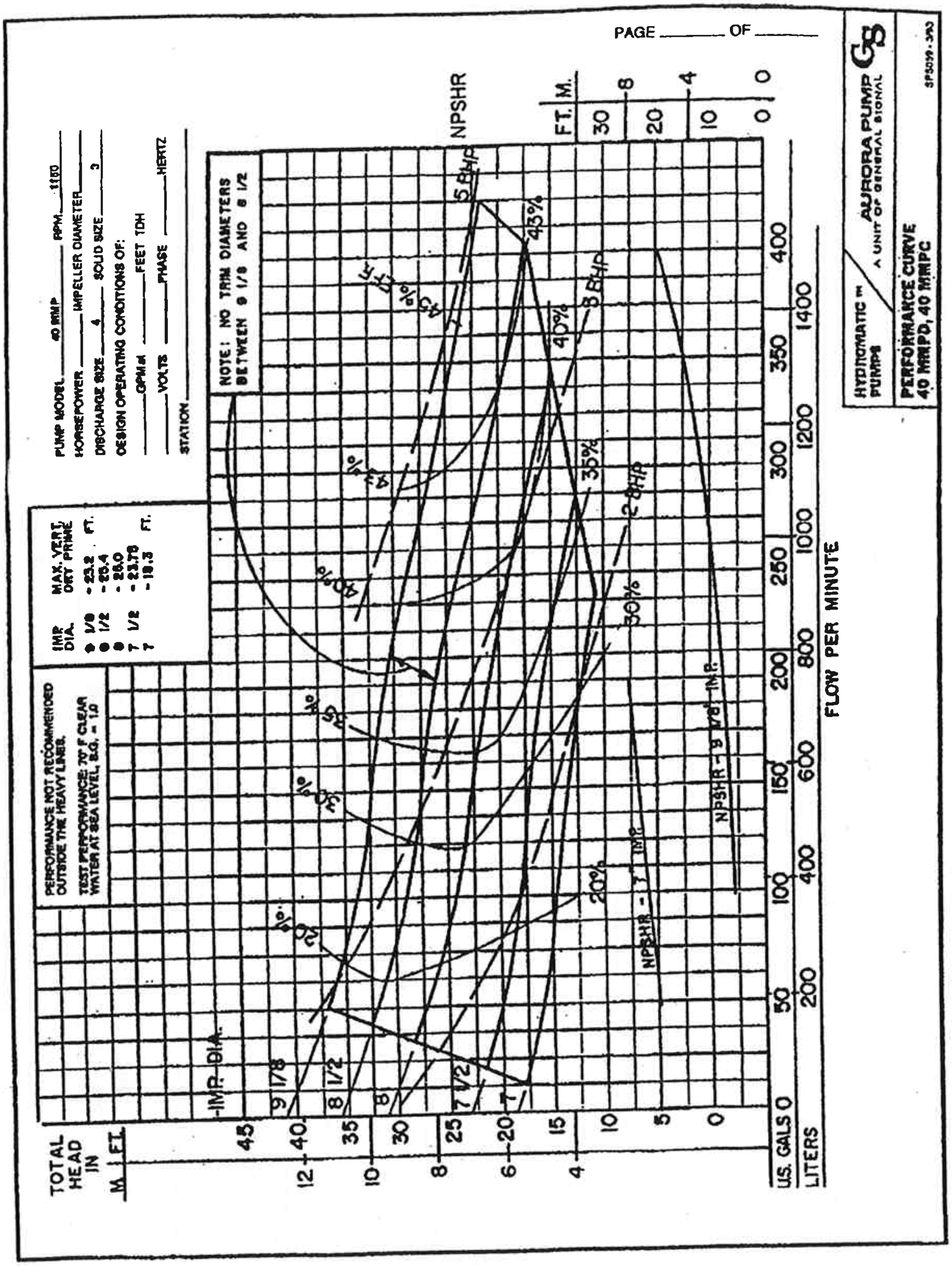
Flowrate @ pump start (curve interpolation)	206 GPM	274 GPM	
Flowrate @ pump stop (curve interpolation)	186 GPM	236 GPM	
Average Flow, gpm	**196** GPM	**255** GPM	Mean
Design GPM	200 GPM	200 GPM	EST. FROM TYPICAL CURVE
% of new capacity	98%	128%	

Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

STATION: **SW ELM-SW 2 ST**
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 12, 2001
FIELD PERSON: GGL CHECKED BY:

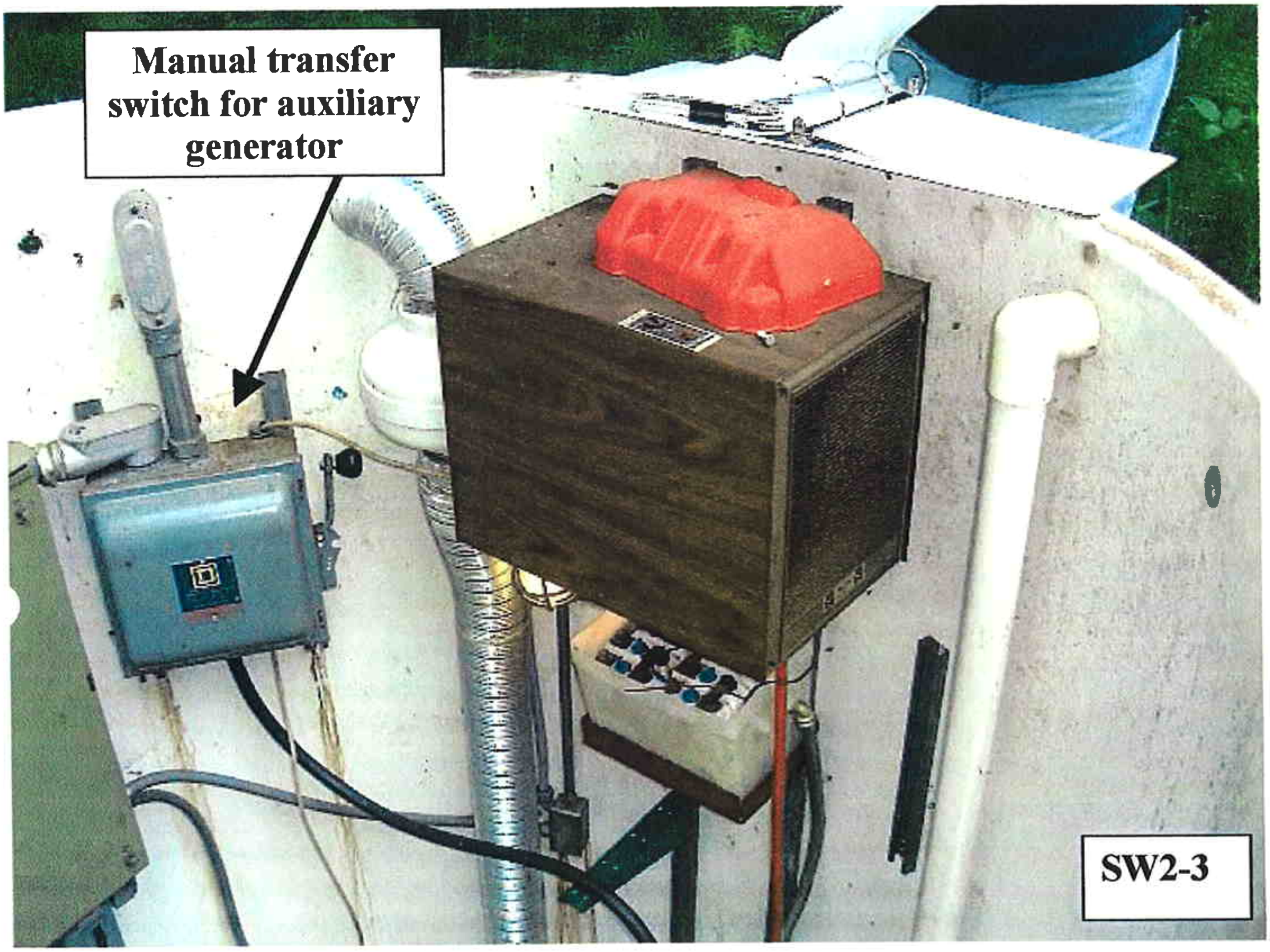
Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

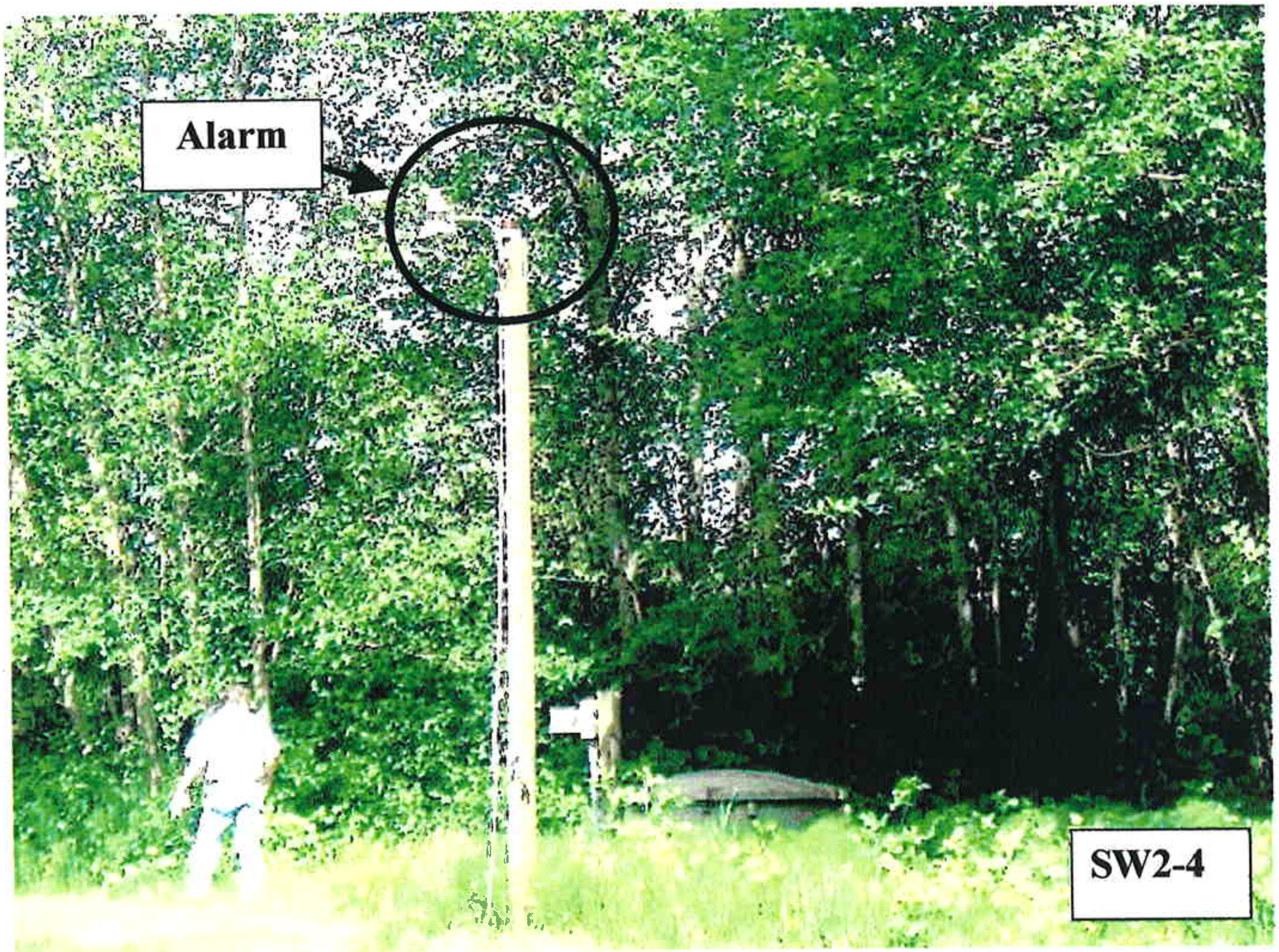
SW ELM & SW 2nd P/S

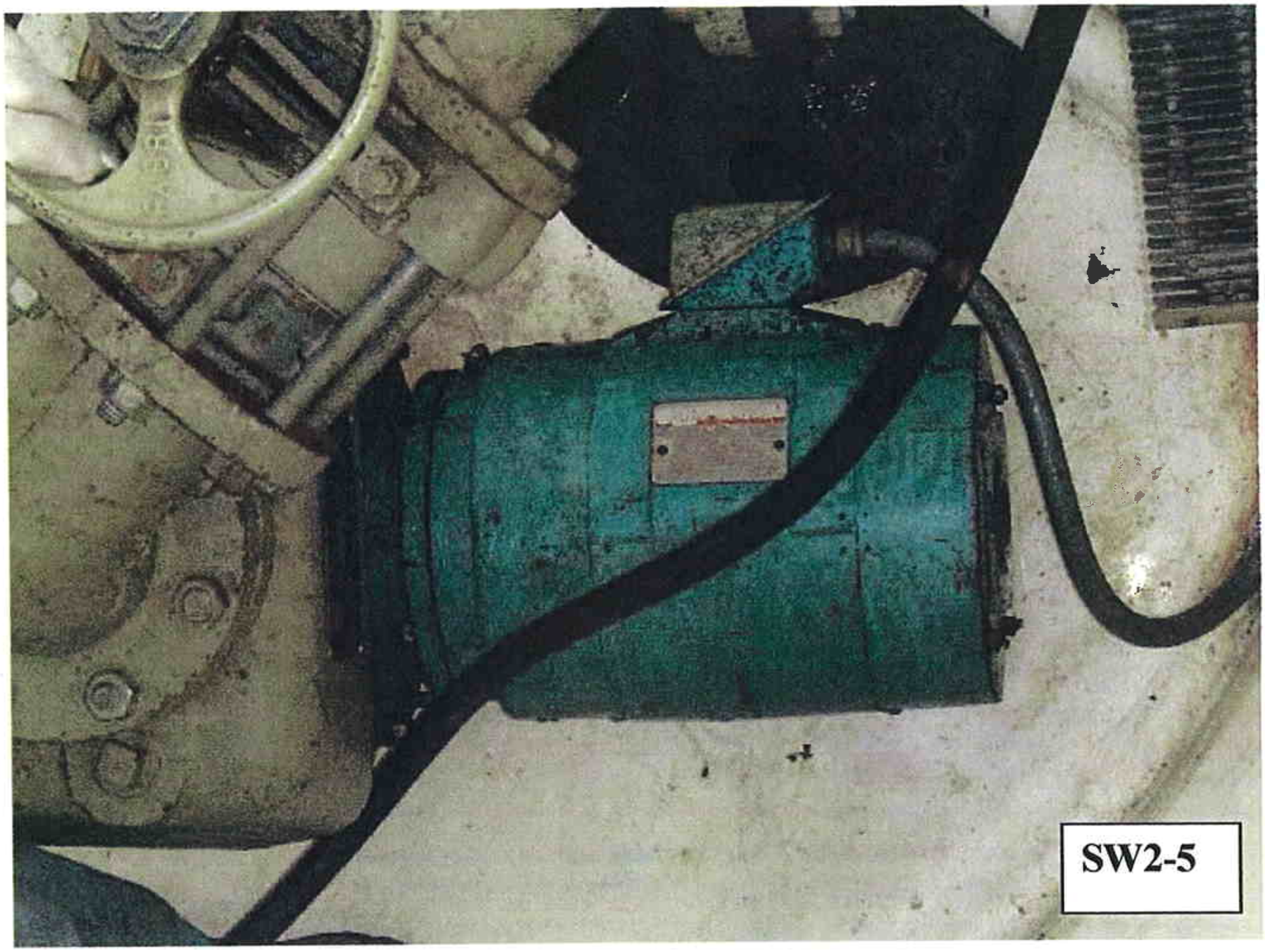


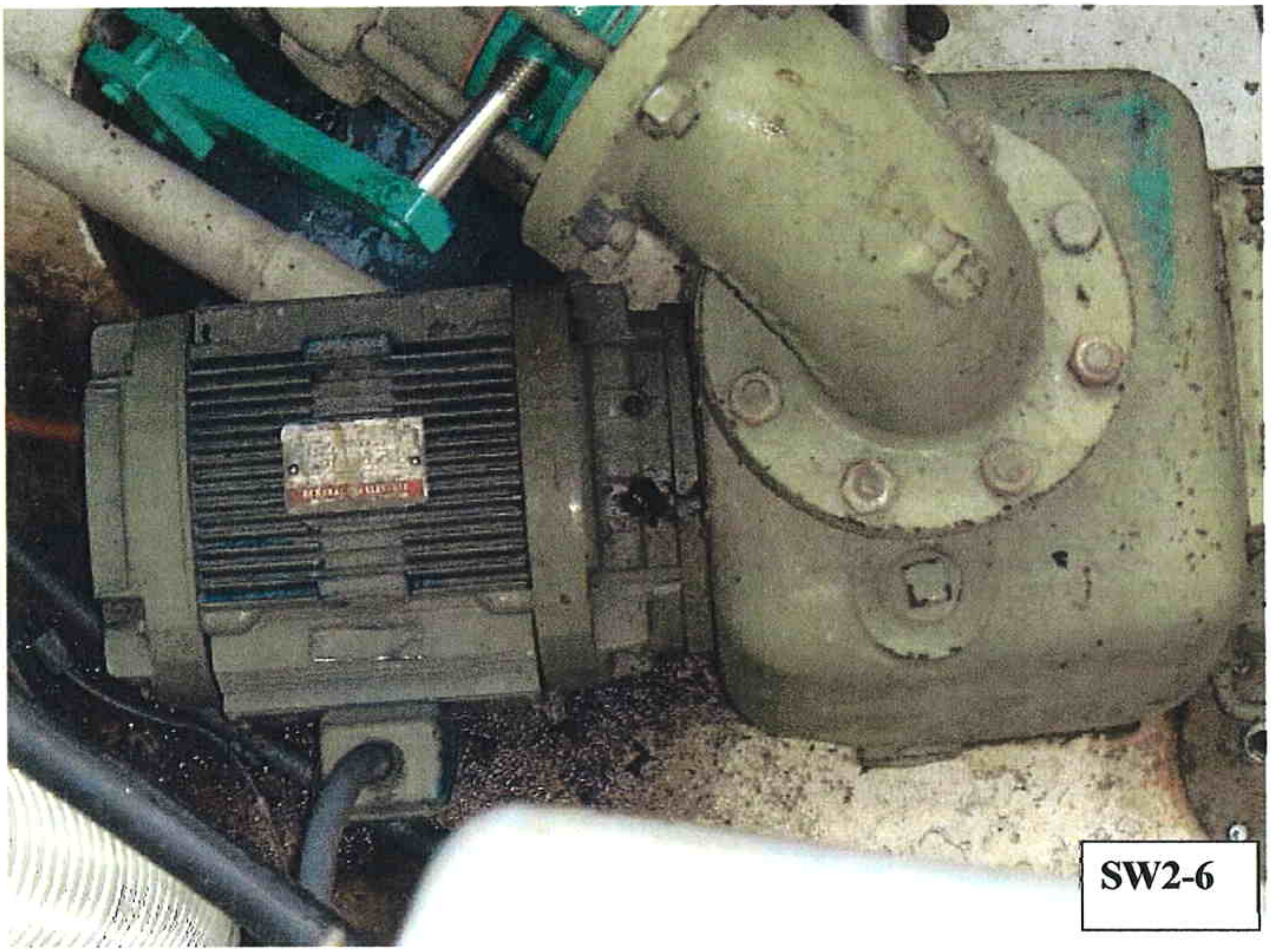

SW2-1

SW2-2


Manual transfer switch for auxiliary generator
SW2-3


Alarm
SW2-4


SW2-5



SW2-6

NW 4th / Alder Manor Pump Station

PUMP STATION REPORT

ALDER MANOR STATION

DESCRIPTION:

This pump station handles the flows from the Alder Manor Mobile Home Park.

This pump station is a HYDRONIX fiberglass pre-fabricated unit station with a split, locking fiberglass cover, mounted on top of a concrete wet well, see attached photo AMN-1. It is a duplex station with 5.0 hp direct coupled, Model 40 MMPC pumps. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational. The discharge gate valves/force main header assembly did not have the required gauges. See photo AMN-2. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines, see attached Flowrate check sheet. Testing and measurements were conducted in accord with these guidelines. It should be noted that this station was tested 2 times, once with the draw down method on June 7, 2000, then re-tested according to the DEQ Flow rate testing procedure on December 11, 2001. Only the DEQ Flow rate testing procedure is reported on here.

The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The main pump controls (inside the station) were tested through operational cycling during flowrate testing. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident. The cover to this panel did not latch properly. Latch broken. See photo AMN-3. It should be noted that the electrical service panel was mounted on a separate post, outside of the pump station enclosure, across the street, and with the proper sealing and panel latch, see attached photo, AMN-1. No odor control equipment or air compressor is used at this pump station.

A provision for alternate power is made by a transfer switch panel and the plug assembly for the portable generator. It is across the street from the station, (west side) see photo AMN-1.

The alarm system is mounted on a separate pole, which is shown on photo AMN-1. The alarm light is mounted on a pole just southwest of the station and appeared to function properly. This alarm light is visible from NW 4th. The station alarm system is also tied into a central alarm console, located in the City of Warrenton Public Works Shop.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found in the beginning of the Warrenton section. A pump curve and photos of this station are attached.

Construction plans for this pump station were available in the City of Warrenton archives. We have copied the original curve from the plan set.

PUMP FLOWRATE/EFFICIENCIES:

It was possible to apply the pump curve to the DEQ Flowrate spreadsheet. Since one pump is operating at the radial thrust area of the curve, it is only an estimate of flows.

From the draw down testing/interview with City personnel and available records, it was noted that this station had 5.0 hp motors with 8" impellers, running at 1150 rpm. Therefore, flow rates are based upon a design maximum flow rate of 200 gpm at a calculated TDH of 21.0 feet for a new pump. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	322 gpm	100+ %	None apparent
#2	159 gpm	80 %	20%

Explanation of the columns: Measured flow is typically from a DEQ Flow rate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

It has been noted that pump stations using the 40 MMPC type pump and impellers, have had impellers/motors changed without proper testing and flow recording procedures. This may explain why pump #1 appears to have higher pump capacity. Note attached photo AMN-2. They are of different motors, but both are 5.0 hp. See recommendations below.

FORCE MAIN:

The force main length is approximately 510 feet and is constructed of 4"ϕ PVC. This force main has a relatively flat profile, with no vacuum break or air release appurtenances. By visual inspection, of both the force main header assembly at the pump station, and the discharge manhole while pump station was operating, the force main appears in good condition. The force main from this pump station discharges into a shallow concrete manhole on the north side of the intersection of NW 4th and NW Warrenton Drive, just off of the fog line. Sewage then flows out of the discharge manhole by 8"ϕ gravity sewer main and becomes tributary to the Lagoon Station pump station #2, located at SW 2nd & Alder, which then pumps into the force main going to the wastewater lagoons.

HYDROGEN SULFIDE:

There did not appear to be any hydrogen sulfide damage at the discharge manhole. The interior of the discharge concrete manhole and steps were probed with a steel rod. The discharge manhole was found to be in good condition. There were no signs of surcharging in this discharge manhole.

OVERFLOWS/BYPASS:

The profile of the force main and the elevation of the pump station make it impossible for the sewage to overflow this station. In informal interviews with City personnel, it was learned that they did not hook a generator up to this station, although the capability exists. This station, once it gets to the top of the wet well, starts draining by gravity. This condition is not anticipated, due the low cycle times of the pump station and the availability of a portable generator set.

RECOMMENDATIONS:

This station is in fair condition hydraulically.

- □ Regular maintenance, cleaning. Repair control panel latch.

- □ As soon as possible, through coordination with the City's pump supplier, the 5.0 hp motors should be tested and the results should indicate whether or not a change should be made. Both impellers should be matched. This is indicated by the lower pumping rates and wear one of the pump chambers, and the higher than curve rates for pump #1.

- □ Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this critical station, and make it possible to use the DEQ flow rate methodology for future testing.

- □ An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	126	inches	(Datum, top of wetwell, pump mounts)	
Suction pipe to pump eye	120	inches	(Datum, top of wetwell, pump mounts)	
Impeller eye elevation above datum	10	inches	(May be same as pump eye to datum)	
Offset of pressure guage to pump eye	26	inches		
Depth of fluid to pump eye (suction lift to start)	88	inches	**START**	
Depth of fluid to pump eye (suction lift to stop)	116	inches	**STOP**	

PRESSURE DATA

	Pump #1	*Pump #2*	Note
Shutoff head, direct guage reading,	10 psig	10 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	33.73 FT	33.73 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	5 psig	7 psig	
Reading adj. to impeller eye (add guage off.+start)	21.01 FT	25.63 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	2 psig	5 psig	
Reading adj. to impeller eye (add guage off.+stop)	16.41 FT	23.34 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

	Pump #1	*Pump #2*	Note
TDH @ pump start (at midpool)	22.18 FT	26.80 FT	taken at mid-pool, with water column moving
TDH @ pump stop	16.41 FT	23.34 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1150 RPM

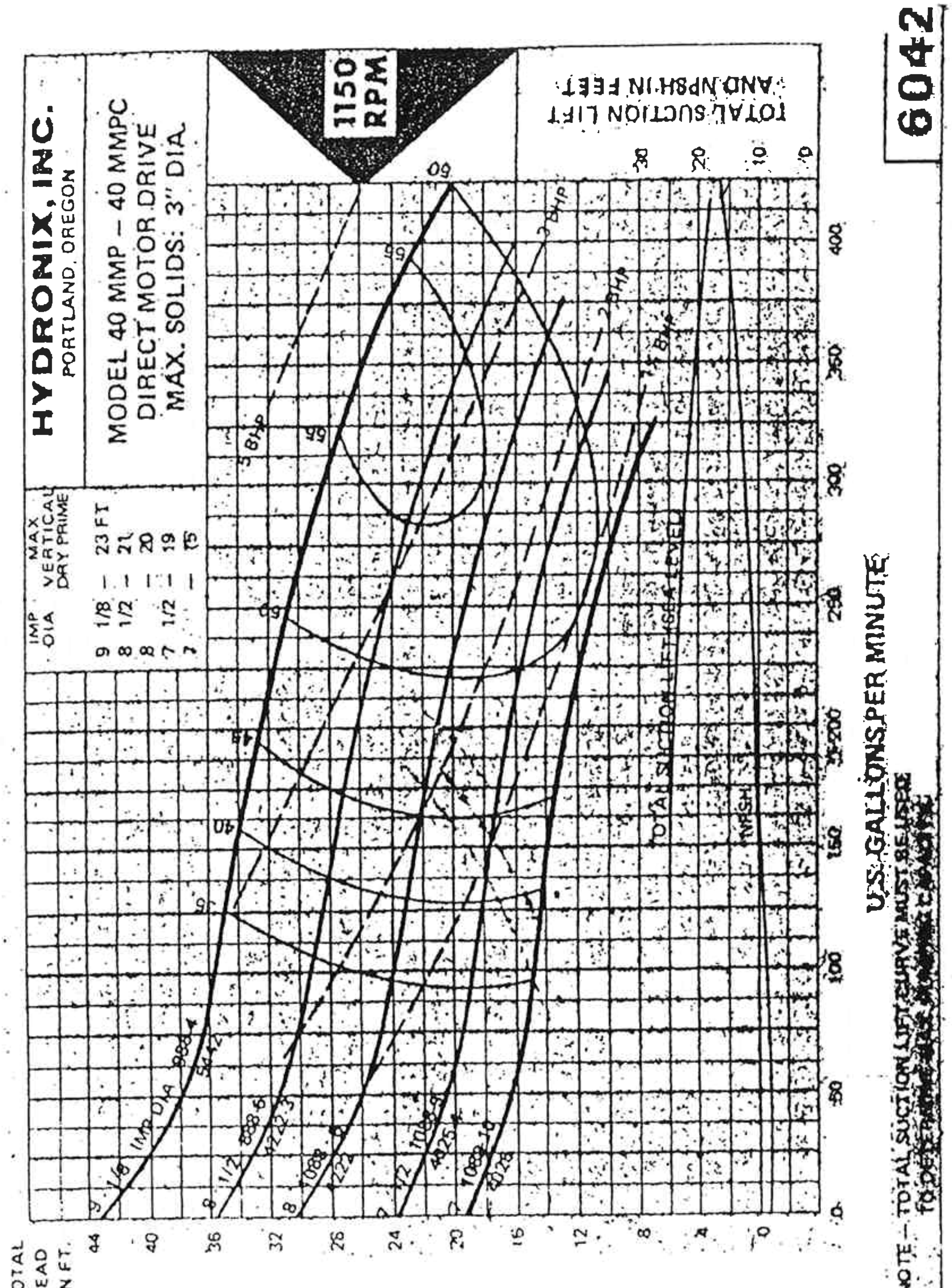
	Pump #1	*Pump #2*	Note
Flowrate @ pump start (curve interpolation)	275 *GPM*	137 *GPM*	
Flowrate @ pump stop (curve interpolation)	362 *GPM*	262 *GPM*	
Average Flow, gpm	**319** *GPM*	**200** *GPM*	Mean
Design GPM	200 *GPM*	200 *GPM*	EST. FROM TYPICAL CURVE
% of new capacity	159%	100%	EST. FROM TYPICAL CURVE, TDH = 25.0'

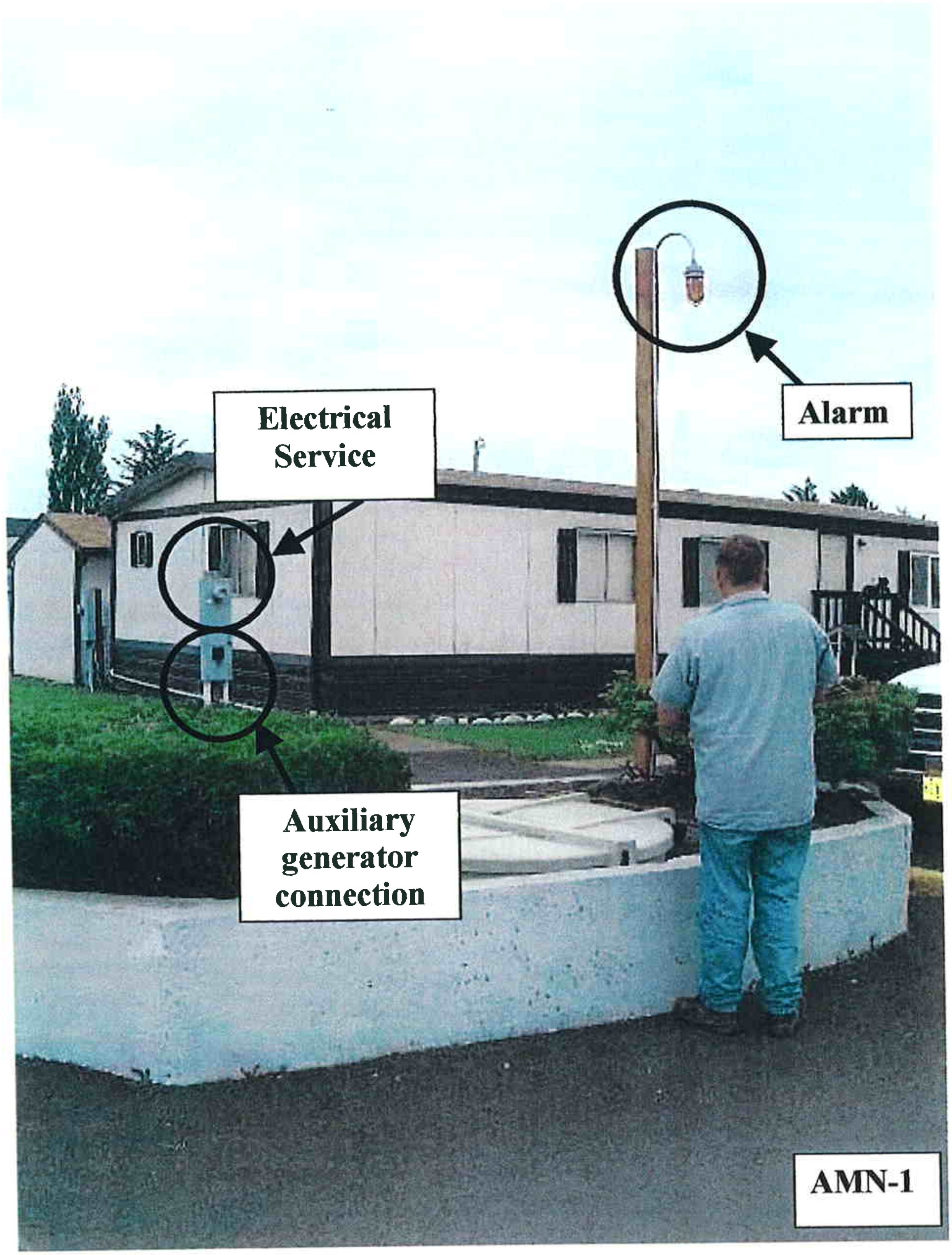
Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

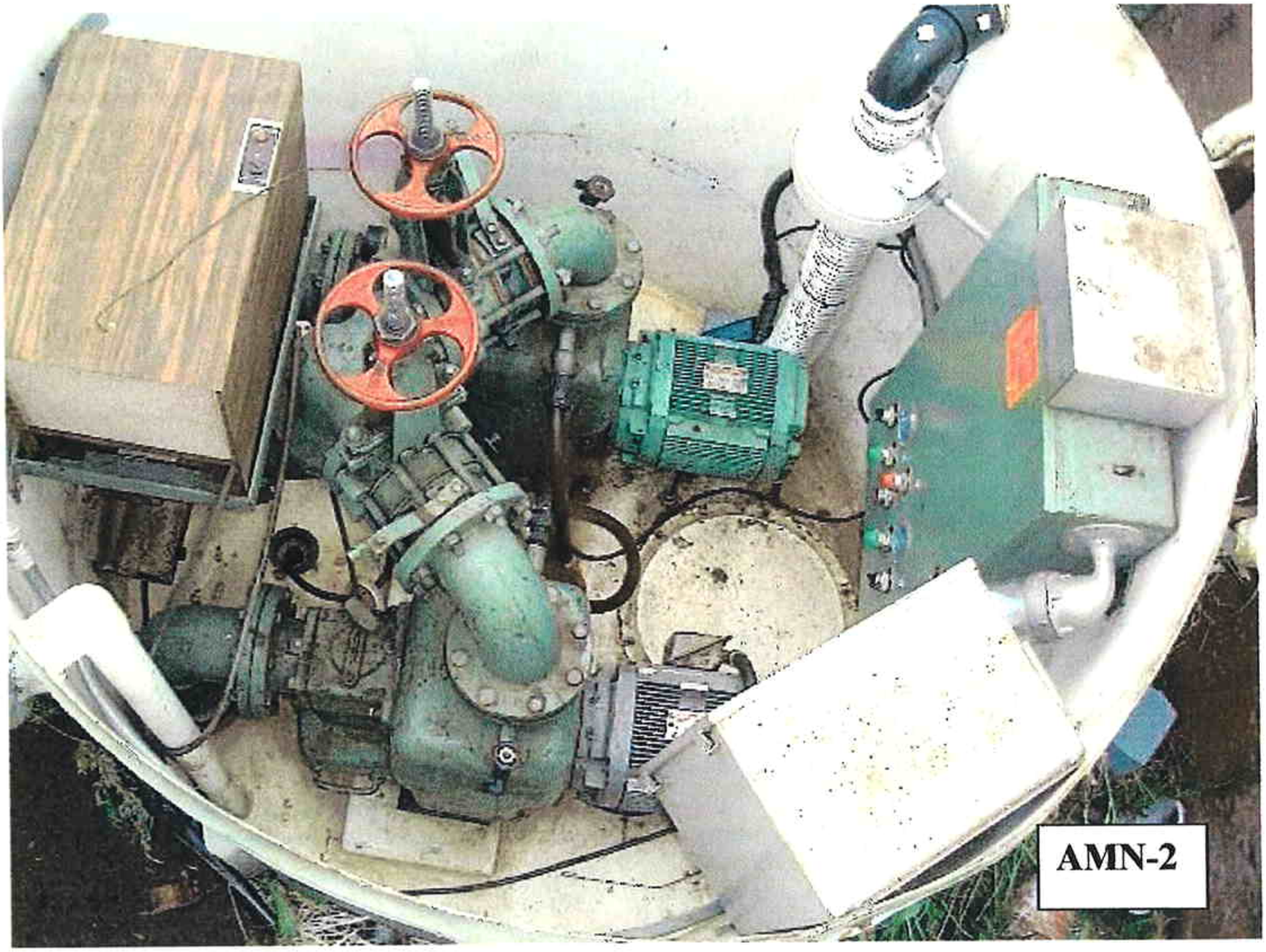
STATION: **ALDER MANOR**
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

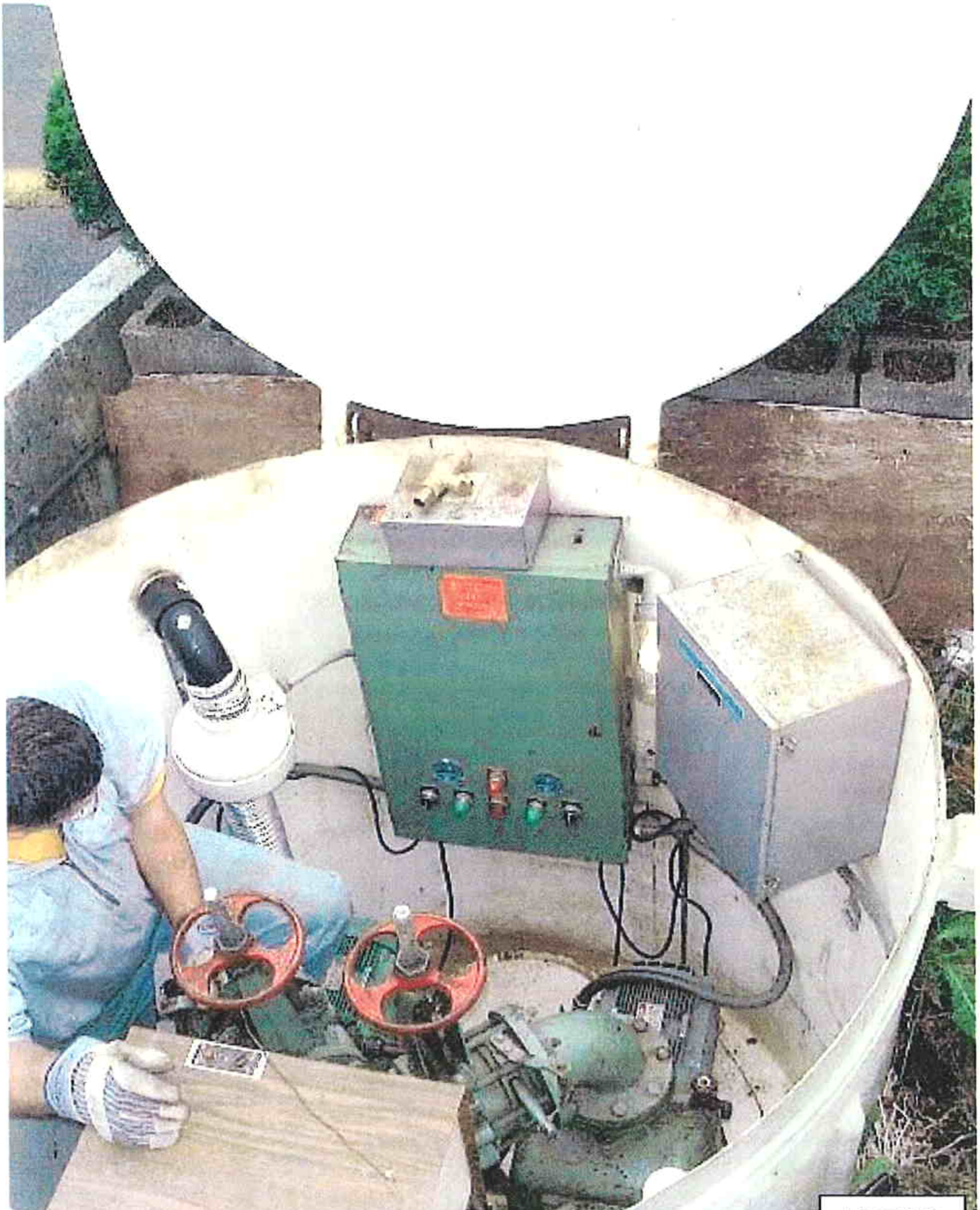
Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

ALDER MANOR P/S




Electrical Service
Alarm
Auxiliary generator connection
AMN-1


AMN-2



AMN-3

SW 9th Pump Station

PUMP STATION REPORT

SW 9TH PUMP STATION

DESCRIPTION:

This pump station was constructed in the summer of 1995. It transfers the flows from southwest Warrenton, by force main, east along SW 9th Street, to a discharge manhole near the Warrenton Middle School. See photo SW9-1.

It is a concrete wet-well type with submersible 5 hp pumps mounted on a rail system. The pumps are PACO, Submersible Non-Clog, Series 4420 Type QDC. Both pumps were found to be operational.

A concrete vault contains the gate valves (with 10"ϕ hand wheels) and discharge header assembly. See photo SW9-1. The discharge gate valves/force main header assembly did have the required gauges. However, the gauges did not appear to be operating properly. The pressures seemed low. The original gauges were removed and a test gauge installed for the testing procedure. The test gauge read approximately 5 psi higher. The testing procedure as required in the DEQ Flowrate Check Sheet guidelines was followed. See photo SW9-3.

A fiberglass equipment enclosure houses pump controls, an air compressor and a small heater. The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The controls were tested through operational cycling during flowrate testing. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch. It should be noted that the electrical service panel was mounted inside of the fiberglass equipment shelter. No odor control equipment is used at this pump station. See attached photos, SW9-1 and SW9-2.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, mounted in the fiberglass equipment shelter. The plug for the auxiliary generator is visible to the right of the switch panel in attached photo SW9-2. The equipment shelter is visible to the south of the wet well in the attached photo, SW9-3.

It should be noted that two (2) alarms are visible in attached photo SW9-1. The alarm to the left of the page, (alarm #1) is a discontinued telephone dialer alarm. The City has stopped using this alarm and uses alarm #2, at the right of the page, which is a radio/telemetry alarm mounted on a pole, just south of the fiberglass equipment station in photo SW9-1. The alarm appears to function properly. The alarm is visible from SW 9th St. The station alarm system is also tied into a central alarm console, located in the City of Warrenton Public Works Shop.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found at the beginning of the Warrenton (green) section. The format of this spreadsheet is taken from the current DEQ Guidelines. The pump curve is attached to this report. Photos of the pump station are attached. A DEQ Guidelines based flow rate spreadsheet with explanatory notes was developed and is also part of and attached to this report.

Construction plans, as-built drawings and technical specifications for this station are available from the City of Warrenton Public Works Department.

PUMP FLOWRATE/EFFICIENCIES:

See attached pump curve, obtained from the pump manufacturer. Based upon a design maximum flow rate of 150 gpm, the calculated TDH is 45 feet for a new pump operating at 50% efficiency. The pump flows were measured during pump station operation. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	295 gpm	100% +	None apparent
#2	120 gpm	80%	20%

Explanation of the columns: Measured flow is typically from a DEQ flowrate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

FORCE MAIN:

Total length of the force main is approximately 3,500 feet, and is constructed of 4"ϕ PVC. This initial section runs in an undulating, slightly up-hill route then downhill to its discharge manhole. This manhole is located approximately 240 feet west of the intersection of SW 9th St and SW Cedar Avenue. See attached photo SW9-5 at this point, sewage flows by gravity, into the 3rd/Main Court Pump Station and then onto the Wastewater Lagoons.

HYDROGEN SULFIDE:

The pump station wet well did not appear to have significant hydrogen sulfide damage. The relative newness of the concrete, along with the operation of the air compressor serves to minimize hydrogen sulfide damage. See photo SW9-4. By visual inspection, both the force main header assembly and vault also appear sound. See photo SW9-3. No exposed aggregate or concrete cracking was observed at the wet well or vault assembly.

The discharge manhole appeared in good condition. The location is shown in photo SW9-5. The force main was not in operation when this manhole was observed. Some exposed aggregate and concrete cracking was observed. When probed with a 4 feet long, 1/2" steel rod, no significant chipping or spalling was observed. See photo SW9-6. Slight ground water infiltration was observed seeping in through the base. The steel steps going into the manhole were in good condition.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. If the station wet-well was surcharged, the overflow would come out the top of the pump station wet well, flowing over and into the sandy ground surface toward the "no-build" wetland areas. This condition is not anticipated though, due to the low cycle times of the pump station, and the availability of a portable generator set.

RECOMMENDATIONS:

This station is in fair condition.

- ☐ The vibration in pump #2 should be examined and repaired.
- ☐ The three (3) gauges in the discharge header vault should be replaced.
- ☐ The discharge header vault had about 2" of water on the vault floor. The 2"drain and "p" trap should be blown out so that vault drains properly.
- ☐ Regular maintenance, cleaning. A long-handled "mutt" was discussed with City personnel as a method to remove grease from the wet-well walls.
- ☐ During the summer months, the fiberglass equipment station should have the fiberglass damage repaired. The small residential-type heater should be replaced with a commercial bar-type heater of low wattage for condensation control.
- ☐ A program to clean/cut the brush around the station would make the alarm light much more visible. City personnel must be right alongside the station to to see the alarm lights.
- ☐ An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.
- ☐ See attached evaluation letter, dated January 22, 2001 regarding the venting of the force main or careful selection of an air release/vacuum breaker and upgrading of the air compressor.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUBMERSIBLE PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	144	inches	(Datum typically lid of wetwell/vault)	
Depth of pump eye to datum	136	inches	(Datum typically lid of wetwell/vault)	
Offset of pressure guage to datum	22	inches	This is a negative number, (below datum)	Datum typically the floor or grating in the station, in this case, datum is the top of separate wet well and vault. Gauge is below datum.
Offset of pressure guage to pump eye	114	inches	(Pump eye elevation = 0.0 typically)	
Depth of fluid to guage (for start)	55	inches	**START**	
Depth of fluid to guage (for stop)	79	inches	**STOP**	

PRESSURE DATA

	Pump #1	***Pump #2***	
			SUBMERSIBLE:
Shutoff head, direct guage reading,	25 psig	18 psig	
Shutoff head, translated to eye of pump, then mid-pool.	**63.33** FT	**47.16** FT	(psig x 2.31) + (avg pumped distance) **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	15 psig	14 psig	
Reading adj. to impeller eye (add guage off.)	44.15 FT	41.84 FT	(psig@start x 2.31) + (guage offset)
Guage reading @ pump stop	16 psig	15 psig	
Reading adj. to impeller eye (add guage off.)	46.46 FT	44.15 FT	(psig@stop x 2.31) + (guage offset)

TOTAL DYNAMIC HEAD

TDH @ pump start, (discharge head - wtr over eye)	**39.23** FT	**36.92** FT	BACK OUT THE WETWELL WATER LEVEL: discharge head @ start - water over pump eye @ start
TDH @ pump stop, (discharge head - wtr over eye)	**43.54** FT	**41.23** FT	discharge head @ stop - remaining water over pump eye @ stop **(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1750 RPM

Flowrate @ pump start (curve interpolation using TDH)	315 ***GPM***	140 ***GPM***	Pump #2 slight noise, slight vibration
Flowrate @ pump stop (curve interpolation using TDH)	275 ***GPM***	100 ***GPM***	
Average Flow, gpm, (mid-pool)	**295** ***GPM***	**120** ***GPM***	Mean average
Design GPM	150 ***GPM***	150 ***GPM***	Design: 150 GPM
% of new capacity	197%	80%	Design: 45' TDH

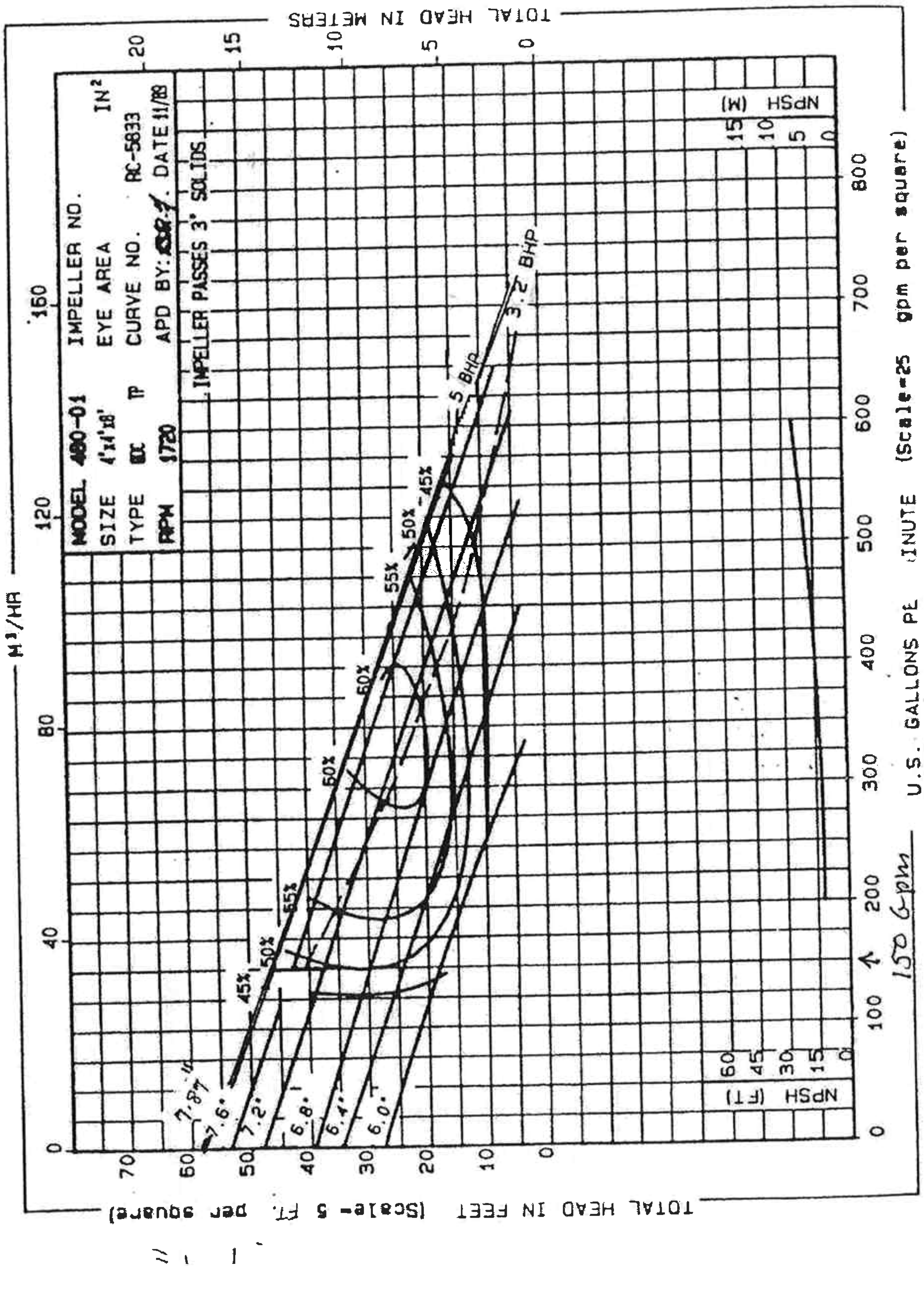
SPREADSHEET CALCS DATE: Oct. 30, 2002
STATION: **SW 9th PS**
CURVE: Yes, attached
DATE OF FIELD TESTING: Nov. 13, 2002
FIELD PERSON: JGF CHECKED BY: JGF

Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.
Note: Test guage used during testing, orig. guages bad.

Design: 7.87" Impeller Trim
Design: 5.0 HP/1750 RPM
Design: PACO 4420 QDC

SW 9th P/S

(45 TDH / 7.87" Trim)



HLB & Associates
I N C O R P O R A T E D

Surveying ♦ Civil Engineering ♦ Planning

January 22, 2001

City of Warrenton
P.O. Box 250
Warrenton, Oregon 97146

ATTN: Mr. Alan Johansson, PE

RE: Inspection and Evaluation of the SW 9th Street Pump Station

Dear Mr. Johansson:

As requested, we have completed an inspection and evaluation of the SW 9th Street Pump Station. Our field findings and analysis are summarized below.

Location

SW 9th Street, Warrenton, about 4,000 feet west of the Warrenton Middle School.

Pump Station Description

The pump station is a standard submersible installation which includes a duplex pump arrangement in a wet well, a small below-grade valve vault, and a nearby above-ground fiberglass enclosure housing motor controls. Each pump discharge contains a spring-actuated check valve and a gate valve. Piping in the wet well and the adjacent valve vault is 4-inch diameter ductile iron pipe. The intertie between the two pumps is performed within the valve vault. A transition to the 4-inch diameter Class 200 IPS PVC is made just outside the valve vault.

The wet well is 6 feet in diameter and about 12 feet deep. Three sewers enter the wet well at about mid-wall height at quarter points away from the pumps. A drain line from the valve vault enters the wet well on the wall nearest the pumps.

The pumps are controlled off floating levels arranged in a typical fashion which include float switches for pumps off, lead pump on, high water alarm, follow pump on, and overflow alarm levels. The pump controls alternate pumps between lead and follow duty. Pump controls include a hand-off-auto switches and pump run-time meters.

Run-time meters indicate that flows to this pumping station are quite low. The total run-time for the station in the last year was 129 hours, split evenly between the two pumps.

The force main is about 3,500 feet long. The invert elevation of the force main discharge manhole is at El 7.36. Note, however, that the force main contains an unvented intermediate high point about 1,800 feet downstream from the pump station. Although there are a number of grade changes along the pipeline alignment, the force main is continuously-rising to the high point and continuously-descending downstream from the high point.

Special Equipment

There is a small air compressor in the motor control shelter used for air injection for hydrogen sulfide control. Air is injected near the confluence of the pump discharge lines. The compressor is capable of delivering 6.2 CFM to the force main at 4.4 psig, although the actual delivery rate will be about one-quarter of this air flow rate at normal force main pressures. This is below the DEQ "rule of thumb" air flow of 2 CFM per inch diameter of force main.

General Condition

The pump station is fairly new (1995 construction) and structurally is in fine shape. Wet well concrete is hard and shows no sign of cracking, exposed aggregate, etc. We noted grease in the wet well, both adhering to the wet well wall below the lead-pump-on level and floating on the surface. We found light rust and grime on the appurtenances within the valve vault. The floor of the vault was covered with about 2 inches of water, indicating that the floor drain is clogged. We are not aware if the drain line contains a trap to prevent sewer gases in the wet well from entering the vault. The galvanized steel access doors for the wet well and the vault were in good condition.

We inspected the force main discharge manhole and found it in moderately-good condition. The manhole is at most 5 feet deep. The condition of the concrete in the cone section of the manhole was excellent, as were the iron manhole steps and the frame and cover. We noted, however, mild to moderate infiltration entering the manhole from the base joint. There was also a trickle of flow coming from the force main, even though it had been some time since the last pump-on cycle. This inflow may be entering through the force main connection to the manhole, and not from points upstream. The manhole cover contains two vent holes. The manhole is located near the centerline of the street, and the street has a pronounced centerline crown. Water will therefore tend to flow away from the manhole and not enter as inflow.

Pump Station Hydraulics

We performed a pump start test to determine the shut-off head of each pump. Correcting for pressure gauge elevation and the water surface elevation in the wet well, we estimate the shut off head for both pumps to be about 43 feet tdh. The pump submittals, however, indicate that the pumps should have shut-off heads of about 57 feet tdh, which is associated with impeller diameters of 7.87 inches at 150 gpm as indicated on the submitted pump curves. If the pump discharge pressure gauges are reading true, then there has either been significant impeller wear or smaller impellers than specified were installed. Impeller wear is unlikely, given the age of the facility and the low run-times on the pumps.

Note that we did not run the pumps with the isolating gates open. At the time we were on-site, there was barely enough sewage in the wet well to cover the pumps. With sewage levels so low, cycling the pumps on with discharge valves open would have caused the pumps to quickly break suction, thereby negating any test results. If it becomes necessary to run the pumps under normal conditions to gather additional head and flow data, then we recommend that the City turn off the pumps for some time prior to testing the pumps so that there is sufficient sewage in the wet well to ensure steady pump performance.

We modified the submitted pump curves to reflect our field findings and compared the curves to our system curve calculations (our system head calculations are attached). We estimate that the pumps are capable of delivering about 112 gpm at about 36 feet tdh. It is important to note, however, our assumptions regarding the operational characteristics of the pumping system. As noted above, the force main contains an unvented intermediate high point. We believe that between pump starts the force main will drain completely downstream from the force main high point. As such, start-up static head conditions will be defined by the high point and not the discharge manhole. Further, some of the force main sections downstream from the high point have gravity flow capacities which are less than the pump capacity of 112 gpm. Pump flow will therefore create a backwater which moves upstream toward the high point. Since the high point is currently unvented, trapped air will be forced upstream in the pipeline and collect along the higher elevations in the pipeline profile. The trapped air (and air added for hydrogen sulfide control) will air-bind the force main and cause the pumps to move back our their curves. This will in turn cause pump flows to decline. It is possible under these discharge conditions for the pump to continually "hunt" for an stable operating point.

Venting the high point will help stabilize pump operation. A small-diameter standpipe would be one solution, although the required height above the surrounding ground surface may make this venting option impractical. Another venting option is to install a vacuum breaker/air release valve at the high point. This will theoretically eliminate air-binding at the high point. Note, however, that vented air near ground surface may cause an odor problem at the point of discharge. Also, most air release valves clog with solids and grease if not maintained regularly. Finally, venting air against a rapidly-rising water column must be done carefully to avoid a potentially-damaging waterhammer condition. There are many documented cases in which pipelines have been damaged as the result of venting air too rapidly.

Recommendations

Based on our field investigations, we make the following recommendations:

1. Vent the force main high point, either with a standpipe or a carefully selected air release/vacuum breaker valve assembly.

2. Clear the floor drain in the valve vault and ensure that a trap is present to prevent sewer gases from venting up into the vault.

3. The pump station is maintained on a weekly basis, but grease build-up in the wet well is scraped off less often. We recommend that grease removal be made part of the weekly routine maintenance.

4. Upgrade the air compressor for higher air delivery rate.

We hope this inspection and evaluation meets with your approval. Please contact us if you have any questions.

Very truly yours,

HLB & Associates, Inc.

Mike Flanigan, PE
Project Engineer

enc. Headloss spreadsheet
Input and output files of a computer model for force main hydraulics
Published pump curves

cc: Mr. David Mann, Oregon Department of Environmental Quality
Project file

<H:\Data\Engr\Govt\Warrenton\FacilityPlan\9th St PS evaluation.doc>
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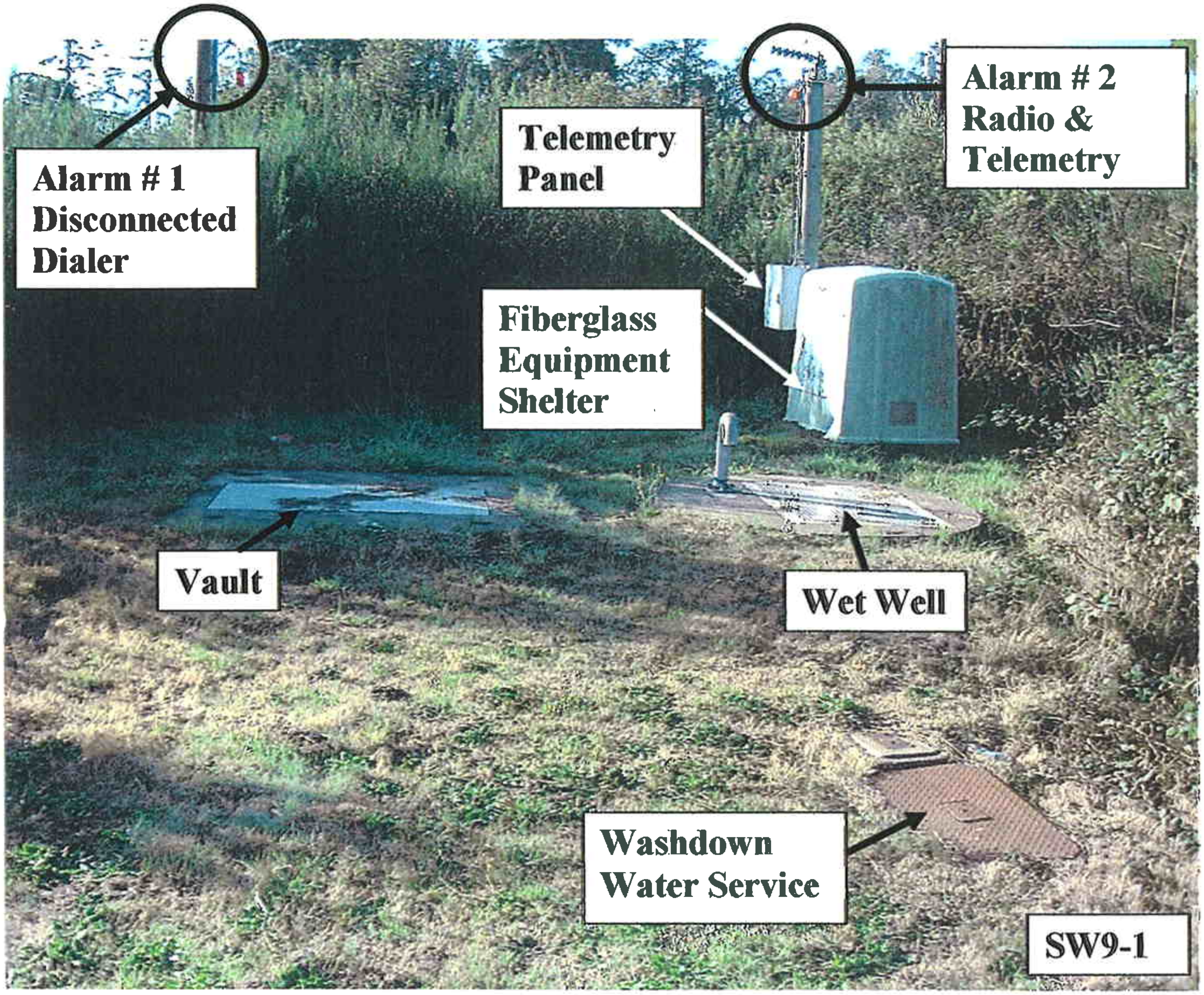
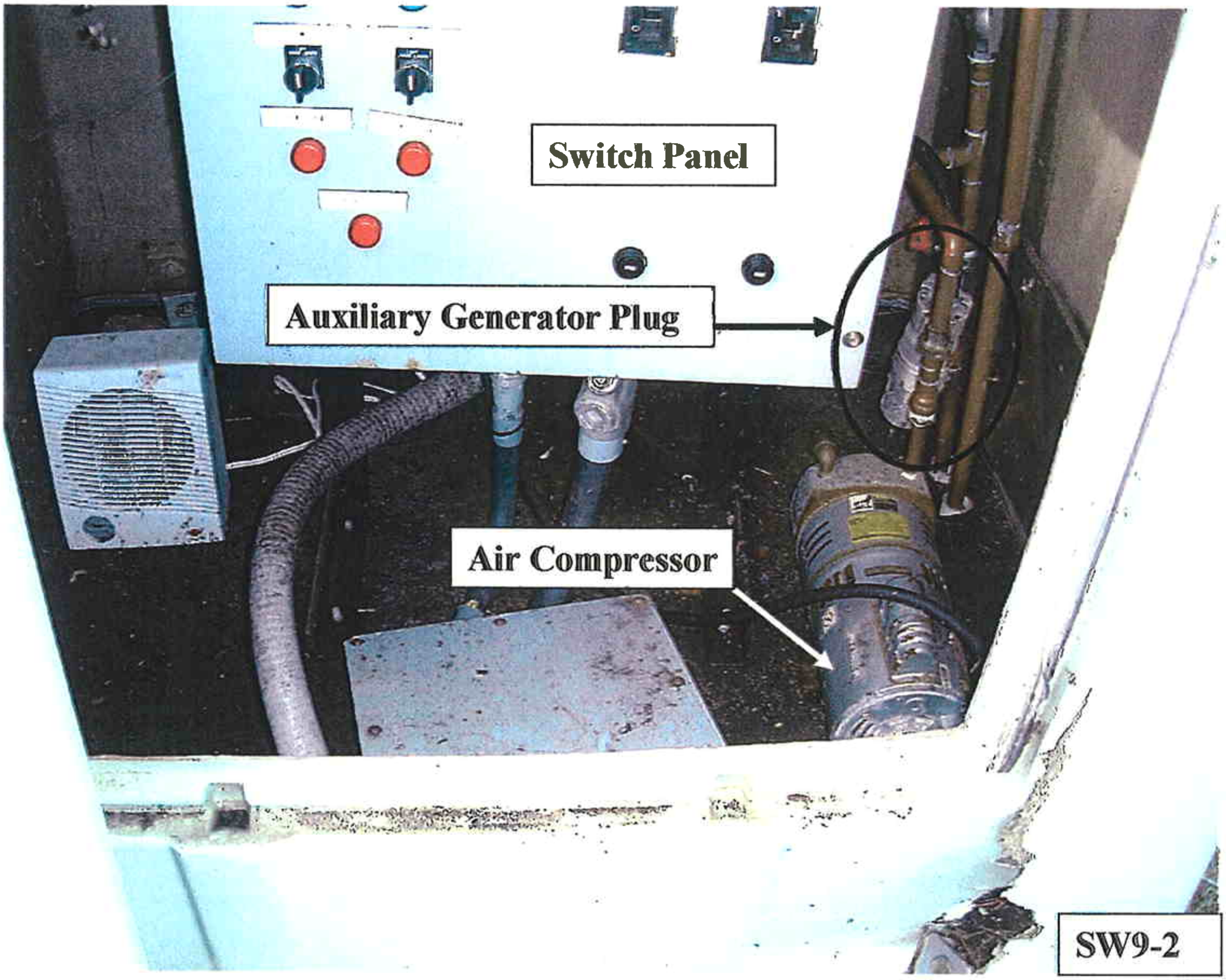
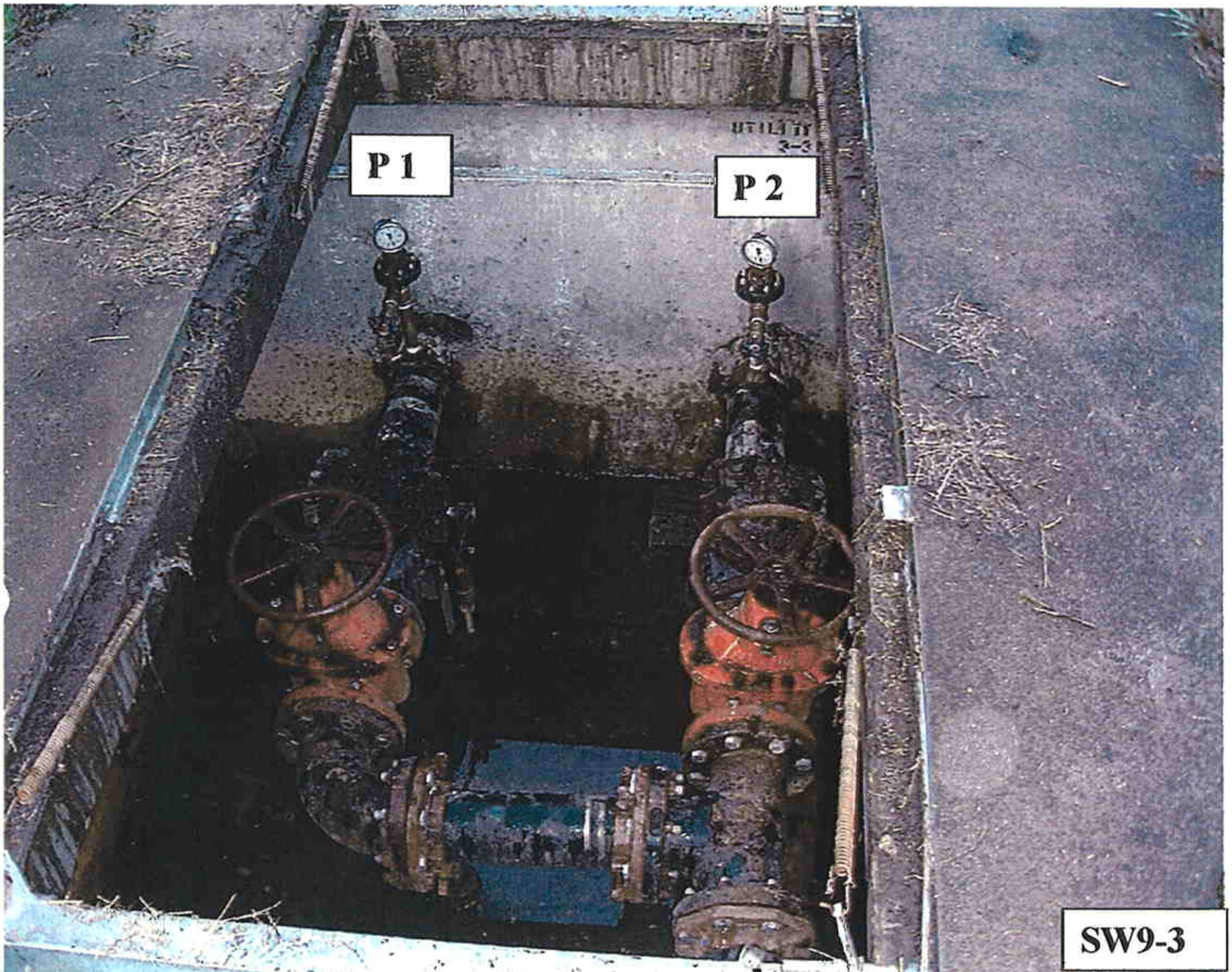
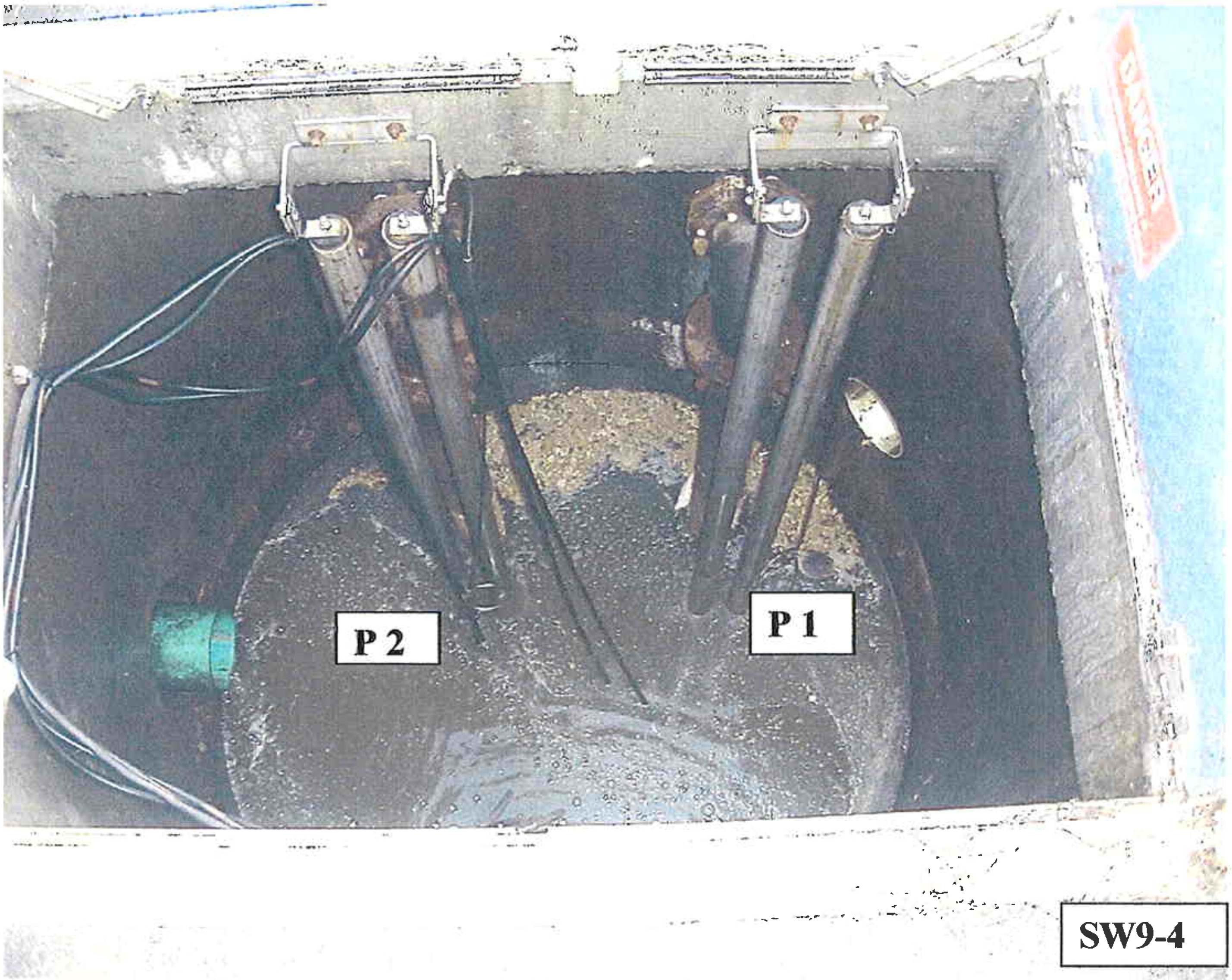

Alarm # 1
Disconnected
Dialer
Telemetry
Panel
Alarm # 2
Radio &
Telemetry
Fiberglass
Equipment
Shelter
Vault
Wet Well
Washdown
Water Service
SW9-1


Switch Panel
Auxiliary Generator Plug
Air Compressor
SW9-2

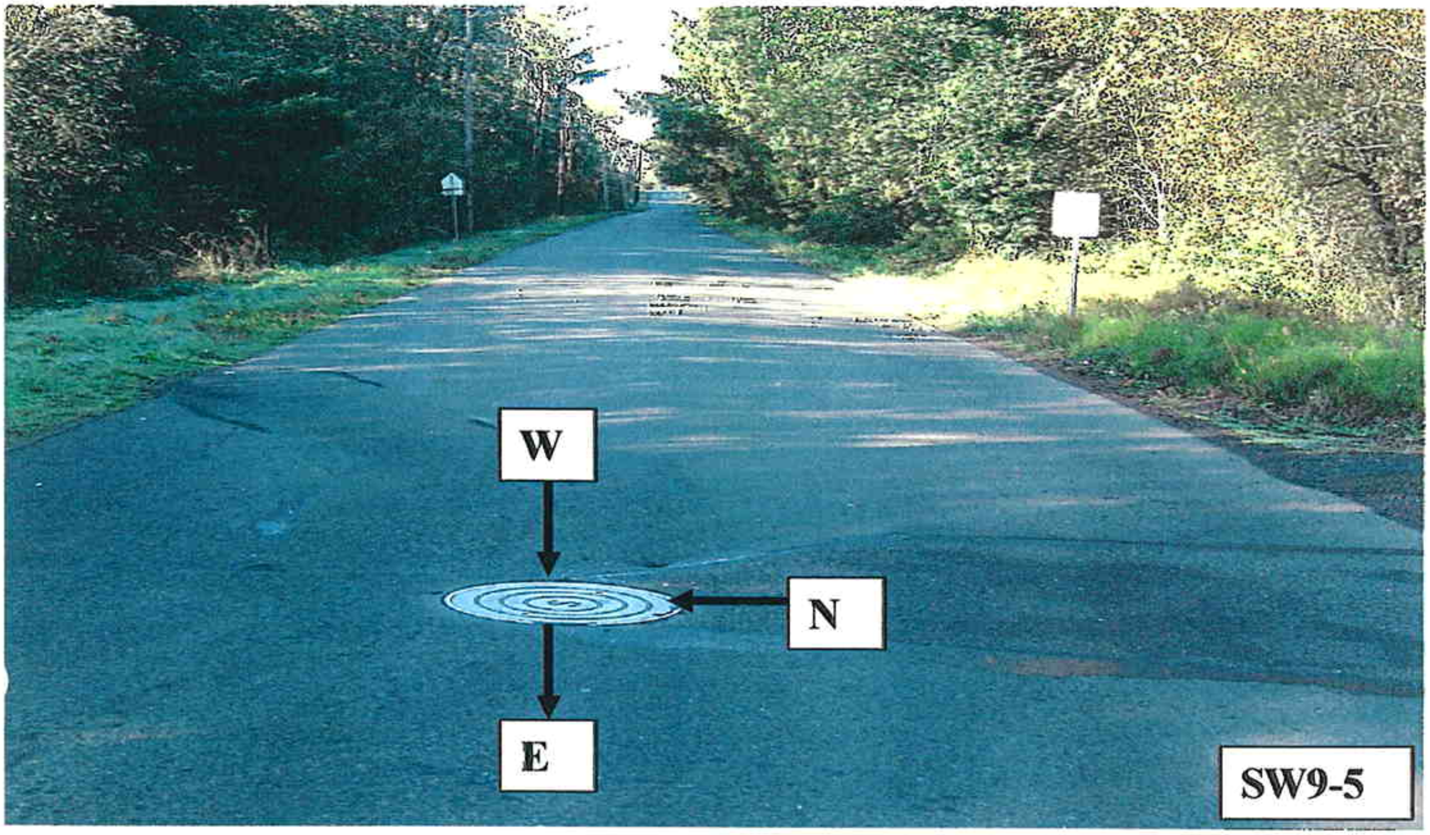


Valve Vault

To Forcemain



Wetwell



Discharge Manhole

Skipanon Pump Station

(NCIP STA - A)

PUMP STATION REPORT

SKIPANON "A" PUMP STATION

DESCRIPTION:

This pump station transfers flows from SE Warrenton and the Industrial Park area, (i.e, Oregon Youth Authority, Pump Station "C") by force main, to a gravity main located in the center of SE Main Street in Warrenton. Sewage flows by this gravity main north and east until it empties into the 3rd and Main Court P/S (Original #1), then by force main toward the lagoon system. This station is relatively new, constructed in 1998, and in good condition.

This is a three (3) component station, made up of a concrete wet well, concrete valve vault, and a fiberglass equipment/controls shelter.

The concrete wet-well contains submersible 10 hp pumps mounted on a rail system. Both pumps were found to be operational. See photos SKP-1 and SKP-2.

A concrete vault contains the gate valves (wheel operated) and discharge header assembly, see photo SKP-3 and SKP-4. The discharge gate valves/force main header assembly did have the required gauges. Both pumps were tested in accord with the DEQ Flowrate testing procedure. See results below.

A fiberglass equipment enclosure houses pump controls and telemetry. The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The controls were tested through operational cycling during flowrate testing. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch. It should be noted that the electrical service panel was mounted on a separate pole, outside of the pump station enclosure, and with the proper sealing and panel latch. No odor control equipment or air compressor is used at this pump station. See attached photo, SKP-5.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, mounted in the equipment shelter and visible to the right of the telemetry panel in photo SKP-6.

The alarm system is mounted on a separate post, which is shown on photo SKP-7. The alarm is mounted on a pole just east of the station, and appeared to function properly. The alarm is clearly visible from the Spur 104 (Old Coast Hwy). The station alarm system is also tied into a central alarm console, located in the City of Warrenton Public Works Shop.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found at the beginning of the Warrenton section. The format of this spreadsheet is taken from the current DEQ Guidelines. The pump curve is attached to this report. Photos of the pump station are attached. A DEQ Guidelines based flow rate spreadsheet with explanatory notes was developed and is also part of and attached to this report.

Construction plans, technical specifications, as-built drawings, and an O&M manual were used in preparation of this report, and available in the City of Warrenton archives.

PUMP FLOWRATE/EFFICIENCIES:

See attached pump curve, obtained from the pump manufacturer. Flows are based upon a design maximum flow rate of 1250 gpm and a design TDH of 22 feet for a new pump. The pump flows were measured during pump station operation. Measured pump flows at this station were as follows:

Pump	**Measured Flow**	**% of New Pump Capacity**	**Wear In Pump chamber**
#1	860 gpm	72 %	28 %
#2	1000 gpm	83 %	17 %

Explanation of the columns: Measured flow is typically from a DEQ flowrate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

It should be noted that this station was tested three (3) times. Once, by draw down testing on June 29, 2000, then by the DEQ Flow rate method on December 12, 2001, when it was observed that pump #2 was leaking and could not be tested, then again when pump was repaired on March 15, 2002.

FORCE MAIN:

The force main length is approximately 1,100 feet and is constructed of 10"ϕ PVC. This force main has a relatively flat profile, with no vacuum break or air release appurtenances.

HYDROGEN SULFIDE:

The pump station wet well did not appear to have significant hydrogen sulfide damage. See photo SKP-2. By visual inspection, both the force main header assembly and vault also appear sound. See photos SKP-3 and SKP-4. No exposed aggregate or concrete cracking was observed.

The force main from this pump station discharges into a shallow concrete manhole near the center of the intersection of South Main and Old Coast Hwy, 101. Sewage then flows out of the discharge manhole by gravity sewer to the original pump station #1, located downtown at 3rd/Main Ct.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. This pump station is located on the east bank of the Skipanon River. If the station wet-well was surcharged, the overflow would come out the top of the pump station wet well, flowing over and into the sandy ground surface, then into the Skipanon. This condition is not anticipated though, due the availability of a portable generator set.

RECOMMENDATIONS:

This station is in good condition.

- Regular maintenance, cleaning.

- As the pumps are repaired through routine maintenance, a measurement should be made of the impeller trim. Flygt pump is unable to disclose impeller trim. However, this is useful information that would help the City track impeller/pumping rate data. The outside diameter should be measured, the depth should be measured and the number of vanes should be recorded.

- Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this critical station, and make it possible to use the DEQ flow rate methodology for future testing. It may be possible to use the original curve with new data points from wire-to-water testing.

- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUBMERSIBLE PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	150	inches	(Datum typically lid of wetwell/vault)	
Depth of pump eye to datum	141.125	inches	(Datum typically lid of wetwell/vault)	
Offset of pressure guage to datum	-25.5	inches	This is a negative number, (below datum)	
Offset of pressure guage to pump eye	115.625	inches	(Pump eye elevation = 0.0 typically)	
Depth of fluid to guage (for start)	61.5	inches	**START**	
Depth of fluid to guage (for stop)	102.5	inches	**STOP**	OUT OF SERVICE

Datum typically the floor or grating in the station, in this case, datum is the top of separate wet well and vault. Gauge is below datum.

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	10 psig	9 psig	**SUBMERSIBLE:**
Shutoff head, translated to eye of pump, then mid-pool.	**29.93** FT	**30.19** FT	(psig x 2.31) + (avg pumped distance) **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig -	3 psig	2 psig	
Reading adj. to impeller eye (add guage off.)	16.57 FT	14.26 FT	(psig@start x 2.31) + (guage offset)
Guage reading @ pump stop	3 psig	1 psig	
Reading adj. to impeller eye (add guage off.)	16.57 FT	11.95 FT	(psig@stop x 2.31) + (guage offset)

TOTAL DYNAMIC HEAD

TDH @ pump start, (discharge head - wtr over eye)	**13.15** FT	**10.84** FT	BACK OUT THE WETWELL WATER LEVEL: discharge start, head total - water over pump eye to stop
TDH @ pump stop, (discharge head - wtr over eye)	**15.47** FT	**10.85** FT	discharge stop, head total - remaining water over pump eye **(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1750 RPM

Flowrate @ pump start (curve interpolation using TDH)	910 *GPM*	1000 *GPM*	
Flowrate @ pump stop (curve interpolation using TDH)	810 *GPM*	1000 *GPM*	
Average Flow, gpm, (mid-pool)	**860** *GPM*	**1000** *GPM*	Mean average

Design GPM	1200 *GPM*	1200 *GPM*	DESIGN: 1200 gpm
% of new capacity	72%	83%	DESIGN: 22.0' TDH

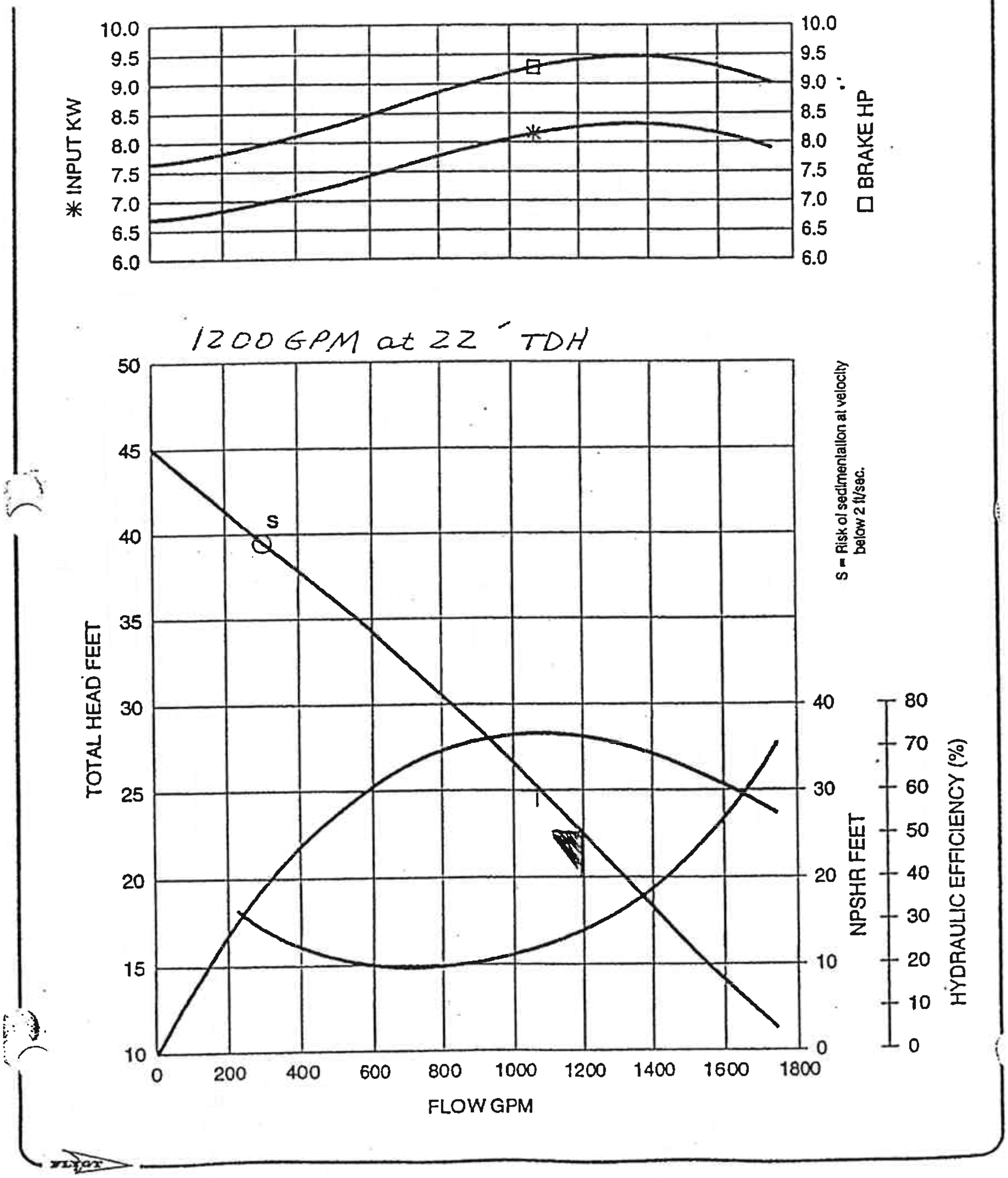
DESIGN: 1750 rpm

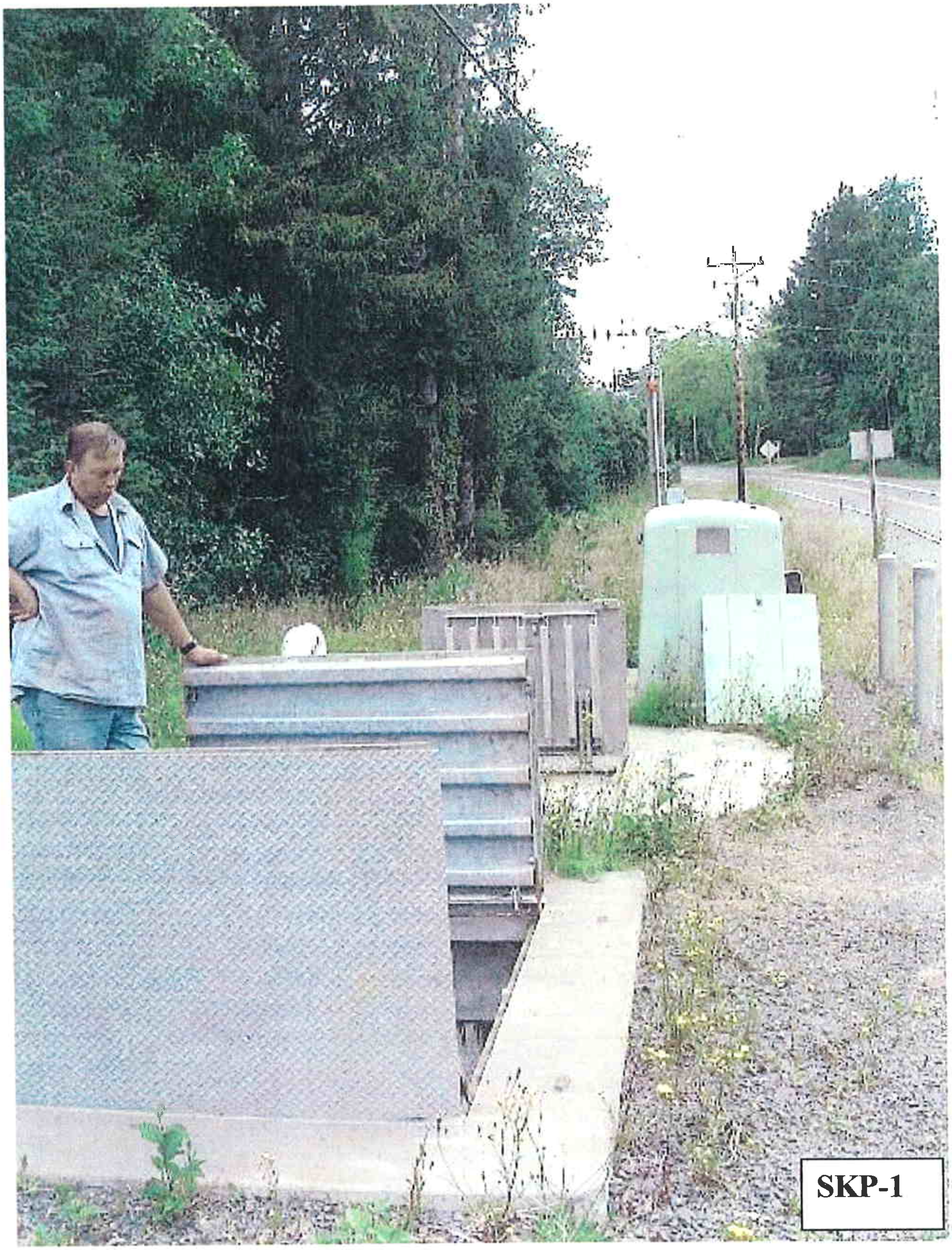
SPREADSHEET CALCS DATE: Jan. 5, 2002
STATION: **SKIPANON "A" PS**
CURVE: Yes, attached
DATE OF FIELD TESTING: Dec. 12, 2001
FIELD PERSON: GGL CHECKED BY:

Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.
Note: Pump #2 repaired and re-tested/JGF

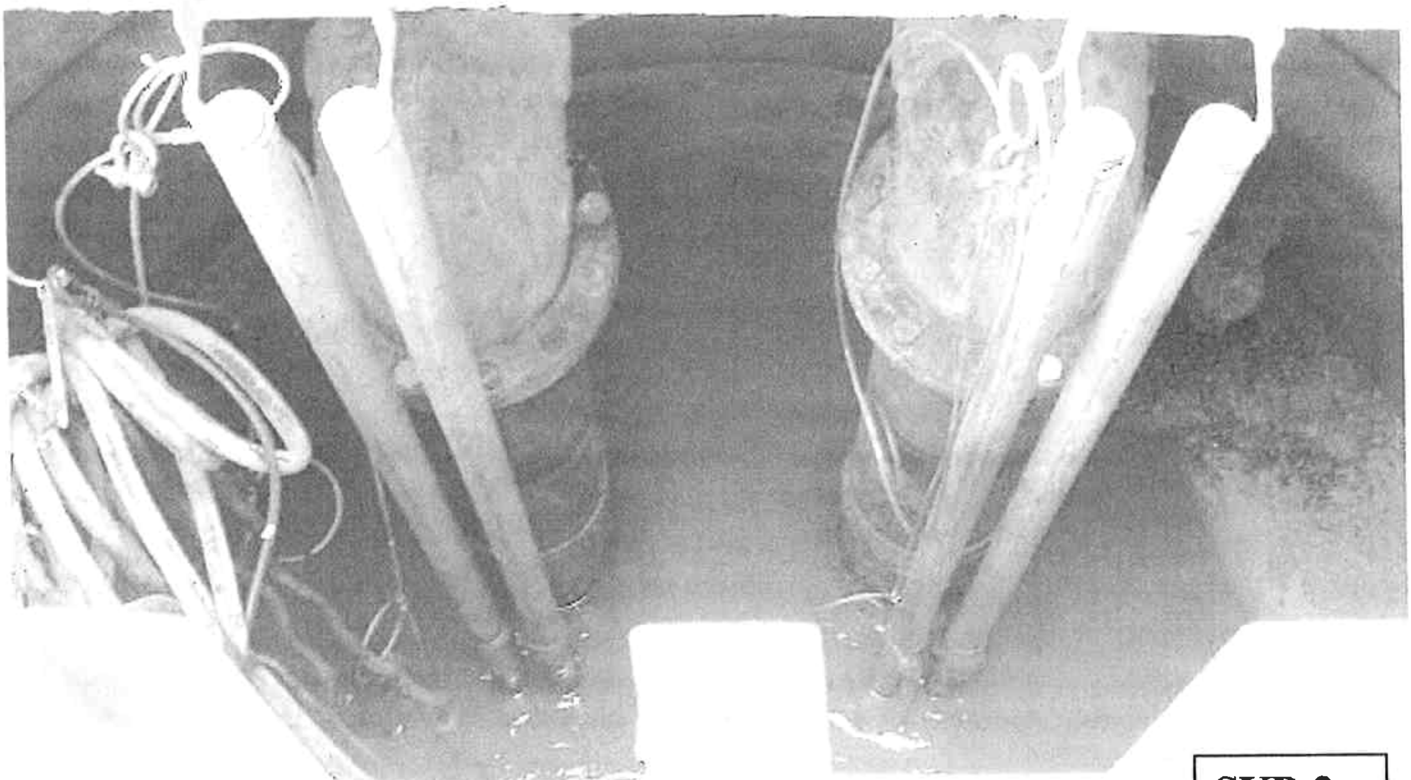
SKIPANON "A" P/S

	SECTION		CONFIG.	
6	3	C-3127	CP/CS	
ISSUED	SUPERSEDES	411 Impeller	VANES	PHASE
.../96	6/94		2	3

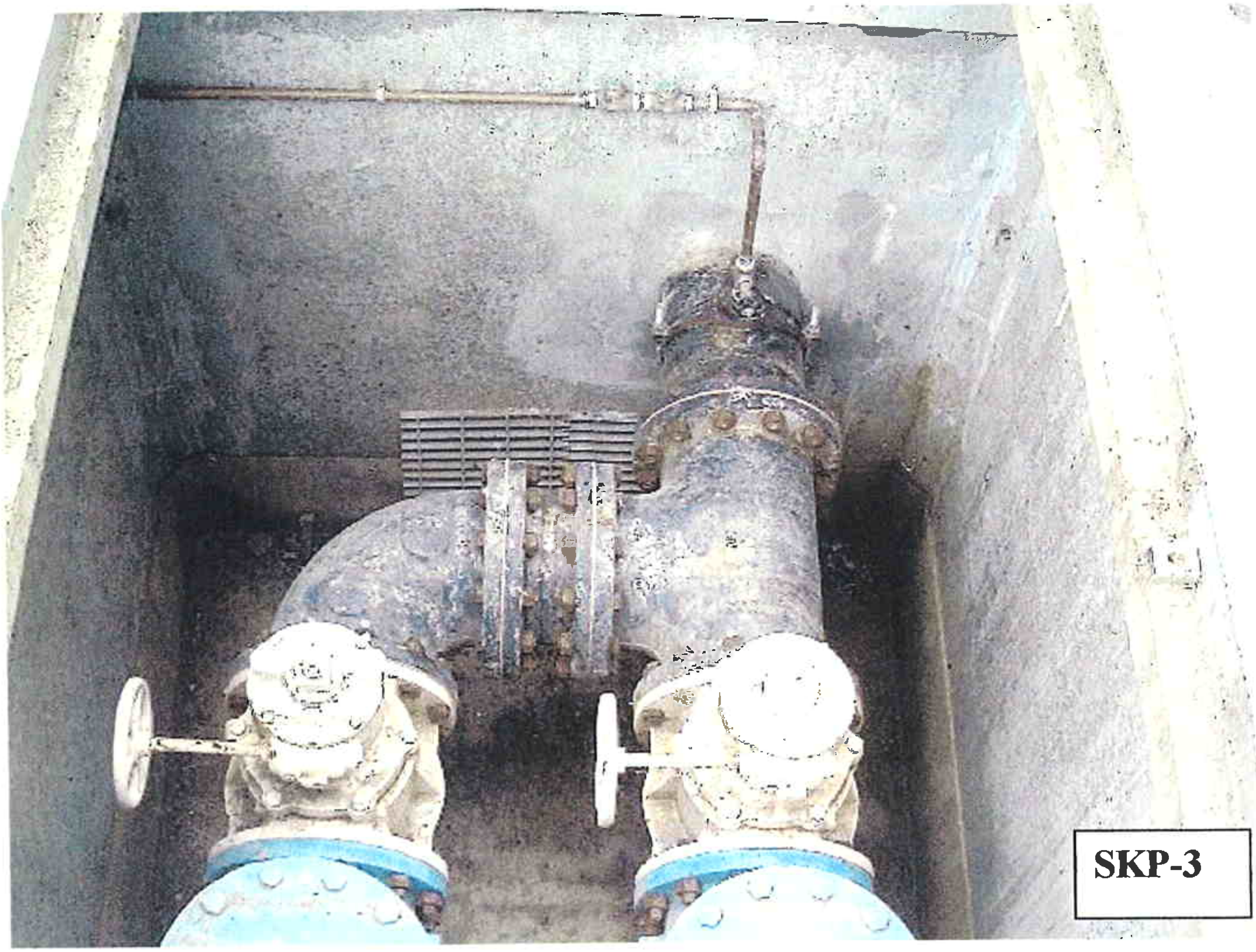




SKP-1



SKP-2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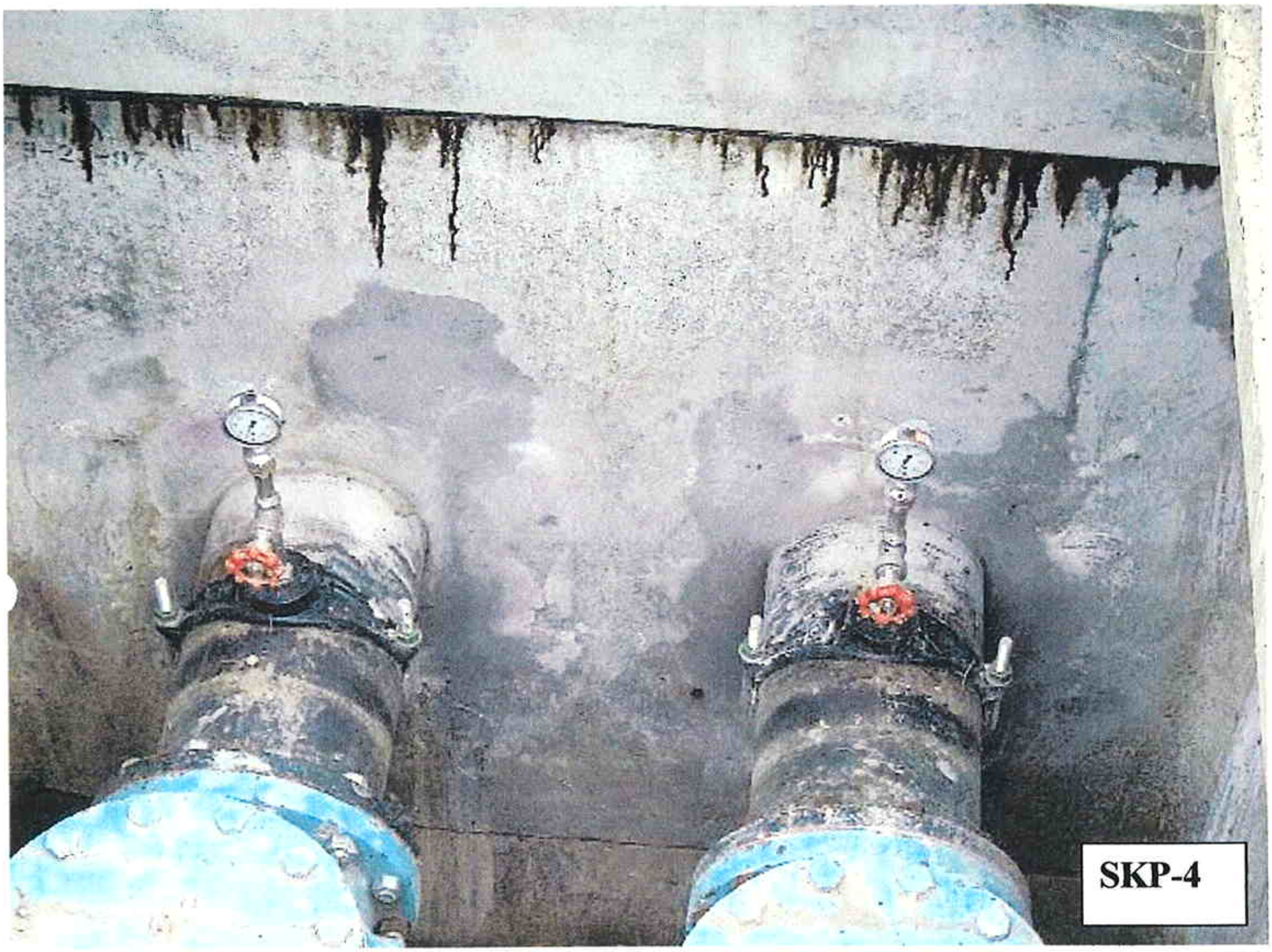
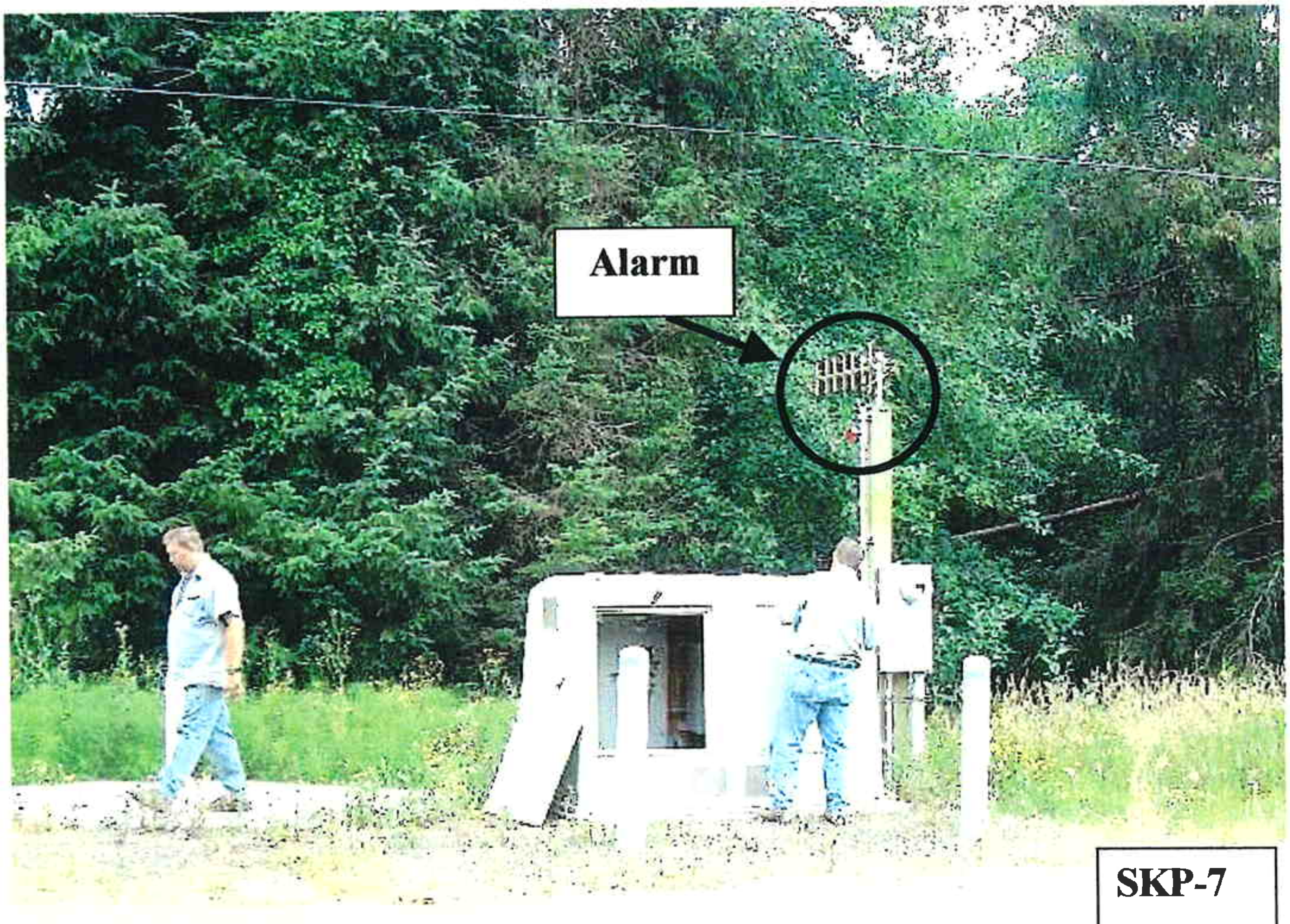

SKP-4

SKP-5

SKP-6



SKP-7

Oregon Youth Authority (OYA)
Pump Station

(NCIP STA - C)

PUMP STATION REPORT

OREGON YOUTH AUTHORITY

DESCRIPTION:

This pump station transfers flows from the east Warrenton industrial area along Dolphin Road, then into the Skipanon A station, which then conveys the flow by force main to a gravity main located in the center of SE Main Street in Warrenton. Sewage flows by this gravity main north and east until it empties into the 3rd and Main Court P/S (Original #1), then by force main toward the lagoon system. This station is relatively new, constructed in 1998, and in good condition.

This is a three (3) component station, made up of a concrete wet well, concrete valve vault, and a fiberglass equipment/controls shelter.

The concrete wet-well contains submersible 10 hp pumps mounted on a rail system. Both pumps were found to be operational. See photo OYA-1.

A concrete vault contains the gate valves (wheel operated) and discharge header assembly, see photo OYA-2. The discharge gate valves/force main header assembly did have the required gauges. Both pumps were tested in accord with the DEQ Flowrate testing procedure. See results below.

A fiberglass equipment enclosure houses pump controls and telemetry. The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The controls were tested through operational cycling during flowrate testing. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch. It should be noted that the electrical service panel was mounted on a separate pole, outside of the pump station enclosure, and with the proper sealing and panel latch. No odor control equipment or air compressor is used at this pump station. See attached photo, OYA-3.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, mounted in the equipment shelter, but not visible in photo OYA-1.

The alarm system is mounted on a separate post, which is shown on photo OYA-1. The alarm is mounted on a pole just east of the station, and appeared to function properly. The alarm is clearly visible from the access road to the East Warrenton Industrial area. The station alarm system is also tied into a central alarm console, located in the City of Warrenton Public Works Shop.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found at the beginning of the Warrenton section. The format of this spreadsheet is taken from the current DEQ Guidelines. The pump curve is attached to this report. Photos of the pump station are attached. A DEQ Guidelines based flow rate spreadsheet with explanatory notes was developed and is also part of and attached to this report.

Construction plans, technical specifications, as-built drawings, and an O&M manual were used in preparation of this report, and available in the City of Warrenton archives.

PUMP FLOWRATE/EFFICIENCIES:

See attached pump curve, obtained from the pump manufacturer. Flows are based upon a design maximum flow rate of 1250 gpm and a design TDH of 22 feet for a new pump. The pump flows were measured during pump station operation. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	860 gpm	72 %	28 %
#2	1000 gpm	83 %	17 %

Explanation of the columns: Measured flow is typically from a DEQ flowrate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by Measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

It should be noted that this station was tested three (3) times. Once, by draw down testing on June 29, 2000, then by the DEQ Flow rate method on December 12, 2001, when it was observed that pump #2 was leaking and could not be tested, then again when pump was repaired on March 15, 2002.

FORCE MAIN:

The force main length is approximately 6,150 feet and is constructed of 8"ϕ PVC. This force main has a relatively flat profile, with no vacuum break or air release appurtenances.

HYDROGEN SULFIDE:

The pump station wet well did not appear to have significant hydrogen sulfide damage. See photo OYA-4. By visual inspection, both the force main header assembly and vault also appear sound. See photo OYA-2. No exposed aggregate or concrete cracking was observed.

The force main from this pump station discharges into a shallow concrete manhole near the center of the intersection of South Main and Old Coast Hwy, 101. Sewage then flows out of the discharge manhole by gravity sewer to the original pump station #1, located downtown at 3rd/Main Ct.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. This pump station is located near a wetland in the East Warrenton Industrial area. If the station wet-well was surcharged, the overflow would come out the top of the pump station wet well, flowing over and into the sandy ground surface. This condition is not anticipated though, due the availability of a portable generator set.

RECOMMENDATIONS:

This station is in good condition.

- Regular maintenance, cleaning.

- The grounds around the station should be treated with a herbicide to keep the area immediately adjacent to the station open and clear. The road into the station should be better marked and maintained with consideration given to rock and drainage.

- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUBMERSIBLE PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	211	inches	(Datum typically lid of wetwell/vault)
Depth of pump eye to datum	201	inches	(Datum typically lid of wetwell/vault)
Offset of pressure guage to datum	-65	inches	This is a negative number, (below datum)
Offset of pressure guage to pump eye	136	inches	(Pump eye elevation = 0.0 typically)
Depth of fluid to guage (for start)	75	inches	**START**
Depth of fluid to guage (for stop)	121	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*
Shutoff head, direct guage reading,	46 psig	44 psig
Shutoff head, translated to eye of pump, then mid-pool.	**114.43** FT	**109.81** FT
Discharge head		
Guage reading @ pump start, psig	18 psig	17 psig
Reading adj. to impeller eye (add guage off.)	52.91 FT	50.60 FT
Guage reading @ pump stop	32 psig	28 psig
Reading adj. to impeller eye (add guage off.)	85.25 FT	76.01 FT

TOTAL DYNAMIC HEAD

TDH @ pump start, (discharge head - wtr over eye)	**49.08** FT	**46.77** FT
TDH @ pump stop, (discharge head - wtr over eye)	**84.00** FT	**74.76** FT

FLOWRATE DATA @ Pump RPM of: 1750 RPM

Flowrate @ pump start (curve interpolation using TDH)	1200 *GPM*	1150 *GPM*
Flowrate @ pump stop (curve interpolation using TDH)	605 *GPM*	740 *GPM*
Average Flow, gpm, (mid-pool)	**903** *GPM*	**945** *GPM*
Design GPM	950 *GPM*	950 *GPM*
% of new capacity	95%	99%

Note: The above box is added to assist report writer.

Note: No suction gauges on City of Warrenton Pump Stations.

SPREADSHEET CALCS DATE: Jan. 5, 2002
STATION: **OREGON YOUTH AUTHORITY C PS**
CURVE: Yes, attached
DATE OF FIELD TESTING: Dec. 12, 2001
FIELD PERSON: GGL CHECKED BY:

Note:
This spreadsheet and the notes that follow are off of the worksheet and published DEQ Guidelines; "O&M NOTES FOR GAUGES ON SEWAGE PUMPS".

Datum typically the floor or grating in the station, in this case, datum is the top of separate wet well and vault. Gauge is below datum.

SUBMERSIBLE:

(psig x 2.31) + (avg pumped distance)
(TRACE SHUTOFF HEAD INTO CURVE)

(psig@start x 2.31) + (guage offset)

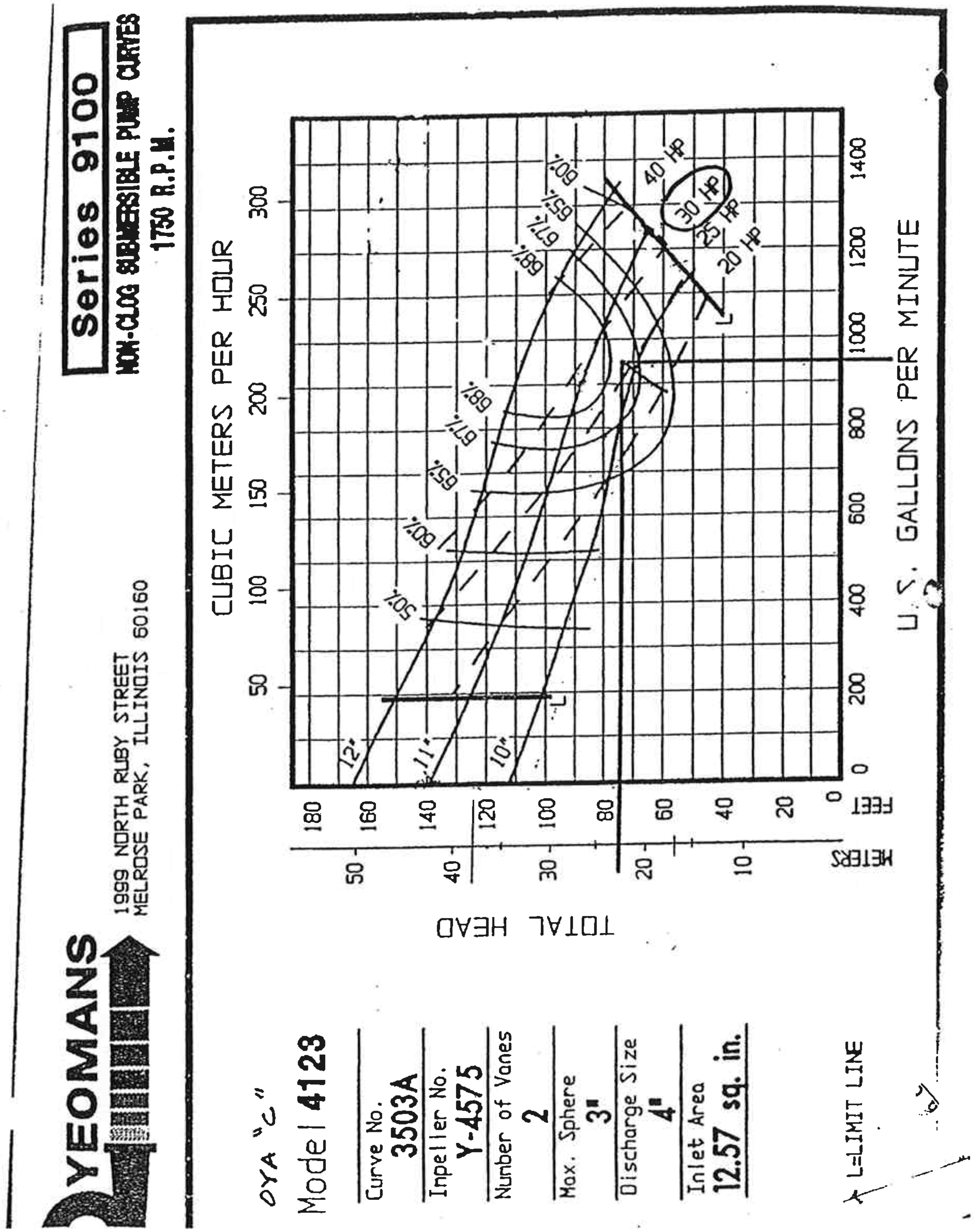
(psig@stop x 2.31) + (guage offset)

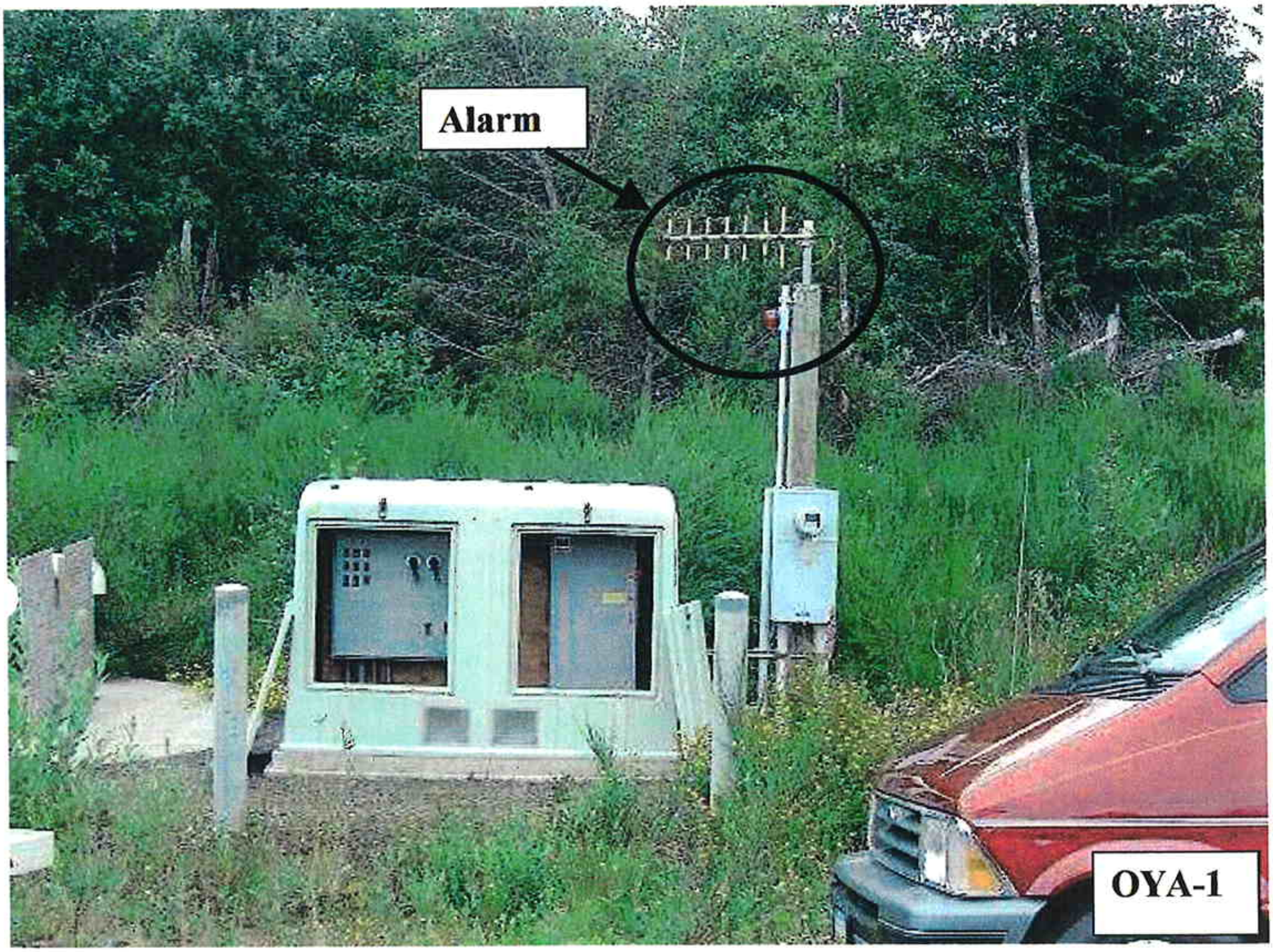
BACK OUT THE WETWELL WATER LEVEL:
discharge start, head total - water over pump eye to stop
discharge stop, head total - remaining water over pump eye
(TAKE THESE NUMBERS INTO CURVE)

Mean average

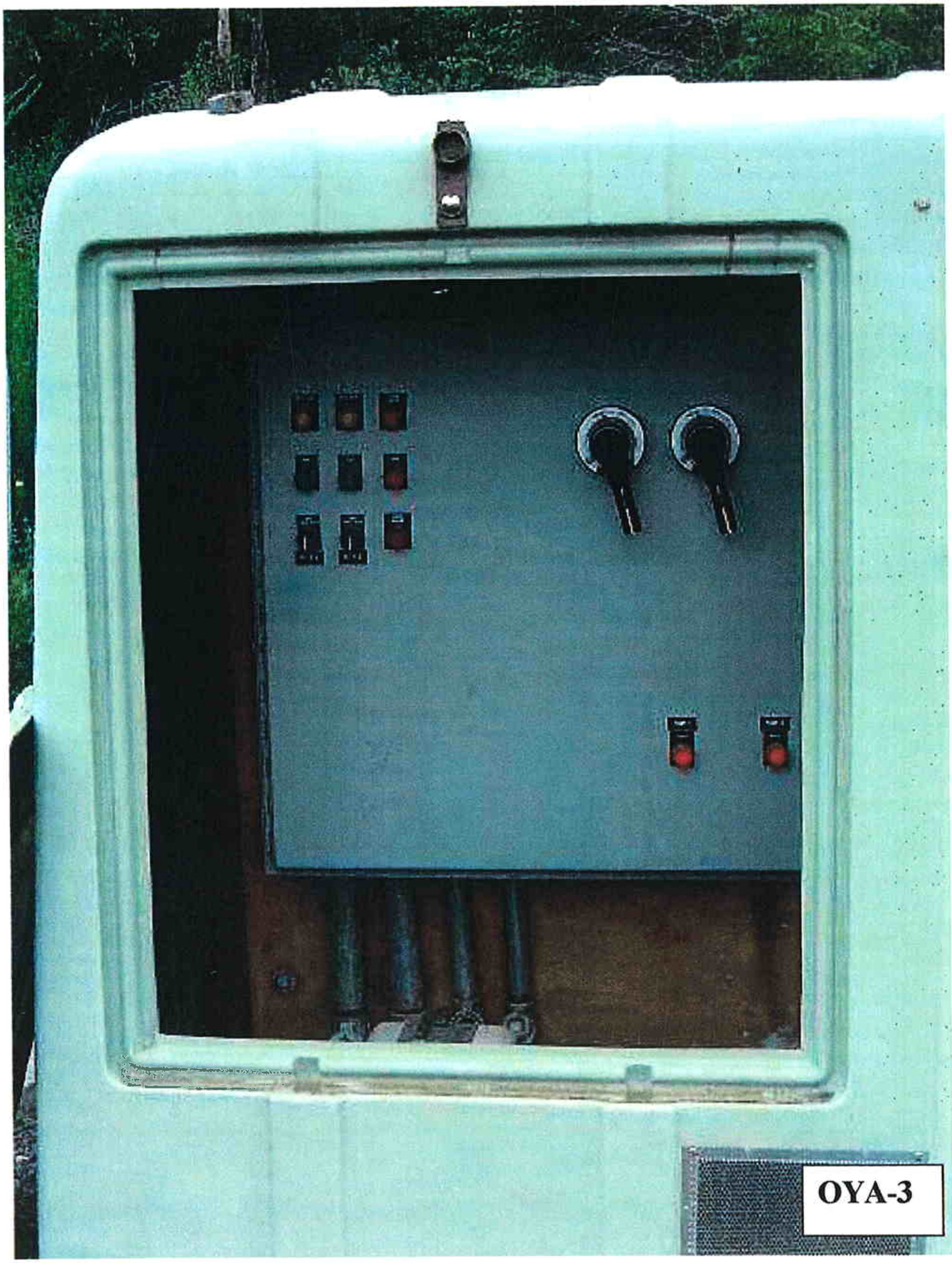
Design: 950 gpm 75' TDH
Impeller: 10.0"
HP = 30

OREGON YOUTH AUTHORITY P/S




Alarm
OYA-1

OYA-2



OYA-3

OYA-4

HAMMOND - PUMP STATION EQUIPMENT INVENTORY

PUMP STATION	N.W. Warrenton Drive (HAM - A)	7th St. / Enterprise (HAM- B)	Jetty St. (HAM - C)	3rd / Tyee (HAM - D)	Fort Stevens (HAM - E)	Lake Street / Ridge Road #1 (Krill Street)	KOA Campground (Connected to FT Stevens FM)	Parkview Apartments (Connected to FT Stevens FM)	Peacock Street (Battery Russell)
Location	Intersection	Intersection	Jetty Street	Intersection	FT Stevens	Near Intersection	KOA	Parkview Apartments	Peacock Street
Date Constructed	1979	1979	1979	1979	1979	1985	1990	1990	1993
Type	Vertical/Non-Clog	Vertical/Non-Clog	Vertical/Non-Clog	Duplex/Suction Prime	Wet Well / Submersible	Wet Well / Submersible	Duplex/Suction Prime	Wet Well / Submersible	Wet Well / Submersible
Pump Manufacturer	Hydronix	Hydronix	Hydronix	Hydronix	Paco Replacement Pumps 1993	Flygt	Hydronix	Flygt	-
Model #	210	210	210	110	Paco 49521	-	183	-	-
Rated Cap. (EA) @ TDH	675 GPM @ 75' TDH	600 GPM @ 41' TDH	550 GPM @ 20' TDH	140 GPM @ 47' TDH	350 GPM @ 75' TDH	240 GPM @ 16' TDH	150 GPM @ 65' TDH	120 GPM @ 80' TDH	Original = 120 GPM
Pump Hp (EA)	25	15	10	7.5	15	3	10	10	3
Impeller	Original = 9 - 1/2" Trim	Original = 8 - 0" Trim	Original = 9 - 3/4" Trim	Original = 7 - 3/4" Trim	Original = 10 - 0" Trim	Unknown	Original = 9 - 5/32" Trim	Original = Unknown	Original = Unknown
Level Control	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float
Wet Well Dimensions	96" Dia. 102" Deep	96" Dia. 183" Deep	96" Dia. 180" Deep	60" Dia. 105" Deep	72" Dia. 211" Deep	60" Dia. 150" Deep	Unknown Dia. 245" Deep	72" Dia. 180" Deep	60" Dia. 150" Deep
OVERFLOW									
O. Point	-	-	-	-	-	-	-	-	-
O. Discharge	-	-	-	-	-	-	-	-	-
O. Elevation	Ground	Ground	Ground	Ground	Ground	Ground	Ground	Ground	Ground
O. Alarm Elevation	-	-	-	-	-	-	-	-	-
AUXILIARY POWER									
Type	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator	Unknown	Aux. Generator	Aux. Generator
Location	City Shops	City Shops	City Shops	City Shops	City Shops	City Shops	Unknown	City Shops	City Shops
Transfer Switch	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
FORCE MAIN									
Diameter, Length	8" Dia. 4412'	8" Dia. 2600'	6" Dia. 873'	4" Dia. 3465'	6" Dia. 2000' Dedicated + 6000' 6" Dia. Shared	4" Dia. 58'	Unknown Dia. 1580'	4" Dia. 3400' Dedicated + 6000' Shared	Two 3" Dia. 490'
Material	PVC	PVC	PVC	PVC	PVC	PVC	Unknown	PVC	PVC
Profile	Available	Available	Available	Available	Available	Available	Not Available at City Shops	Available	Available
Discharge Manhole	Waste Water Treatment Plant	NW Warrenton Dr + Eben B. Carruthers Wayside	7th + Iredale St.	Lake St. + Pacific Drive	Tees Into Force Main on Ridge Road	Tees Into Force Main on Ridge Road	Tees Into Force Main on Ridge Road	Tees Into Force Main on Ridge Road	Intersection of 7th Drive + Quinalt
Air Release Valves	Yes	None	None	Yes	Yes	None	None	None	None
Vacuum Release Valves	Yes	None	None	None	Yes	None	None	None	None
SULFIDE CONTROL									
Back Drainage System	None	None	None	None	None	None	None	None	None
Air Injection Comp.	None	None	None	None	None	None	None	Inoperative	None
Chemical Feed	None	None	None	None	None	None	None	None	None

*(Original Name or Tributary Connection)

blue

NW Warrenton Drive Pump Station

(HAM - A)

PUMP STATION REPORT

NW WARRENTON Dr & NW 9TH St. PUMP STATION
(Originally Hammond "A" P/S)

DESCRIPTION:

This pump station transfers the flows from Northeast Warrenton and Hammond by force main to the Warrenton Wastewater Treatment lagoons.

This pump station is a HYDRONIX Model 210 fiberglass pre-fabricated unit station with a split, locking fiberglass cover, mounted on top of a concrete wet well, (see attached photos, WAR-1 and 2). It is a duplex station with vacuum primed, 25 hp direct coupled, vertical non-clog sewage pumps. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational. The discharge gate valves/force main header assembly did not have the required gauges. See photo WAR-3. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines, (see attached Flowrate check sheet). Testing and measurements were conducted in accord with these guidelines.

The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The main pump controls (inside the station) were tested through operational cycling during flowrate testing. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch. Please note that panel was not latched at time of observations. It should be noted that the electrical service panel was mounted on a separate pole, outside of the pump station enclosure, and with the proper sealing and panel latch, (see attached photos, WAR-1, WAR-2, WAR-4). No odor control equipment or air compressor is used at this pump station.

An alternate power source is a manual transfer switch, just visible on a NEMA panel and the plug assembly for the portable generator is placed just behind the aluminum access ladder, (see photo WAR-3).

The alarm system is mounted on a separate pole, which is shown on photo WAR-2. The alarm light is mounted on a pole just east of the station and appeared to function properly. This alarm light is visible from the main road, NW Warrenton Drive. The station alarm system is also tied into a central alarm console, located in the City of Warrenton Public Works Shop.

This pump station was the first of five original Hammond pump stations constructed in 1979-1980, under EPA Grant # C-410502. They were originally designated as Hammond A, B, C, D, and E. The City of Warrenton has changed their designation to; Warrenton Drive/9th Street (A), 7th Street (B), Jetty Street (C), Tyee (D), and this station, Fort Stevens (E). Construction plans, as-built drawings and technical specifications for these stations are available from the City of Warrenton.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found in the beginning of the Hammond section. The pump curve is attached. Photos of the pump station are attached.

PUMP FLOWRATE/EFFICIENCIES:

See attached pump curve, obtained from the pump manufacturer. Based upon a design maximum flow rate of 675 gpm, the calculated TDH is 73 feet for a new pump. The DEQ Flowrate methodology was used. Pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	675 gpm	100%	None Apparent
#2	768 gpm	114%	None Apparent

Explanation of the columns: Measured flow is typically from a DEQ flowrate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

Note that on pump #2, the measured flows (768 gpm) are higher than the original design flow rate gpm (675). On April 4, 2001 this pump station was tested at the new flume, and by new measuring equipment. P1, was measured at 644 gpm, while P2 was measured at 650 gpm, at the flume, respectively.

This difference between flume measurements and current testing has at least two (2) possible explanations. One is the location of the testing. The measurements of April 4, 2001, taken at the flume vs the measurements of December 11, 2001, taken at the station itself, could be lower due to friction head loss in the long force main. The second possible explanation is that the combination of pressure gauge/reading error at the pump station and the new flume/recording instrumentation may result in an overall *apparent* reduction of flows. The loss appears consistent with the earlier results so no action is required for this pump station. See recommendations section.

FORCE MAIN:

The force main length is approximately 4,412 feet from plan measurements and is constructed of 8"ϕ PVC, with an 8" ductile iron bridge crossing. This force main has a relatively flat profile, with a combination vacuum break-air release valve at station 38+78, which is the west end of the bridge crossing. At the pump station, the elevation of the force main is approximately 1.0' and at the point of connection with the Lagoon force main, the elevation is -0.5'. No inspection of the force main assembly is possible, other than the discharge header assembly at the pump station.

HYDROGEN SULFIDE:

The force main from this pump station discharges into the Lagoon force main, which continues to the Parshall flume at the Lagoon. Therefore, no visible hydrogen sulfide inspection is possible.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. Overflow would come out the top of the pump station, and run into drainage wetlands feeding Alder Creek, and then into the Columbia River. This condition is not anticipated, though, due to the availability of a portable generator set.

RECOMMENDATIONS:

This station is in good condition hydraulically.

- □ Regular maintenance, cleaning.
- □ A regularly scheduled check of the air relief valve, located at the west end of the Alder Creek Bridge should be made part of the scheduled maintenance.
- □ Because of the critical nature of this station, and the fact that it is a vacuum prime system, spare, replacement parts should be on hand for the vacuum prime system. This would include gaskets for the canister, water filter/trap assembly and a spare vacuum pump at the City Public Works Shop.
- □ An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

	USER INPUTS IN COLORED BOXES ONLY!		
Depth of wetwell to datum	102	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	96	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	9	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	18	inches	
Depth of fluid to pump eye (suction lift to start)	43	inches	**START**
Depth of fluid to pump eye (suction lift to stop)	72	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	40 psig	40 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	98.65 FT	98.65 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	30 psig	30 psig	
Reading adj. to impeller eye (add guage off.+start)	74.34 FT	74.34 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	30 psig	20 psig	
Reading adj. to impeller eye (add guage off.+stop)	76.76 FT	53.66 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

TDH @ pump start (at midpool)	75.55 FT	75.55 FT	taken at mid-pool, with water column moving
TDH @ pump stop	76.76 FT	53.66 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1750 RPM

			Flume measurements taken 4-4-00 P1, measured at Flume = 650 P2, measured at Flume = 644
Flowrate @ pump start (curve interpolation)	675 *GPM*	675 *GPM*	
Flowrate @ pump stop (curve interpolation)	675 *GPM*	860 *GPM*	
Average Flow, gpm	**675** *GPM*	**768** *GPM*	Mean
Design GPM	675 *GPM*	675 *GPM*	Est. from curve
% of new capacity	100%	114%	Impeller: 9-1/2"

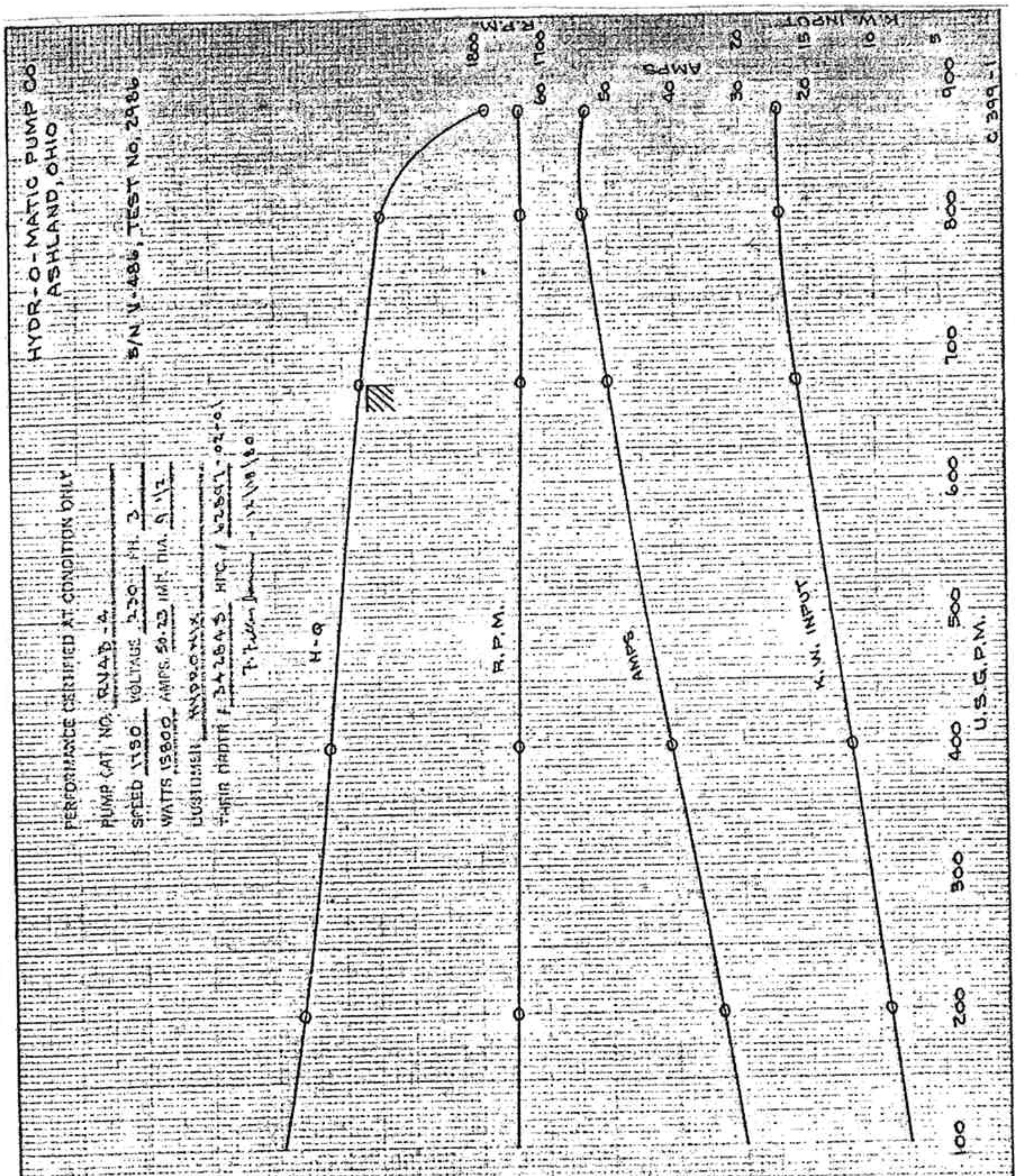
Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

Design SO Head: 73'
Force Main +/- 2100' ending @ Lagoon/force main.

Date of spreadsheet calcs: Jan. 5, 2002
STATION: **NW WAR DR/NW 9TH PS** (orig. Ham. A)
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

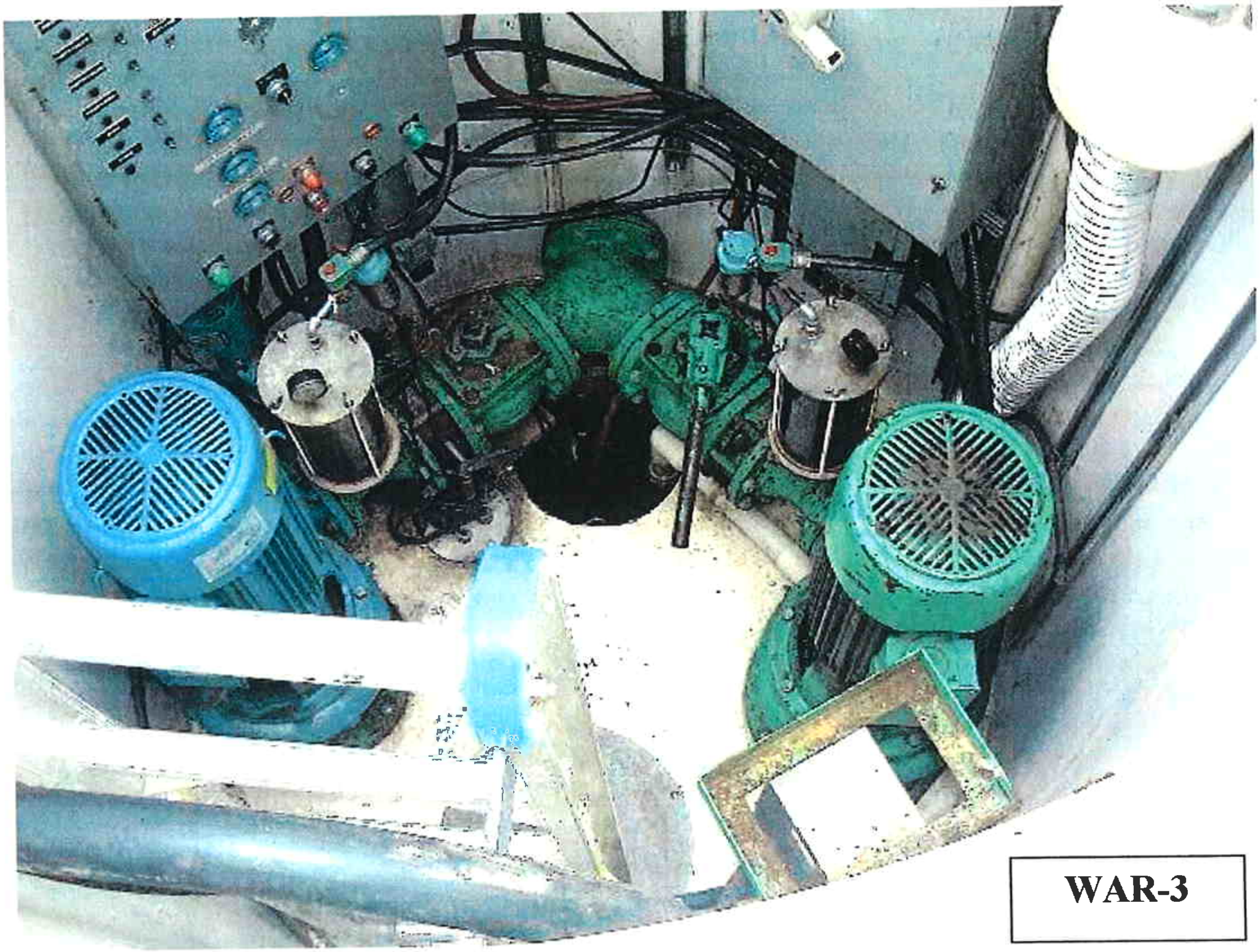
Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

NW WAR DR/NW 9th P/S

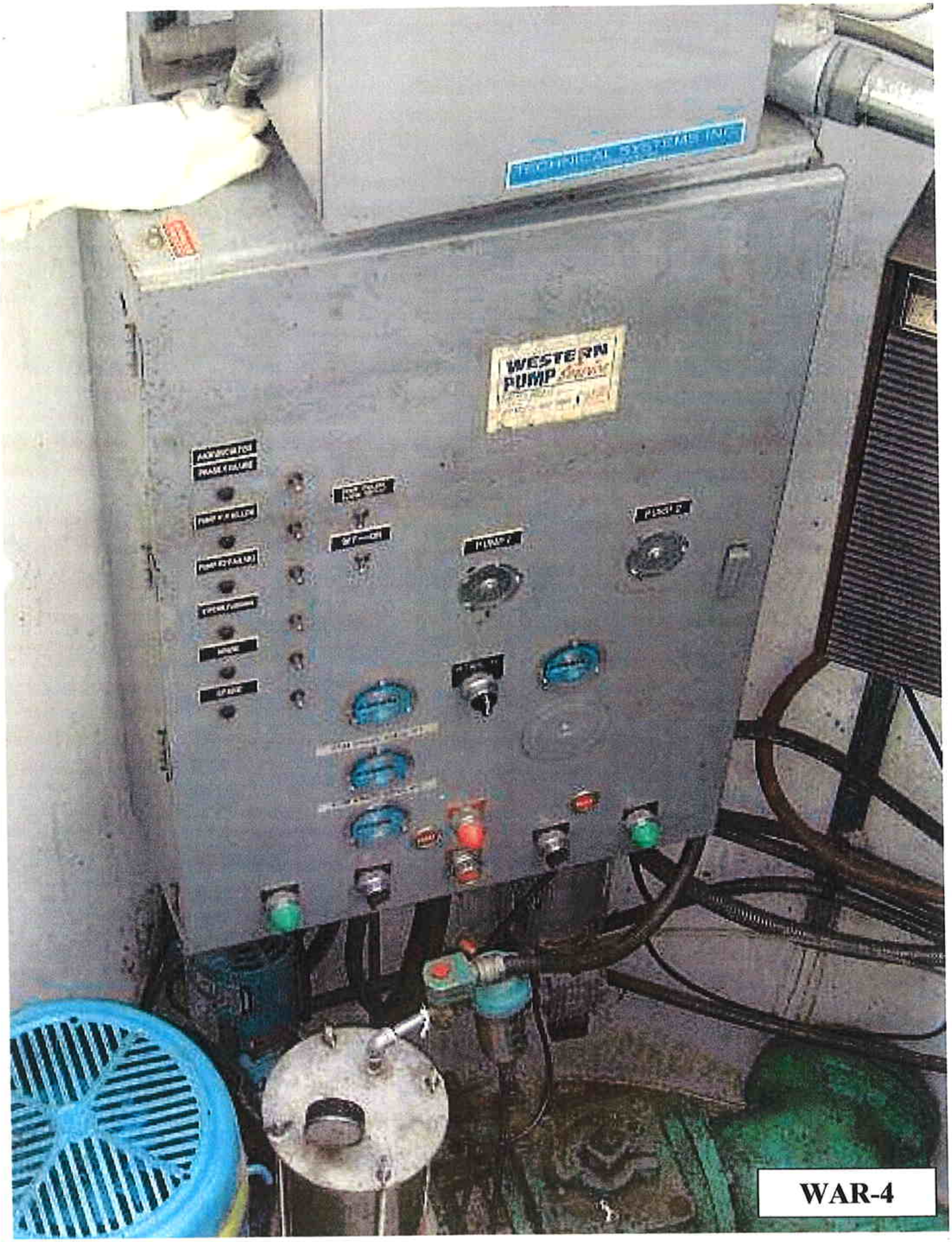



WAR-1

WAR-2



WAR-3



WAR-4

<u>7th St. / Enterprise Pump Station</u>

(HAM - B)

PUMP STATION REPORT

7TH & ENTERPRISE PUMP STATION
(Originally Hammond "B" P/S)

DESCRIPTION:

This pump station continues transfer of flows from downtown Hammond by force main to the east.

This pump station is a HYDRONIX fiberglass pre-fabricated unit station with a split, locking fiberglass cover, mounted on top of a concrete wet well, (see attached photo 7TH/ENT-1). It is a duplex station with vacuum primed, 15 hp direct coupled, vertical non-clog sewage pumps. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational. The discharge gate valves/force main header assembly did not have the required gauges. See photo 7TH/ENT-2. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines, (see attached Flowrate check sheet). Testing and measurements were conducted in accord with these guidelines. It should be noted that this station was tested 3 times, once with draw down testing on June 14, 2000, tested according to the DEQ Flow rate testing procedure on December 14, 2001, and again on March 8, 2002. Only the March 8, 2002 results are presented in this report.

The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The main pump controls (inside the station) were tested through operational cycling during flowrate testing. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch. Please note that panel was not latched at time of observations. It should be noted that the electrical service panel was mounted on a separate pole, outside of the pump station enclosure, and with the proper sealing and panel latch, (see attached photo, 7TH/ENT-3). No odor control equipment or air compressor is used at this pump station.

A provision for alternate power is made by a manual transfer switch panel and the plug assembly for the portable generator. It is to the right of the station control panel, (see photo 7TH/ENT-2), under the split covers.

The alarm system is mounted on a two separate poles, which are shown on photo 7TH/ENT-1. The alarm light is mounted on a pole just south of the station and appeared to function properly. This alarm light is visible from 7TH Avenue. The station alarm system is also tied into a central alarm console, located in the City of Warrenton Public Works Shop.

This pump station was the second of five original Hammond pump stations constructed in 1979-1980, under EPA Grant # C-410502. They were originally designated as Hammond

A, B, C, D, and E. The City of Warrenton has changed their designation to; Warrenton Drive/9th Street (A), 7th Avenue (B), Jetty Street (C), Tyee (D), and Fort Stevens (E). Construction plans, as-built drawings and technical specifications for these stations were available from the City of Warrenton.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found in the beginning of the Hammond section. The pump curve is attached. Photos of the pump station are attached.

PUMP FLOWRATE/EFFICIENCIES:

See attached pump curve, obtained from the pump manufacturer. It is based upon a design maximum flow rate of 600 gpm, and a design TDH of 41 feet for a new pump. The DEQ Flowrate methodology was used. Pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	738 gpm	123%	None Apparent
#2	580 gpm	97%	3%

Explanation of the columns: Measured flow is typically from a DEQ flowrate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

FORCE MAIN:

The force main length is approximately 2,600 feet from plan measurements and is constructed of 8"ϕ PVC. The 8"ϕ PVC force main ends at the discharge manhole and a 15"ϕ PVC gravity sewer begins. This manhole is located along NW Warrenton Drive, just to the west of Eben B. Carruthers Wayside. It is +/- 33 feet south of the centerline.

HYDROGEN SULFIDE:

No hydrogen sulfide damage was observed in this manhole. No visible cracks at sections. The manhole steps were sound. When probed, the concrete was solid. No ground water infiltration was observed. However, a 4"ϕ PVC service lateral from the southeast is connected to this manhole. This service lateral appears to have groundwater infiltration coming from the lateral connection to the manhole.

OVERFLOWS/BYPASS:

The ground elevation along 7th Avenue, about 360 feet east of the pump station, would be the overflow point. At this point it would surcharge the gravity manholes, (B-1-1, and B-

1-2, from plans) and then sewage would go into a storm drainage ditch, along the north side of 7th Avenue, should the pump station overflow. This condition is not anticipated, though, due to the availability of a portable generator set.

RECOMMENDATIONS:

This station is in fair condition hydraulically.

- □ Regular maintenance, cleaning.
- □ Pump #2 is very noisy. Has bad seals and is leaking oil.
- □ Because of the critical nature of this station, and the fact that it is a vacuum prime system, spare, replacement parts should be on hand for the vacuum prime system. This would include gaskets for the canister, water filter/trap assembly and a spare vacuum pump at the City Public Works Shop.
- □ An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	183.0	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	186.5	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	9.5	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	6.0	inches	
Depth of fluid to pump eye (suction lift to start)	106.5	inches	**START**
Depth of fluid to pump eye (suction lift to stop)	145.5	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	28 psig	25 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	75.68 FT	68.75 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	12 psig	12 psig	
Reading adj. to impeller eye (add guage off.+start)	37.10 FT	37.10 FT	psig*2.31+ guage offset + start
Guage reading @ pump stop	12 psig	11 psig	
Reading adj. to impeller eye (add guage off.+stop)	40.35 FT	38.04 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

TDH @ pump start (at midpool)	38.72 FT	38.72 FT	taken at mid-pool, with water column moving
TDH @ pump stop	40.35 FT	38.04 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1755 RPM

Flowrate @ pump start (curve interpolation)	725 GPM	585 GPM	
Flowrate @ pump stop (curve interpolation)	750 GPM	575 GPM	
Average Flow, gpm	**738** GPM	**580** GPM	Mean
Design GPM	600 GPM	600 GPM	
% of new capacity	123%	97%	

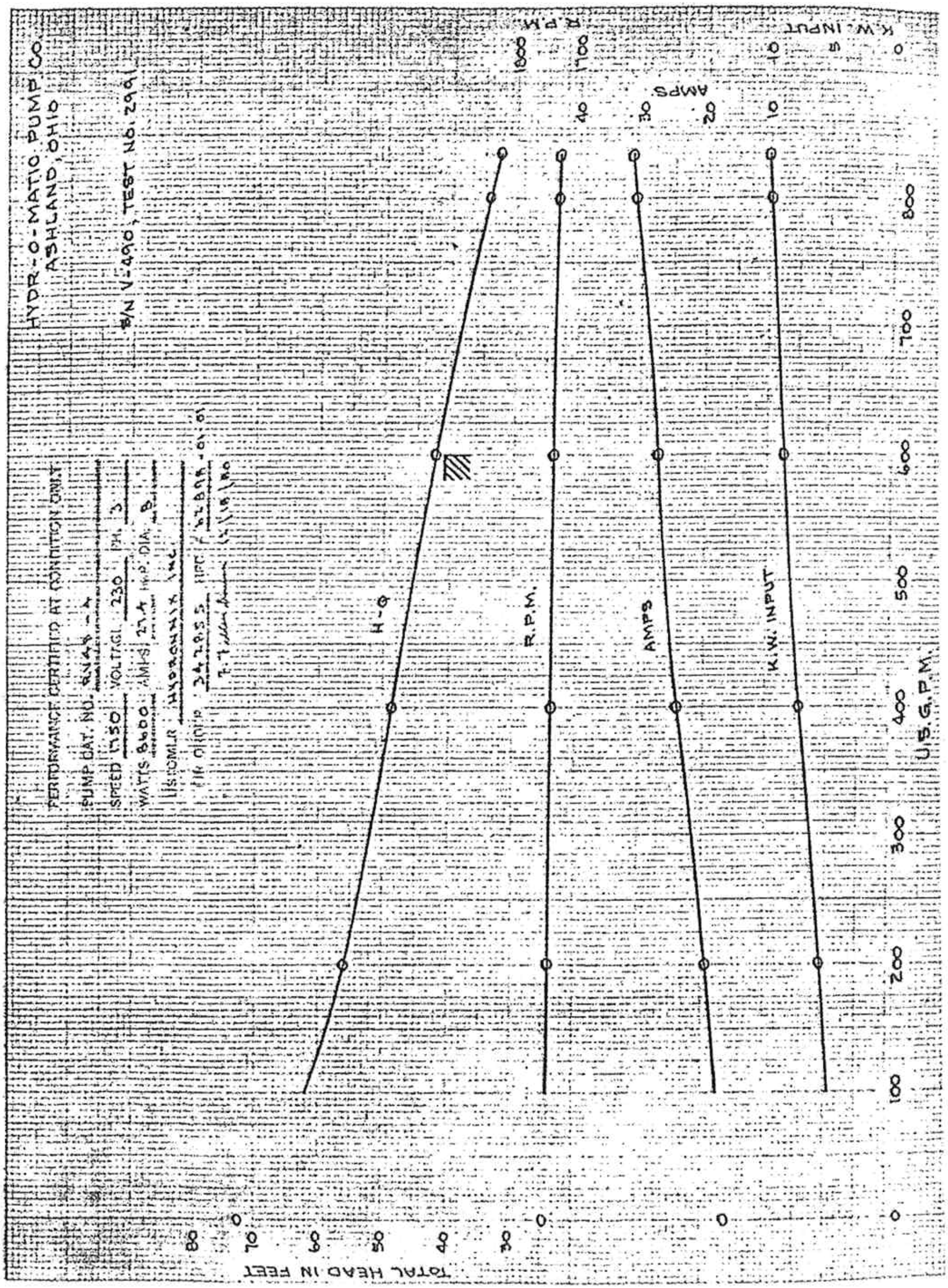
Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

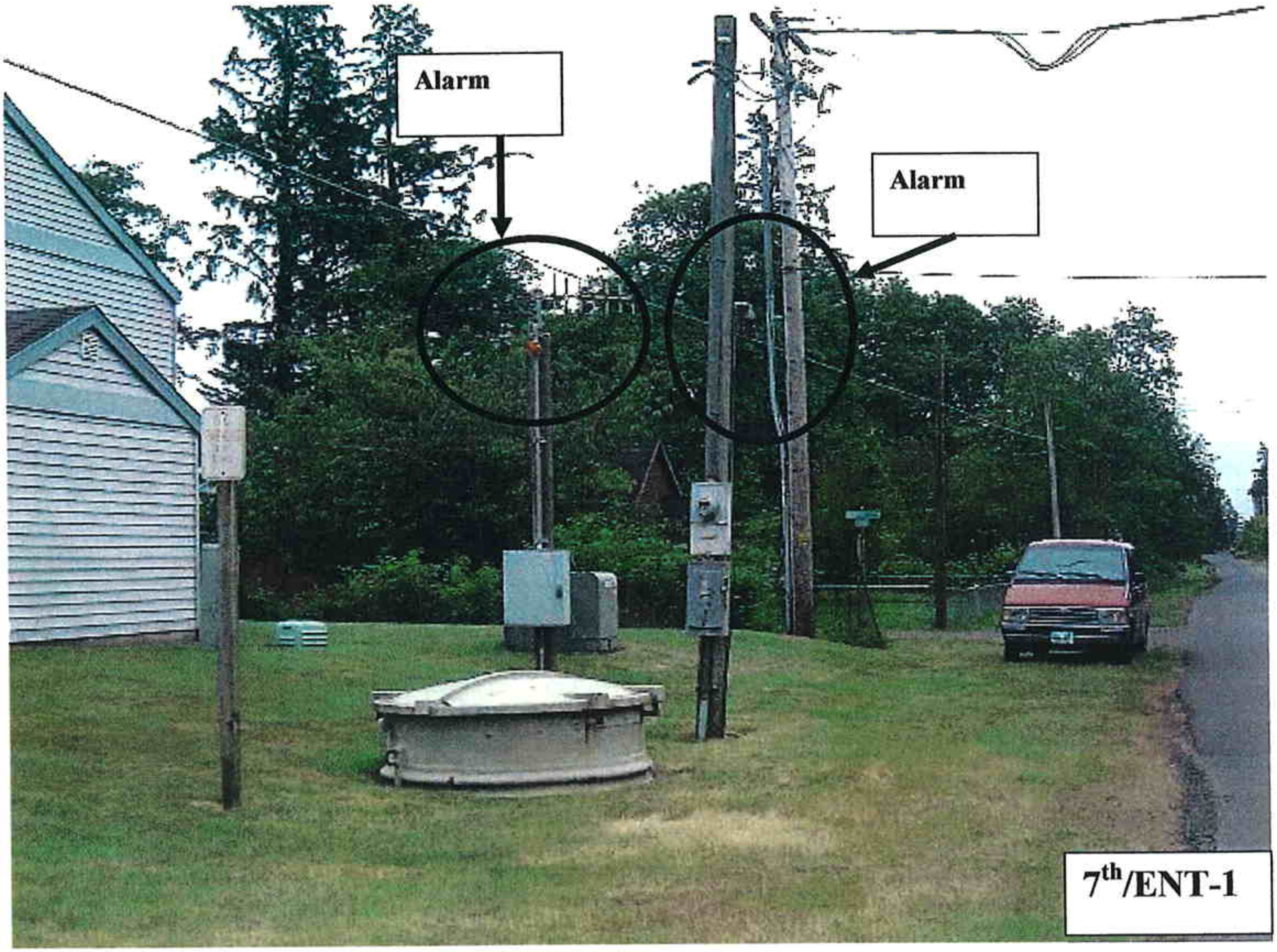
Date of spreadsheet calcs: Jan. 5, 2002
STATION: **7TH & ENTERPRISE PS** (orig. Ham. B)
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

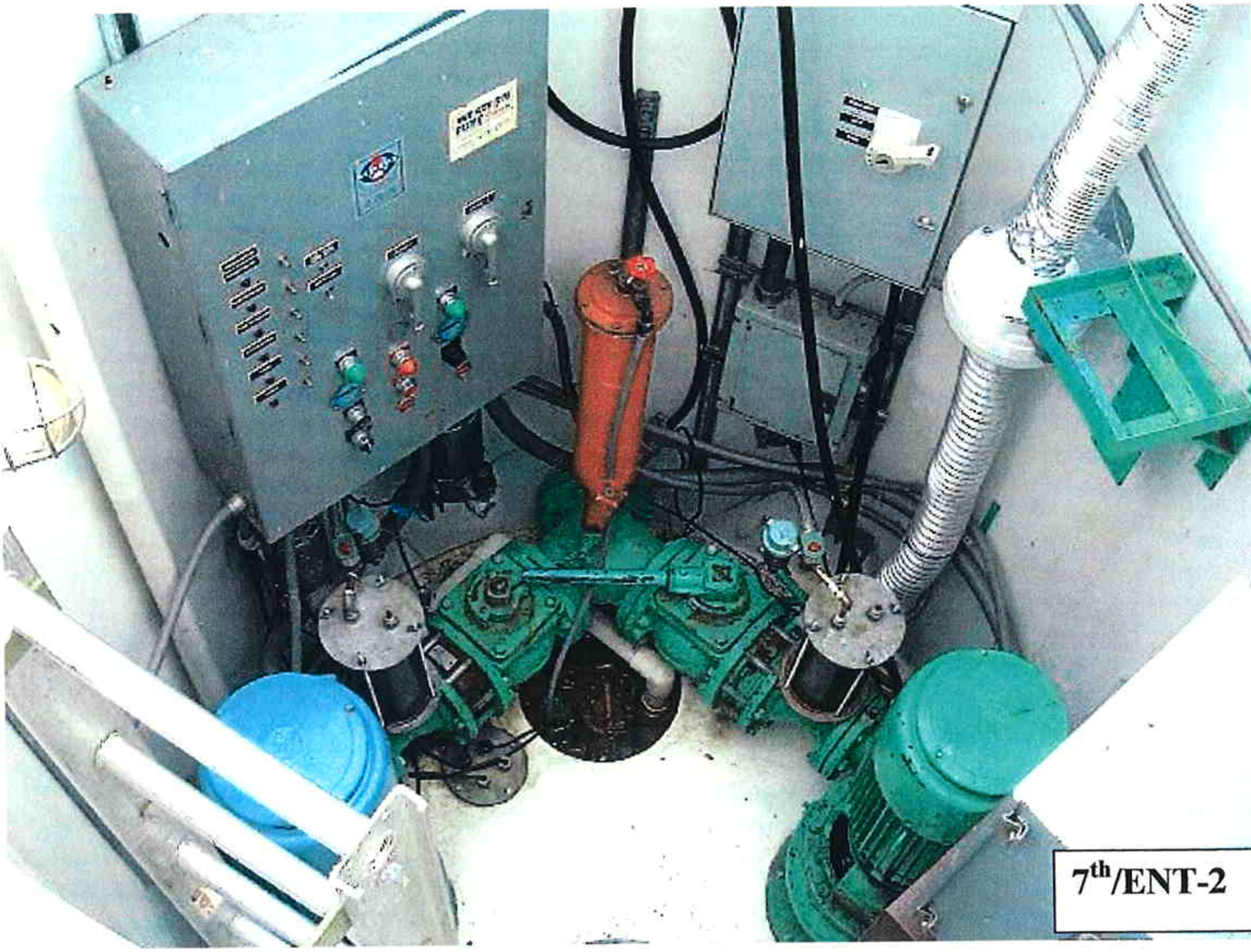
Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

Design: 600 gpm
Design SO Head: 41'
Impeller: 8"

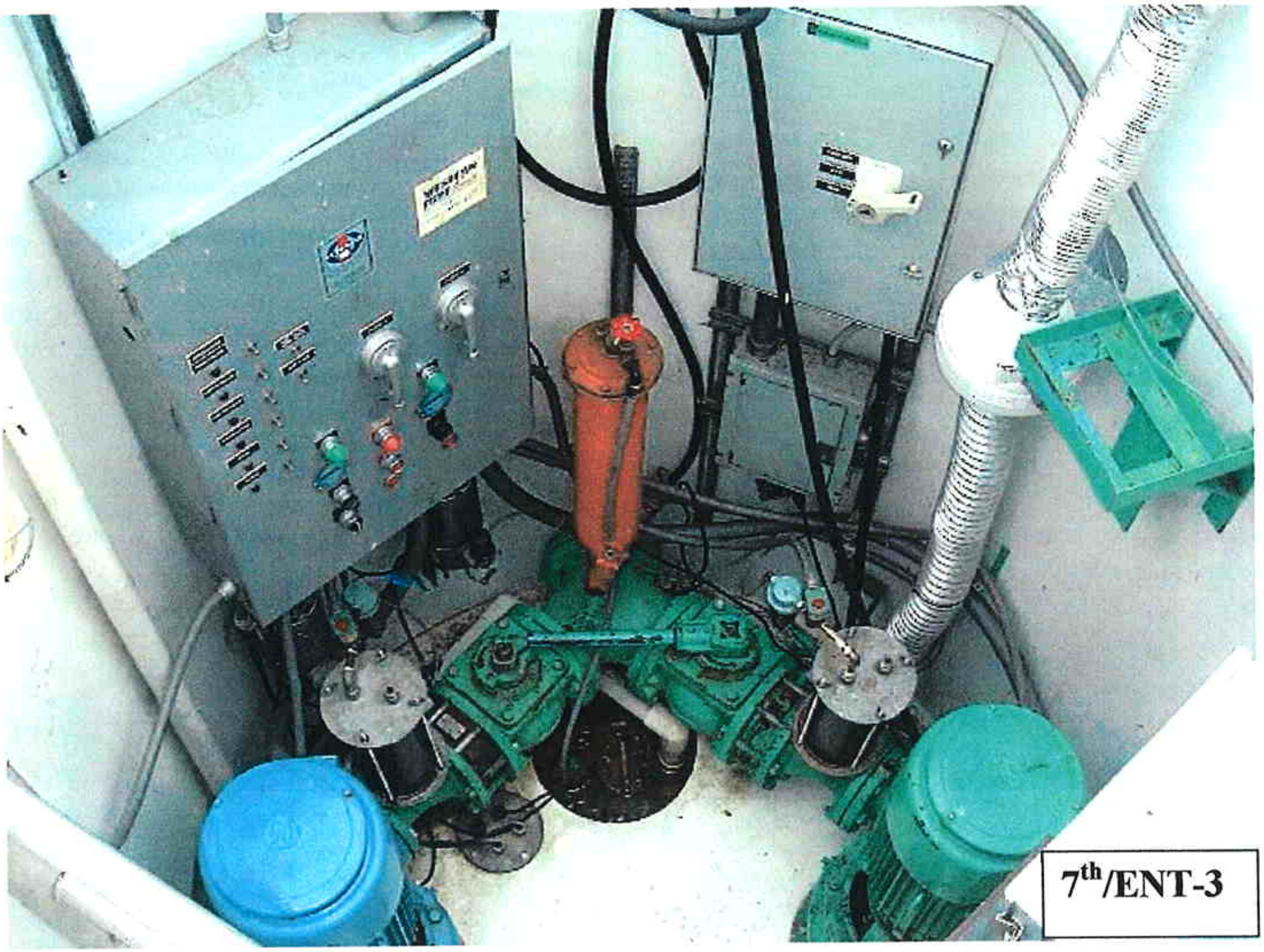
7th & ENTERPRISE (Orig. Ham. B)




Alarm
Alarm
7th/ENT-1



7th/ENT-2



7th/ENT-3

Jetty St.
Pump Station

(HAM - C)

PUMP STATION REPORT

JETTY STREET PUMP STATION
(Originally Hammond "C" P/S)

DESCRIPTION:

This pump station continues transfer of flows from downtown Hammond by force main to the east. A gravity system then continues east to the 9th/Warrenton Drive pump station, then to the City of Warrenton Wastewater Lagoons.

This pump station is a HYDRONIX fiberglass pre-fabricated unit station with a split, locking fiberglass cover, mounted on top of a concrete wet well, (see attached photo JET-1). It is a duplex station with vacuum primed, 10 hp direct coupled, vertical non-clog sewage pumps, model #RV/LV-4B. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational. The discharge gate valves/force main header assembly did not have the required gauges. See photo JET-2. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines, (see attached Flowrate check sheet). Testing and measurements were conducted in accord with these guidelines. It should be noted that this station was tested 3 times, once with draw down testing on May 31, 2000, tested according to the DEQ Flow rate testing procedure on December 14, 2001, and again on March 8, 2002.

The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The main pump controls (inside the station) were tested through operational cycling during flowrate testing. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident. Please note that panel was not latched at time of observations, see photo JET-3. It should be noted that the electrical service panel was mounted on a separate pole, outside of the pump station enclosure, and with the proper sealing and panel latch, (see attached photo, JET-1). No odor control equipment or air compressor is used at this pump station.

A provision for alternate power is made by a manual transfer switch panel and the plug assembly for the portable generator. It is to the right of the station control panel, (see photo JET-4), under the split covers, looped over the dehumidifier equipment.

The alarm system is mounted on a separate pole, which is shown on photo JET-1. The alarm light is mounted on a pole just south of the station and appeared to function properly. This alarm light is visible from Pacific Drive. In photo JET-2, the 12V battery for a redundant alarm is missing. However, the station alarm system is also tied into a central alarm console, located in the City of Warrenton Public Works Shop.

This pump station was the third of five original Hammond pump stations constructed in 1979-1980, under EPA Grant # C-410502. They were originally designated as Hammond A, B, C, D, and E. The City of Warrenton has changed their designation to; Warrenton Drive/9th Street (A), 7th Avenue (B), Jetty Street (C), 3rd/Tyee (D), and Fort Stevens (E). Construction plans, as-built drawings and technical specifications for these stations were available from the City of Warrenton.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found in the beginning of the Hammond section. The pump curve is attached. Photos of the pump station are attached.

Construction plans, as-built drawings and technical specifications for this pump station were available in the City of Warrenton archives.

PUMP FLOWRATE/EFFICIENCIES:

It was impossible to apply the original pump curve to the DEQ flowrate spreadsheet. See attached pump curve, obtained from the O&M manual. Since the flows obtained through 3 different observations/testing periods did not match the O&M curve, the flows presented are only estimates.

From the O&M manual, the station should have 10.0 hp motors with 9-3/4" impellers, running at 1155 rpm. Based upon a design maximum flow rate of 550 gpm, the calculated TDH is 32.0 feet for a new pump. Since neither pump is operating on this curve, it is also impossible to use the original curve. See recommendations below. The attached DEQ flow rate spreadsheet is included for its shutoff head information, and also future testing and measurements. Measured pump flow (pump 1) at this station was as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	188 gpm	34 %	66 %
#2	Off curve	Unknown %	Unknown %

Explanation of the columns: Measured flow is typically from a DEQ Flow rate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

FORCE MAIN:

The force main length is approximately 873.0 feet from plan measurements and is constructed of 6"ϕ PVC. The force main discharges into a manhole at the northeast corner of the intersection of 7th Avenue and Iredale Street.

HYDROGEN SULFIDE:

No hydrogen sulfide damage was observed in this manhole. However, it should be noted that the force main comes into the manhole at 90 degrees, or perpendicular to its flow path. When the pump station is in operation, the flow washes over the beaches, swirls in the manhole, and cuts off the opposite 8"ϕ gravity main. No visible cracks at sections. The manhole steps were sound. When probed, the concrete was solid. No ground water infiltration was observed. One reason for this extreme flow is that this pump station is part of a sewage conveyance system that has as its upstream component, the Parkview Apartments station, KOA Campground station, Fort Stevens station, Lake Street station, Peacock station, and the 3rd/Tyee station flows all directed through it.

As a secondary observation, the clarity of the effluent being pumped, during the inspection/observation time indicates that this station is pumping large quantities of I/I. This I/I comes from further upstream. Therefore, consideration should be given to reducing I/I from sewers on private and public property.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. I t's top of w etwell elevation is 3.5 feet, while the surrounding manholes, are at approximately 10.0 feet. If the station wet-well was surcharged, the overflow would come out the top of the pump station wet well, flowing over and into the sandy ground surface north, toward Pacific Drive. This condition is not anticipated, due the low cycle times of the pump station, and the availability of a portable generator set.

RECOMMENDATIONS:

This station is in fair condition hydraulically.

- □ It may be cost effective to replace this station and the discharge manhole piping. Especially if other areas to the west of Warrenton, Hammond are developed further. Further study and area/flow analysis is necessary. However, the following recommendations assume that the station will be used for the short term, foreseeable future.

- Regular maintenance, cleaning.

- Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this critical station, and make it possible to use the DEQ flow rate methodology for future testing.

- Because of the critical nature of this station, (ALL flows from Ft. Stevens, KOA Campground, Parkview Apartments, Lake Street, Peacock, and 3rd/Tyee stations go through here) and the fact that it is a vacuum prime system, spare, replacement parts should be on hand for the vacuum prime system. This would include gaskets for the canister, water filter/trap assembly and a spare vacuum pump, at the City Public Works Shop.

- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	180	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	183	inches	
Impeller eye elevation above datum	9	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	8	inches	
Depth of fluid to pump eye (suction lift to start)	119	inches	START
Depth of fluid to pump eye (suction lift to stop)	148	inches	STOP

PRESSURE DATA

	Pump #1	Pump #2	Note
Shutoff head, direct guage reading,	13 psig	20 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	41.82 FT	57.99 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	8 psig	7 psig	
Reading adj. to impeller eye (add guage off.+start)	29.06 FT	26.75 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	13 psig	5 psig	
Reading adj. to impeller eye (add guage off.+stop)	43.03 FT	24.55 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

TDH @ pump start (at midpool)	30.27 FT	27.96 FT	taken at mid-pool, with water column moving
TDH @ pump stop	43.03 FT	24.55 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1150 RPM

	off curve	off curve	
Flowrate @ pump start (curve interpolation)	375 GPM	0 GPM	
Flowrate @ pump stop (curve interpolation)	0 GPM	0 GPM	
Average Flow, gpm	**188** GPM	**0** GPM	Mean
Design GPM	550 GPM	550 GPM	Est. from curve
% of new capacity	34%	0%	Design SO Head: 32'

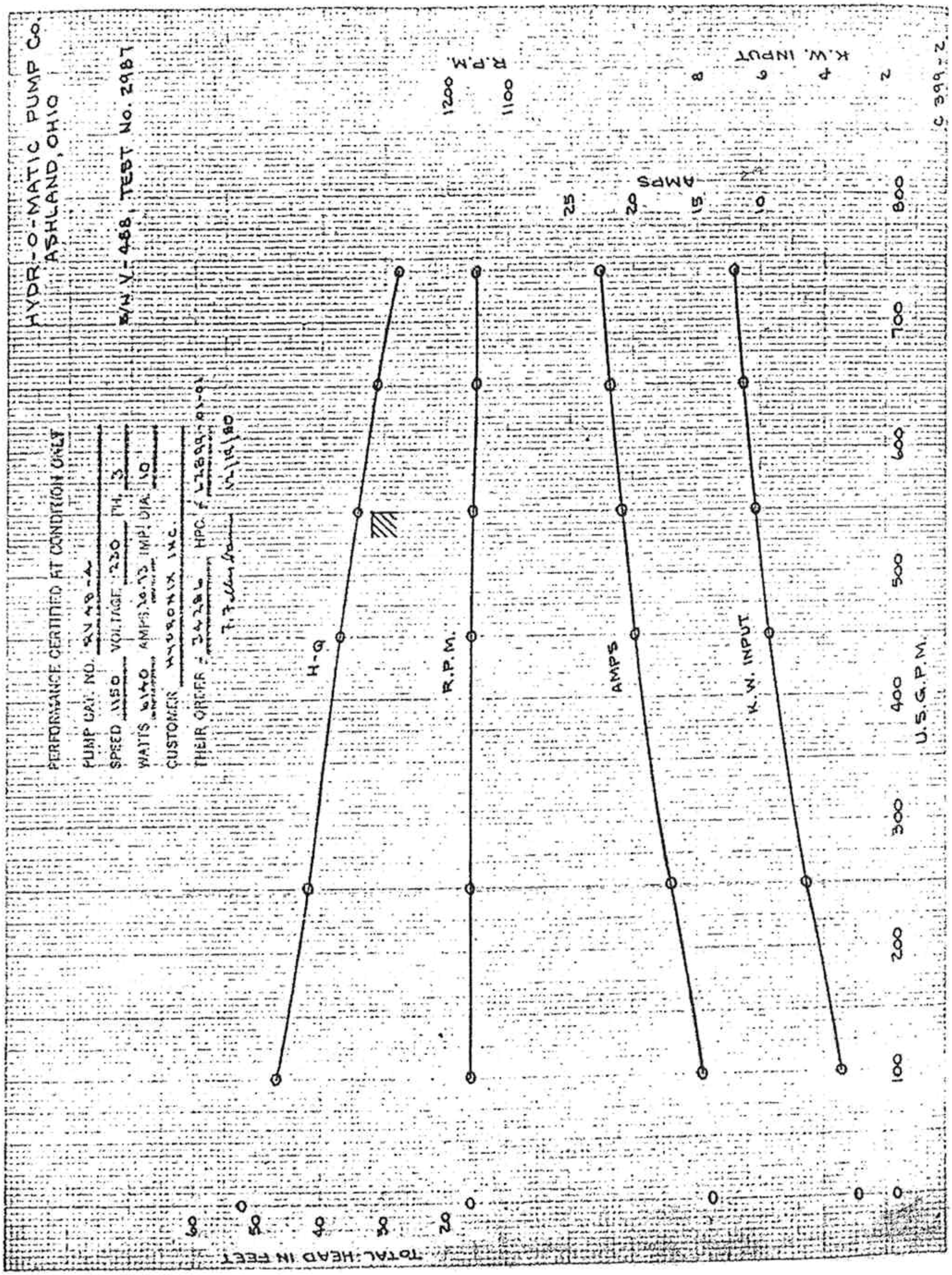
Impeller: 10"

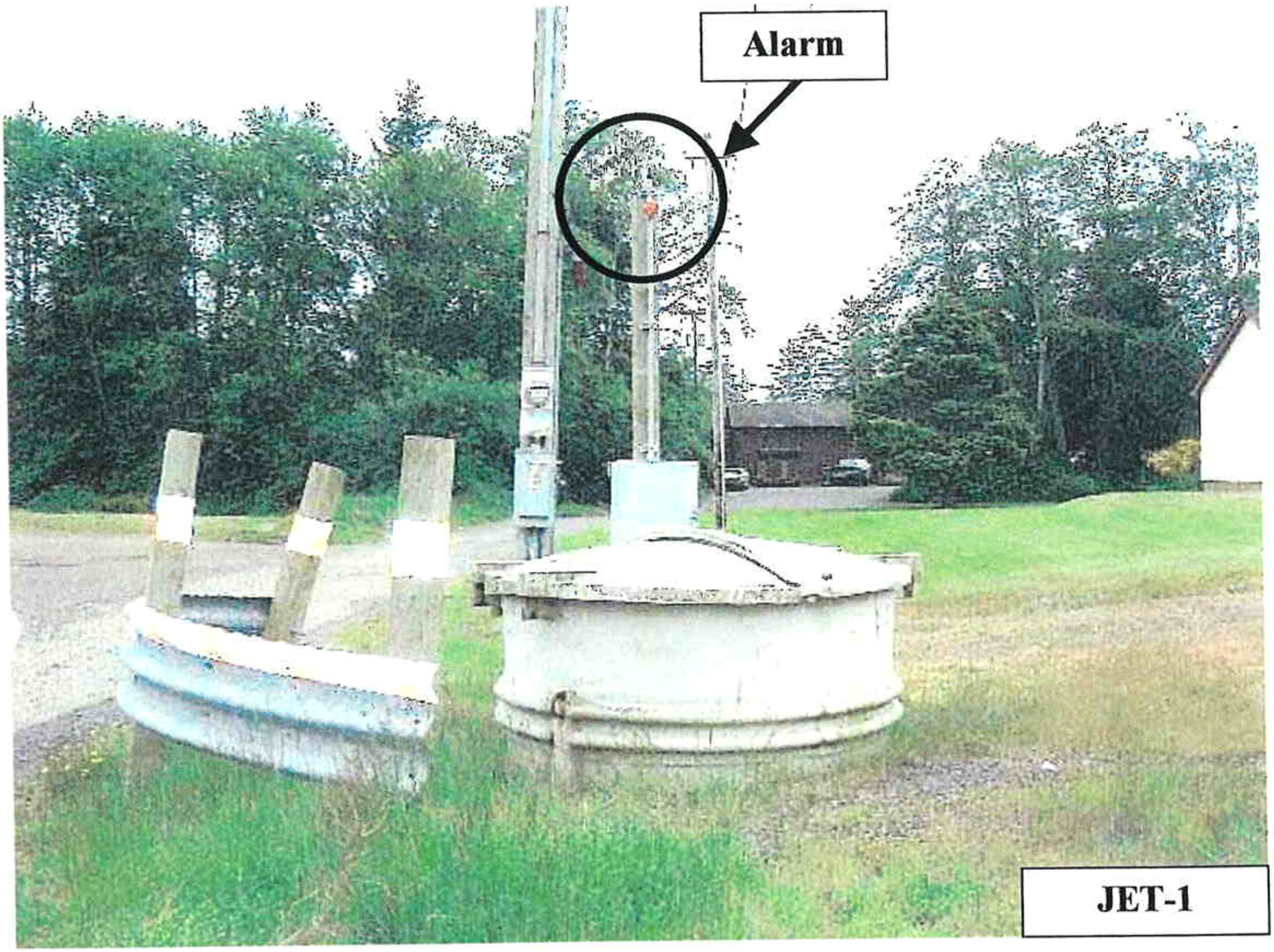
Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

Date of spreadsheet calcs: Jan. 6, 2002
STATION: **JETTY STREET PS** (orig. Ham. C)
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

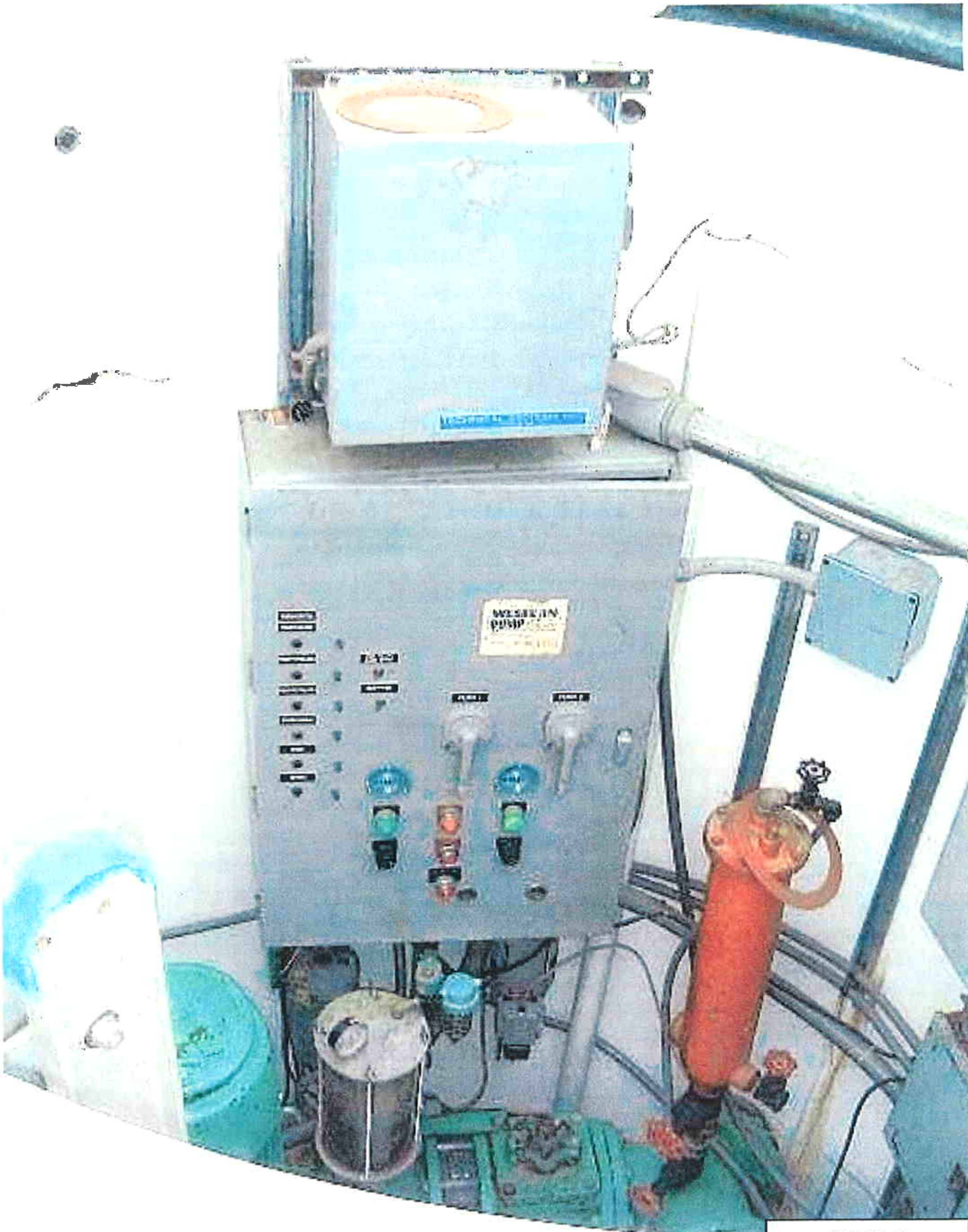
Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

JETTY ST. (Orig. Ham. C)

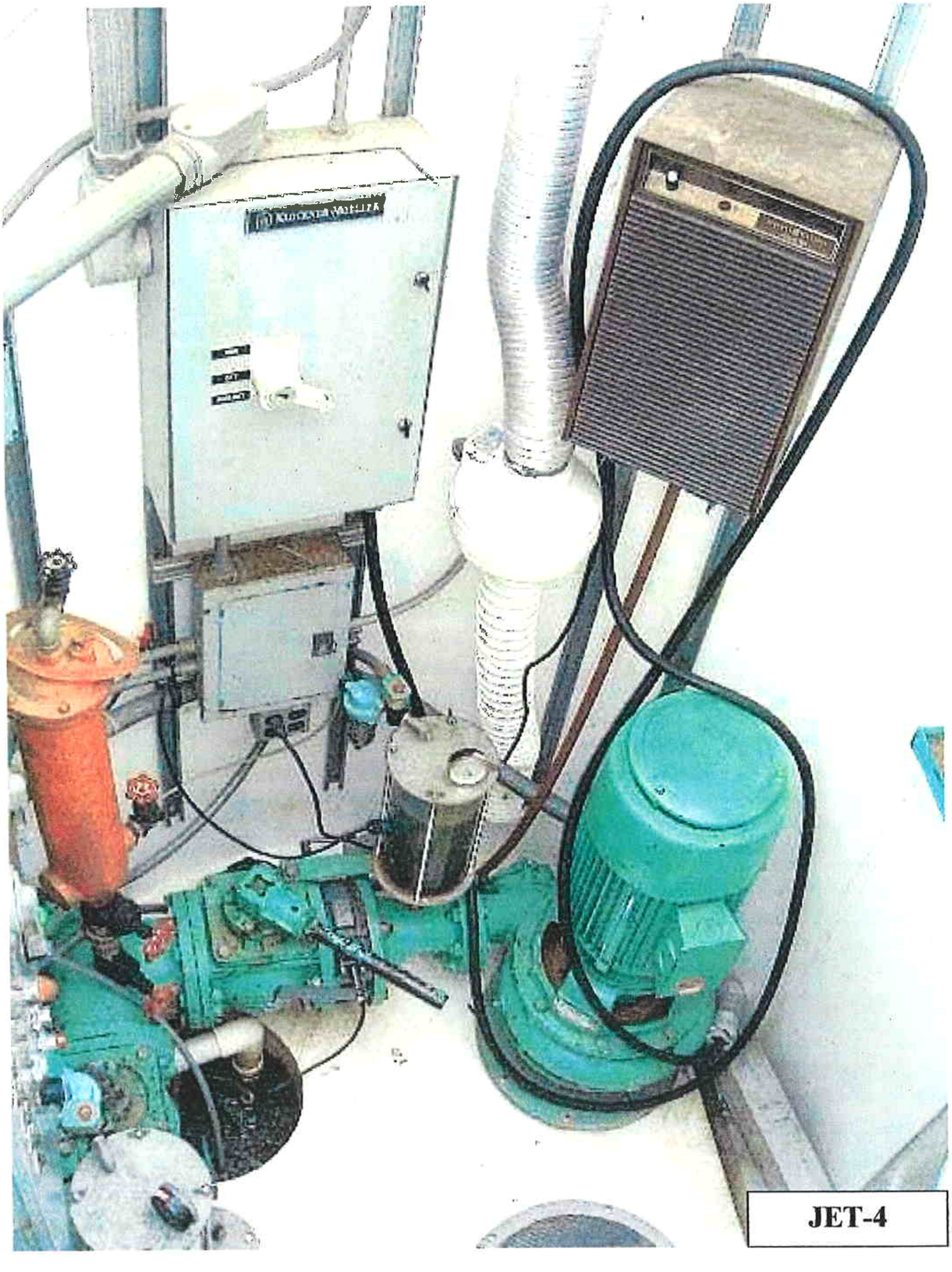



Alarm
JET-1

JET-2



JET-3



JET-4

3^{rd} / Tyee Pump Station

(HAM - D)

PUMP STATION REPORT

3RD/TYEE STREET PUMP STATION
(Originally Hammond "D" P/S)

DESCRIPTION:

This pump station transfers sewage flows from the old Fort Stevens area (northwest of Hammond) by force main to downtown Hammond. A combination gravity system/pressure system then continues east to the City of Warrenton Wastewater Lagoons.

This pump station is a HYDRONIX fiberglass pre-fabricated unit station with a split, locking fiberglass cover, mounted on top of a concrete wet well, (see attached photo TYE-1). It is a duplex station with 7.5 hp direct coupled, sewage pumps, model 40 MMPC. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational. The discharge gate valves/force main header assembly did not have the required gauges. See photo TYE-2. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines, (see attached Flowrate check sheet). Testing and measurements were conducted in accord with these guidelines. It should be noted that this station was tested 3 times, once with draw down testing on May 31, 2000, tested according to the DEQ Flow rate testing procedure on December 14, 2001, and again on March 8, 2002.

The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The main pump controls (inside the station) were tested through operational cycling during flowrate testing. The control panel appears to be a weather resistant, o-ring cover panel, with no corrosion evident, see photo TYE-3. It should be noted that the electrical service panel was mounted on a separate pole, outside of the pump station enclosure, and with the proper sealing and panel latch, (see attached photo, TYE-1). No odor control equipment or air compressor is used at this pump station.

A provision for alternate power is made by a manual transfer switch panel and the plug assembly for the portable generator. It is to the right of the station control panel, on a separate pole with the electrical service panel. (See photo TYE-4).

The alarm system is mounted on two (2) poles, which are shown on photo TYE-1. The alarm light is mounted on a pole just north of the station and appeared to function properly. This alarm light is visible from Tyee Street. The station alarm system is also tied into a central alarm console, located in the City of Warrenton Public Works Shop.

This pump station was the fourth of five original Hammond pump stations constructed in 1979-1980, under EPA Grant # C-410502. They were originally designated as Hammond A, B, C, D, and E. The City of Warrenton has changed their designation to; Warrenton Drive/9th Street (A), 7th Avenue (B), Jetty Street (C), 3rd/Tyee (D), and Fort Stevens (E). Construction plans, as-built drawings and technical specifications for these stations were available from the City of Warrenton. Since their construction, another station, on

Peacock Street has been added. The flows from the Peacock station are transferred through a force main and gravity to this 3rd/Tyee station.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found in the beginning of the Hammond section. The pump curve is attached. Photos of the pump station are attached.

Construction plans, as-built drawings and technical specifications for this pump station were available in the City of Warrenton archives.

PUMP FLOWRATE/EFFICIENCIES:

It was difficult to apply the original pump curve to the DEQ flowrate spreadsheet with any degree of accuracy. See attached pump curve, obtained from the O&M manual. Since the flows obtained through 3 different observations/testing periods did not match the O&M curve, the flows presented are only estimates.

From the O&M manual, the station should have 7.5 hp motors running at 1750 rpm, based upon a design maximum flow rate of 140 gpm, and a design TDH of 47.0 feet for a new pump. The attached DEQ flow rate spreadsheet is included for its shutoff head information, and also future testing and measurements. Measured pump flows at this station was as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	70 gpm	50 %	50 %
#2	43 gpm	31 %	69 %

Explanation of the columns: Measured flow is typically from a DEQ Flow rate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

It should be noted that "drawdown testing" of this station on May 31, 2000 was somewhat higher (112-104 gpm), however, those results are not part of the DEQ Flow rate testing procedure, and therefore are not included or analyzed as the table above.

It is also important to note that through routine maintenance, both pump motors have been changed. This may be an indicator of why the flow numbers do not match the original curve better. See recommendations section below.

FORCE MAIN:

The force main length is approximately 3,465 feet from plan measurements and is constructed of 4"ϕ PVC. It is relatively flat, the profile showing about 6 feet of vertical change overall. Maximum elevation is approximately 14.0 feet, and minimum elevation is approximately 8.0 feet at the pump station. The force main discharges into a manhole at the northeast corner of the intersection of Lake Street and Pacific Drive in downtown Hammond, (per Town of Hammond Sewer Plans, dated September, 1979). According to the plans, a 4"ϕ force main should enter this manhole. It appears to be 6-8". Also, this force main has an air release valve at station 25+16. No flow difficulties were observed in this manhole.

HYDROGEN SULFIDE:

No hydrogen sulfide damage was observed in this manhole. No visible cracks at sections. However, some slight infiltration was observed between the cone and the first section. The manhole steps were sound. When probed, the concrete was solid. No ground water infiltration at the base was observed. The force main was in operation during this inspection.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. If the station wet-well was surcharged, the overflow would come out the top of the pump station wet well, flowing over and into the sandy ground surface south of Tyee, into a wetland area. This condition is not anticipated, due the low cycle times of the pump station, and the availability of a portable generator set.

RECOMMENDATIONS:

This station is in fair condition hydraulically.

- Regular maintenance, cleaning.
- A check/cleaning of the air release valve at station 25+16 should be made a part of the maintenance program.
- Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this critical station, and make it possible to use the DEQ flow rate methodology for future testing.
- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	105	inches	(Datum, top of wetwell, pump mounts)	
Suction pipe to pump eye	105	inches		
Impeller eye elevation above datum	7.5	inches	(May be same as pump eye to datum)	
Offset of pressure guage to pump eye	25	inches		
Depth of fluid to pump eye (suction lift to start)	50	inches	**START**	
Depth of fluid to pump eye (suction lift to stop)	74	inches	**STOP**	

PRESSURE DATA

	Pump #1	*Pump #2*	Note
Shutoff head, direct guage reading,	23 psig	20 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	60.34 FT	53.41 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	20 psig	18 psig	
Reading adj. to impeller eye (add guage off.+start)	52.41 FT	47.79 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	17 psig	16 psig	
Reading adj. to impeller eye (add guage off.+stop)	47.48 FT	45.17 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

	Pump #1	*Pump #2*	Note
TDH @ pump start (at midpool)	53.41 FT	48.79 FT	taken at mid-pool, with water column moving
TDH @ pump stop	47.48 FT	45.17 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1750 RPM

	Pump #1	*Pump #2*	Note
Flowrate @ pump start (curve interpolation)	40 GPM	25 GPM	
Flowrate @ pump stop (curve interpolation)	100 GPM	60 GPM	
Average Flow, gpm	**70** GPM	**43** GPM	Mean
Design GPM	140 GPM	140 GPM	Est. from curve
% of new capacity	50%	30%	Design SO Head: 47'

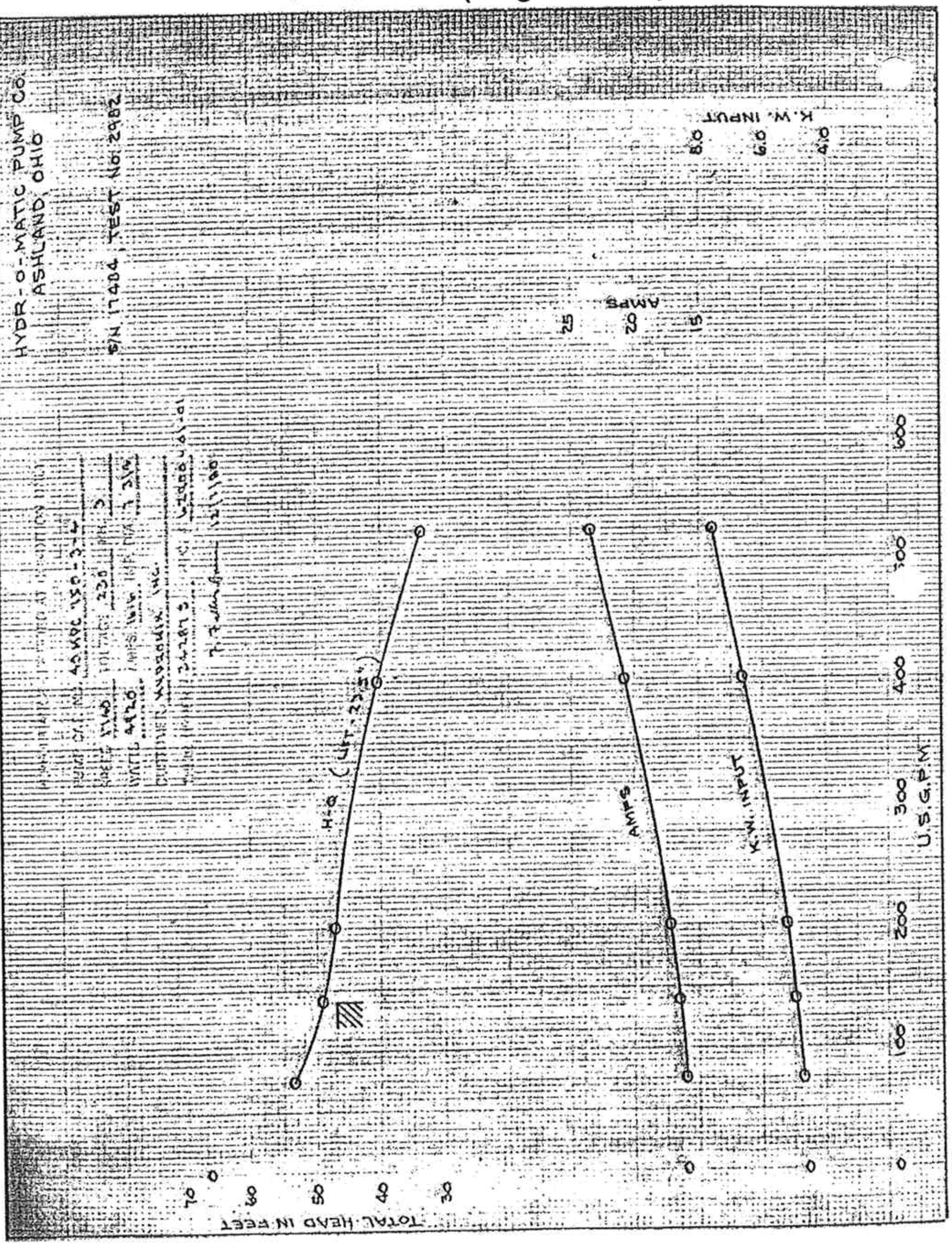
Impeller: 7-3/4"

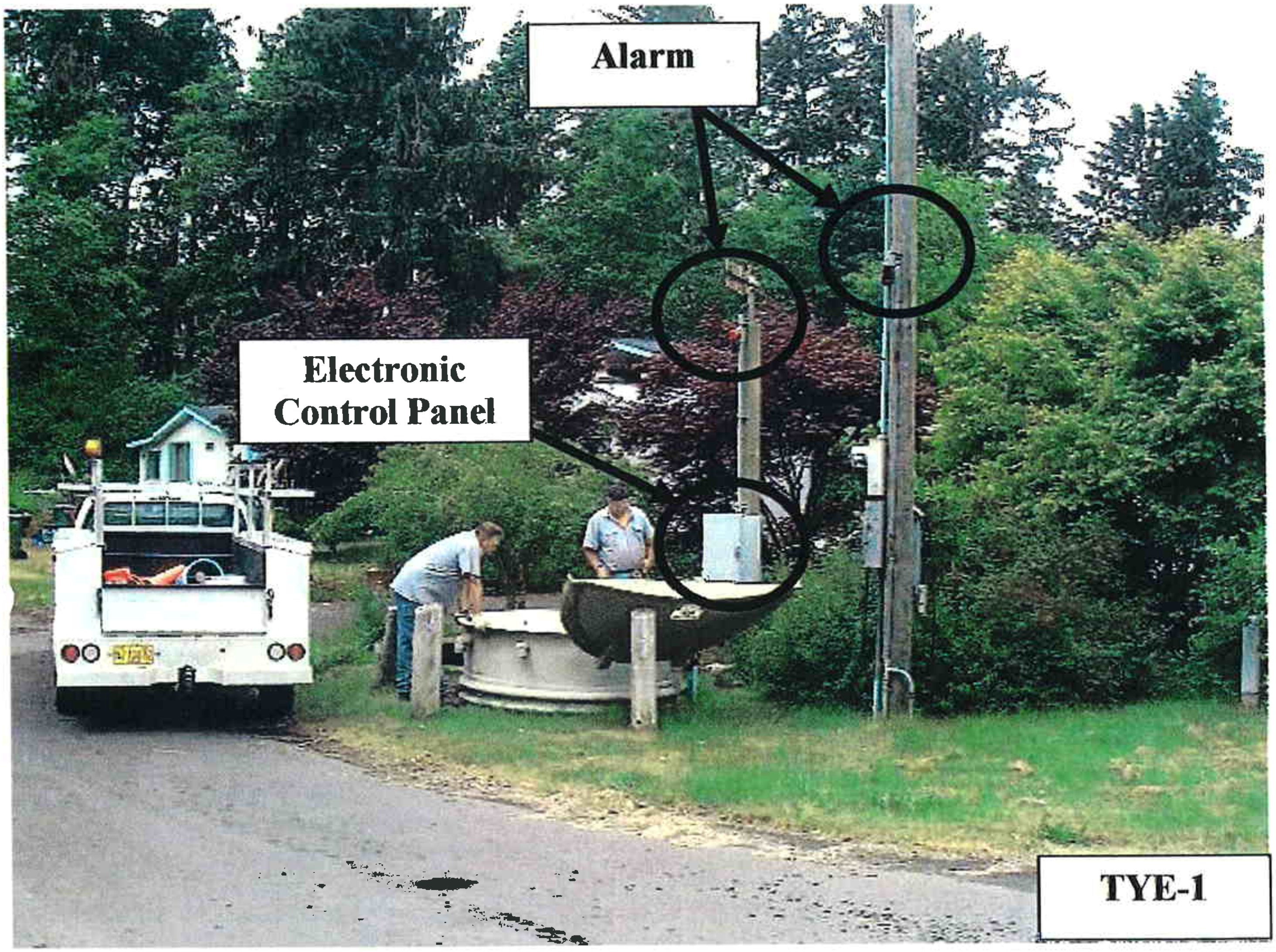
Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

Date of spreadsheet calcs: Jan. 7, 2002
STATION: **3RD-TYEE PS** (orig. Ham. D)
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

3RD & TYEE (Orig. Ham. D)

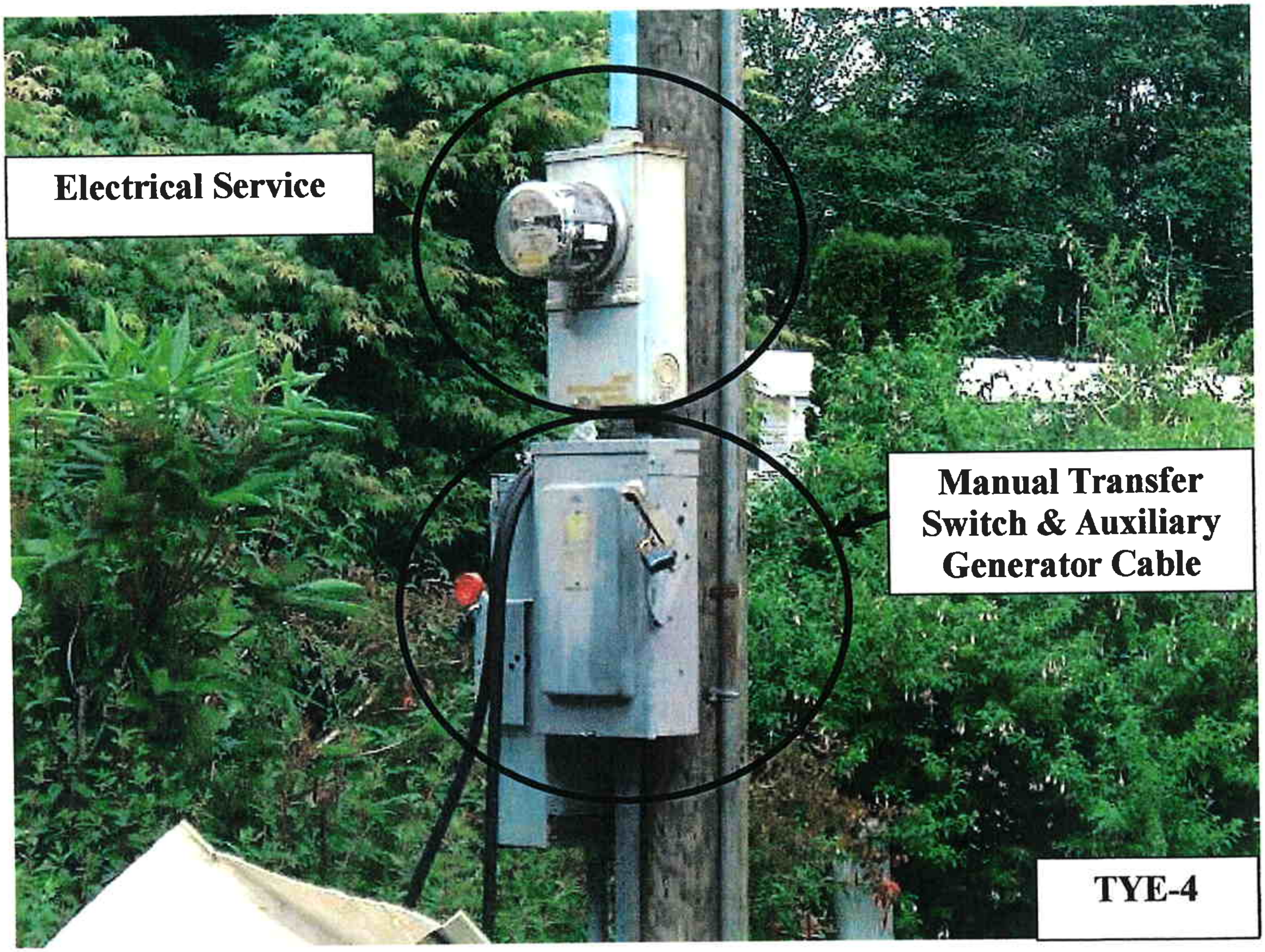




Alarm
Electronic
Control Panel
TYE-1

TYE-2

TYE-3


Electrical Service
Manual Transfer Switch & Auxiliary Generator Cable
TYE-4

Fort Stevens Pump Station

(HAM - E)

PUMP STATION REPORT

FT. STEVENS CAMPGROUND PUMP STATION
(Originally Hammond "E" P/S)

DESCRIPTION:

This pump station transfers the flows from the Ft. Stevens State Park campground north by force main to downtown Hammond.

It is a concrete wet-well type with submersible 15 hp pumps mounted on a rail system. The original Hydronix pumps have been replaced with PACO pumps approximately September, 1993. Both pumps and gate valves were found to be operational.

A concrete vault contains the gate valves (2" square operating nuts) and discharge header assembly, (see photo FS-6). The discharge gate valves/force main header assembly did not have the required gauges. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines. Testing and measurements were conducted in accord with these guidelines.

A fiberglass equipment enclosure houses pump controls and telemetry. The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The controls were tested through operational cycling during flowrate testing. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch. It should be noted that the electrical service panel was mounted on a separate pole, outside of the pump station enclosure, and with the proper sealing and panel latch. No odor control equipment or air compressor is used at this pump station. See attached photos, FS-1, FS-2, FS-3, and FS-4.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, mounted in the equipment shelter and visible to the right of the control panel.

The alarm system is mounted on a separate pole, which is shown on photo FS-1. The alarm is mounted on a pole just west of the station, and appeared to function properly. The alarm is clearly visible from the public entrance into Ft. Stevens State Park. The station alarm system is also tied into a central alarm console, located in the City of Warrenton Public Works Shop.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found at the beginning of the Hammond section. The format of this spreadsheet is taken from the current DEQ Guidelines. The pump curve is attached to this report. Photos of the pump station are attached. A DEQ Guidelines based flow rate spreadsheet with explanatory notes was developed and is also part of and attached to this report.

The five (5) original Hammond pump stations were constructed during 1979, under EPA Grant # C-410502. They were originally designated as Hammond A, B, C, D, and E. The City of Warrenton has changed their designation to; Warrenton Drive/9th Street (A), 7th Street (B), Jetty Street (C), Tyee (D), and this station, Fort Stevens (E). These stations transfer flows from the Hammond area into the Warrenton Wastewater Treatment Lagoons. Construction plans, as-built drawings and technical specifications for these stations are available from the City of Warrenton.

Note that since the original five pump stations were constructed in 1979, ***three (3) additional*** pump stations have been added in the Hammond – Ft. Stevens area. These additional stations are; KOA, Parkview Apartments, and Ridge Road/Lake Street. These three stations are attached to the Ft. Stevens' force main. Please see the Force Main Schematic, below.

PUMP FLOWRATE/EFFICIENCIES:

See attached pump curve, obtained from the pump manufacturer. Based upon a design maximum flow rate of 350 gpm, the calculated TDH is 75 feet for a new pump operating at 63% efficiency. The pump flows were measured during pump station operation, the three other pump stations connected to the common force main were in the "off" position during the testing. Flow rates will likely decrease with multiple pump stations operating simultaneously. Measured pump flows at this station were as follows:

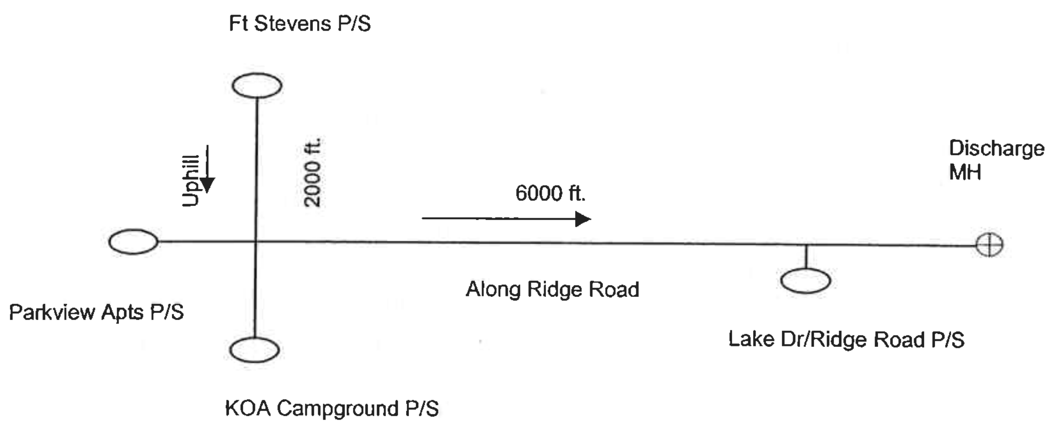
Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	308 gpm	88%	12%
#2	303 gpm	86%	14%

Explanation of the columns: Measured flow is typically from a DEQ flowrate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by Measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

FORCE MAIN:

Total length of the force main is approximately 8,000 feet. The initial section of the force main is approximately 2,000 feet and is constructed of 6"ϕ PVC. This initial section runs in an undulating, up-hill route to an air-relief valve, then to its intersection with Ridge Road. At that intersection the force main connects to a 6"ϕ force main that runs down-hill for another approximately 6,000 feet and discharges into a manhole near downtown Hammond. As originally constructed, this force main was connected only to the Ft. Stevens pump station.

As discussed above, since its construction, this force main has had three other pump stations connected to it. The diagram below illustrates the layout of the common force main with multiple pump stations.



FORCE MAIN SCHEMATIC

It should be noted that the common force main that is currently used by the four stations as shown, is not operating in accordance with DEQ guidelines. The pump stations, depending on pumping cycles tend to run longer when all (or more than one) pump station is operating. Hence, there is more electrical use, more pump wear, and the resulting lower flows.

This situation could be remedied by one of 2 options:

1) a gravity sewer, 8-12" in diameter, run at minimum slope from the intersection of the KOA Campground and Ft. Stevens entrance road on Ridge Road and along Ridge Road north, into the current common discharge manhole being used by the force main. This manhole is located in Hammond, approximately 6,000 feet away,

2) a parallel force main, or mains, used by all pump stations except the Ft. Stevens, which would remain separate. Additional analysis is required to determine sizing and costs.

At some point, however, growth, and additional capacity needs in this area will necessitate additional sewer infrastructure.

HYDROGEN SULFIDE:

The pump station wet well did not appear to have significant hydrogen sulfide damage. See photos FS-5, FS-7, and FS-8. By visual inspection, both the force main header assembly and vault also appear sound. See photo FS-6. It was raining when the photos were taken, so some water appears in the discharge header assembly vault. No exposed aggregate or concrete cracking was observed.

The discharge manhole appeared in good condition. The force main was in operation when this manhole was observed. No exposed aggregate or concrete cracking was observed. A 4 foot long ½ inch diameter hot-rolled steel rod was used as a probe, (described earlier in *Section 4*) to test for chipping and spalling. No water damage evident. No ground water infiltration was observed coming in through the base, individual manhole sections, manhole cone or the pipe collars. The steel steps going into the manhole were in good condition. A high velocity of effluent was observed going into the gravity side of the manhole. The high velocity would indicate that remedial action (such as the additional sewer piping options mentioned above) will be necessary soon. No photo exists of this discharge manhole.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. If the station wet-well was surcharged, the overflow would come out the top of the pump station wet well, flowing over and into the sandy ground surface. If a situation develops that would stop flow through the force main, a discharge coupling flange and valve are located in the discharge manifold vault. This provides an access connection for sewage pumping, such as by truck. Either of these conditions is not anticipated though, due the low cycle times of the pump station, and the availability of a portable generator set.

RECOMMENDATIONS:

This station is in good condition.

- Regular maintenance, cleaning.
- A regularly scheduled check of the air relief valve, located at about 430 feet from the pump station, on the Park entrance road, should be made part of the scheduled maintenance.
- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUBMERSIBLE PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	211	inches	(Datum typically lid of wetwell/vault)
Depth of pump eye to datum	201	inches	(Datum typically lid of wetwell/vault)
Impeller eye elevation	0	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	163	inches	
Depth of fluid to guage (for start)	83	inches	**START**
Depth of fluid to guage (for stop)	112	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	40 psig	40 psig	(psi*2.31) + avg pumped distance: this calculation is the mid-pool for max pump capacity
SO HEAD, trans. to eye of pump, then up to midpool	**100.53** FT	**100.53** FT	**(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	38 psig	39 psig	
Reading adj. to impeller eye (add guage off.)	101.36 FT	103.67 FT	(psig*2.31) + guage offset only
Guage reading @ pump stop	22 psig	22 psig	
Reading adj. to impeller eye (add guage off.)	64.40 FT	64.40 FT	(psig*2.31) + guage offset only

Total Dynamic Head, (feet)

TDH @ pump start, (discharge head - wtr over eye)	**94.70** FT	**97.01** FT	BACK OUT THE WETWELL WATER LEVEL: discharge head @ start - water over pump eye @ start
TDH @ pump stop, (discharge head - wtr over eye)	**60.15** FT	**60.15** FT	discharge head @ stop - remaining water over pump eye @ stop **(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1750 RPM

Flowrate @ pump start (curve interpolation)	15 *GPM*	5 *GPM*	
Flowrate @ pump stop (curve interpolation)	600 *GPM*	600 *GPM*	
Average Flow, gpm, (mid-pool)	**308** *GPM*	**303** *GPM*	Mean average

Design GPM	350 *GPM*	350 *GPM*
% of new capacity	88%	86%

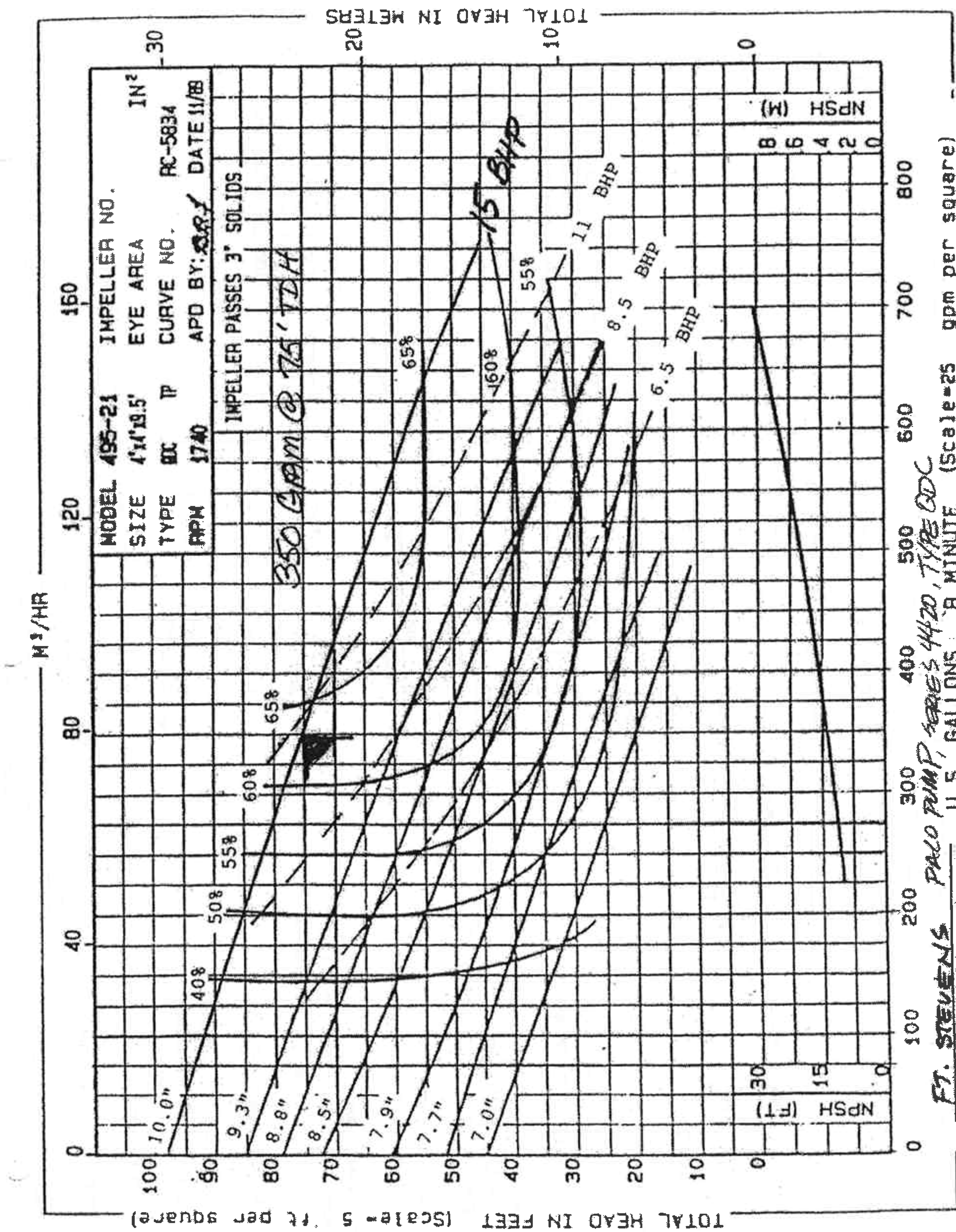
STATION: **FT STEVENS (orig. Hammond "E")**
CURVE Yes, attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:
DATE OF OFFICE CALCS: Jan. 4, 2002

Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

Note:
This spreadsheet and the notes that follow are off of the worksheet and published DEQ Guidelines; "O&M NOTES FOR GAUGES ON SEWAGE PUMPS".

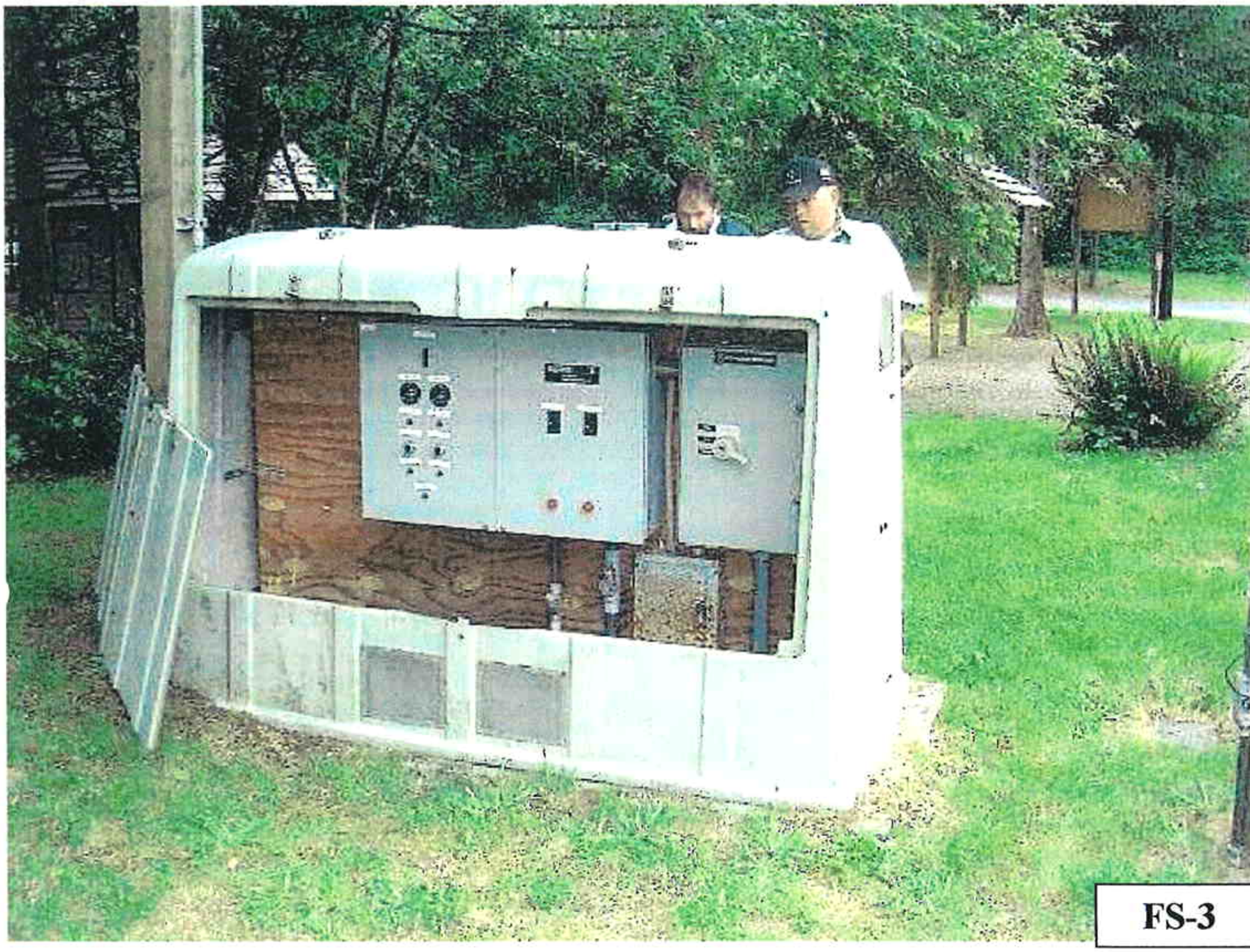
Design: 350 gpm 75' TDH
Impeller: 10.0"
HP = 15

FT STEVENS CAMPGROUND P/S



FS-1


FS-2



FS-3

FS-4


FS-5

FS-6

FS-7

FS-8

Lake Street / Ridge Road #1
Pump Station

(Krill St.)

PUMP STATION REPORT

LAKE STREET AT RIDGE ROAD PUMP STATION
(Originally Krill St. P/S)

DESCRIPTION:

This station was constructed in October, 1985. It serves a small drainage area in the southeast portion of Hammond, east of Ridge Road.

This pump station is a concrete wet-well, duplex type with submersible, 3.0 hp pumps mounted on a rail system. The rail system appeared in good condition. (The original design called out Hydronix, self-priming pumps, which was changed to Flygt submersible during construction). Both pumps were found to be operational. It should be noted here that the pumps were tested according to the draw-down method, due to original pump station construction. This station did not have a separate gate valve, check valve vault to observe operations and testing from. The results of the drawdown testing are provided in this report. No DEQ Flowrate check sheet is provided for this report.

The force main "y" header assembly and wheel operated gate valves are located just outside of the wet-well. No concrete vault exists for these valves, just standard valve boxes, see photo LS-4. The force main header assembly did not have the required test ports or gauges. However, both pumps and gate valves were found to be operational.

The force main from this pump station tees into the Ft. Stevens force main near the discharge manhole, which is located in downtown Hammond. See the Force Main Schematic below.

A fiberglass equipment enclosure houses pump controls and telemetry. The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The controls were tested through operational cycling during drawdown testing. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch. It should be noted that the electrical service panel was mounted on a separate pole, outside of the pump station enclosure, and with the proper sealing and panel latch. No odor control equipment or air compressor is used at this pump station. See attached photos, LS-1, LS-2, LS-3, and LS-4.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, mounted in the equipment shelter and visible to the left of the control panel, in photo LS-2.

The alarm system is mounted on a separate pole, which is shown on photo LS-1. The alarm is mounted on a pole just east of the fiberglass shelter, and north of the wet well. The alarm system appeared to function properly. The alarm is clearly visible from Ridge

Road or Lake Street. The station alarm system is also tied into a central alarm console, which is located in the City of Warrenton Public Works Shop.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found at the beginning of the Hammond Section. The pump curve is attached. Photos of the pump station are attached to this report.

Construction plan drawings for this pump station were available in the City of Warrenton archives.

PUMP DRAWDOWN/EFFICIENCIES:

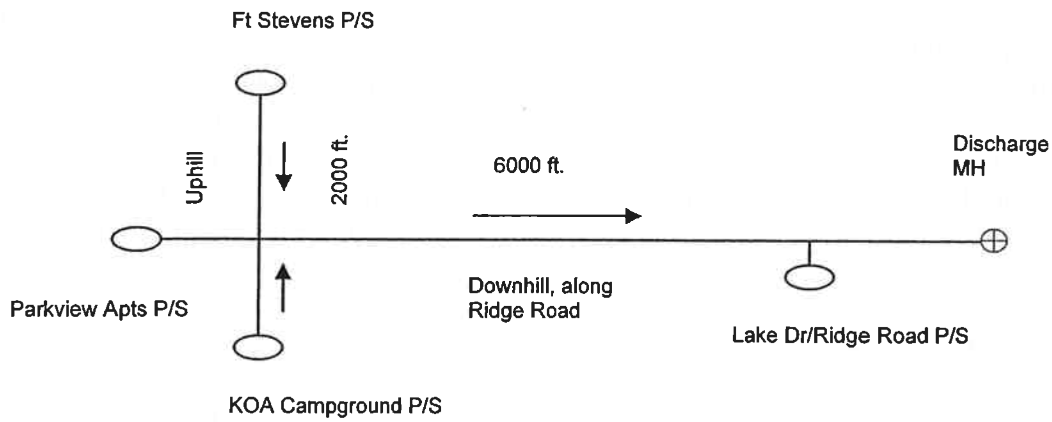
See attached pump curve, obtained from the plans. Based upon a design maximum flow rate of 240 gpm, the calculated TDH is 16 feet for a new pump operating at 80% hydraulic efficiency. Measured pump flows were as follows:

	Design Flow	Measured Flow
Pump #1	240 gpm	326 gpm
Pump #2	240 gpm	316 gpm

When measured by the drawdown method, these pumps appear much stronger than the design. There could be several reasons for this. During the specific drawdown testing, one or more of the other pump stations could have been operating. Their operation would contribute to a venturi effect, thus the drawdown from this pump station could have been at a much greater rate. The shortness of the force main would contribute to that effect, see Force Main Schematic, below. Another reason may be that stronger pumps were installed than the design called for. This may have been an attempt to deal with the higher head requirements that would exist when multiple stations were operating.

FORCE MAIN:

The force main length is approximately 58.0 feet and is constructed of 4"ϕ PVC. This force main has a relatively flat profile, with no vacuum break or air release appurtenances. It is tee'd directly into the 6"ϕ Ft. Stevens force main.



FORCE MAIN SCHEMATIC

It should be noted that the common force main that is currently used by the four stations as shown, is not operating in accordance with DEQ guidelines. The pump stations, depending on pumping cycles tend to run longer when all (or more than one) pump station is operating. Hence, there is more electrical use, more pump wear, and the resulting lower flows.

This situation could be remedied by one of 2 options:

1) a gravity sewer, 8-12" in diameter, run at minimum slope from the intersection of the KOA Campground and Ft. Stevens entrance road on Ridge Road and along Ridge Road north, into the current common discharge manhole being used by the force main. This new gravity alignment would give an additional discharge manhole for this pump station to tie into, without being impacting the other stations as they operate,

2) a parallel force main, or mains, used by all pump stations except the Ft. Stevens, which would remain separate. Additional analysis is required to determine sizing and costs.

At some point, however, growth, and additional capacity needs in this area will necessitate additional sewer infrastructure.

HYDROGEN SULFIDE:

The pump station wet well did not appear to have significant hydrogen sulfide damage. See photos LS-1, LS-4, and LS-5. No exposed aggregate or concrete cracking was observed.

It should be noted that this pump station, along with the Ft. Stevens, Parkview Apts, and KOA Campground pump stations all discharge (by common force main) into a common discharge manhole. The discharge manhole appeared in good condition. The force main was in operation when this manhole was observed. No exposed aggregate or concrete cracking was observed. No ground water infiltration was observed coming in through the base, individual manhole sections, manhole cone or the pipe collars. The steel steps going into the manhole were in good condition. A high velocity of effluent was observed going into the gravity side of the manhole. The high velocity would indicate that remedial action (such as the additional sewer piping options mentioned above) will be necessary soon. No photo exists of this discharge manhole.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation. If the station wet-well was surcharged, the overflow would come out the top of the pump station wet well, flowing over and into the sandy ground surface. Flow would then go to a storm drainage swale toward the shoulder of Ridge Road. This condition is not anticipated, though, due to the close proximity of the discharge gravity sewer manhole, low cycle times of the pump station, and the availability of a portable generator set.

RECOMMENDATIONS:

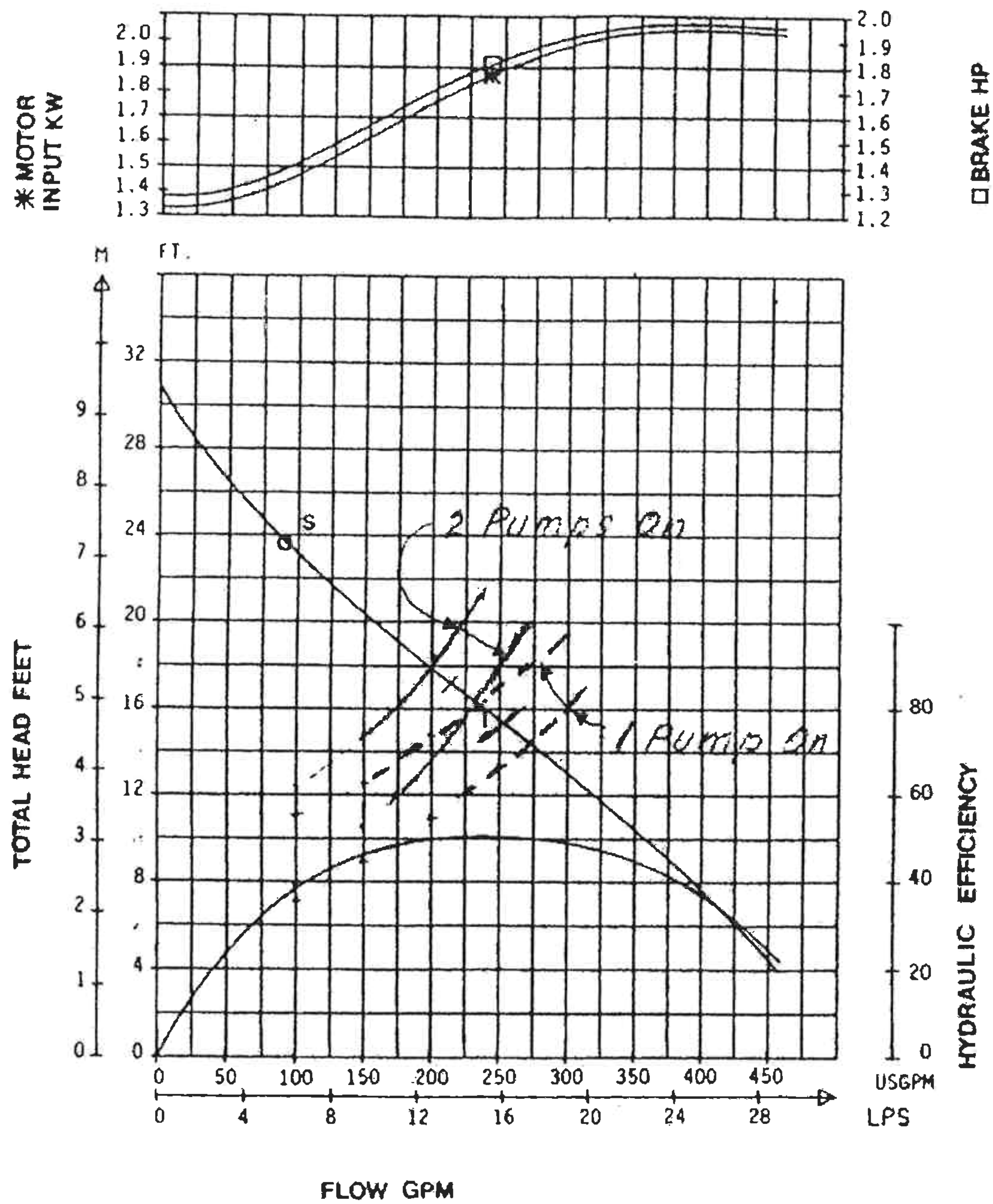
This station is in fair condition.

- ☐ Continued regular maintenance, i.e., cleaning, as the City is doing.
- ☐ The check valves currently located near the wet well are very difficult to test for functionality. They should be replaced with a short length of ductile iron spool piping. Replacement as follows in next item.
- ☐ A new concrete vault should be installed next to the wetwell, for the placement of the existing discharge force main header assembly. In this new vault, 2- 4" diameter, swinging check valves, spring loaded, along with gauge ports should be installed, along with re-installing the existing force main valves.
- ☐ After the vault assembly is installed, a test of this station should be made, using the current DEQ Flowrate methodology. Pump capacities should be recorded and compared with the drawdown method in this report. This will assist long-term planning and maintenance.
- ☐ Investigation of alternatives/routes/costs to multiple connections to force main.

END OF REPORT

LAKE STREET AT RIDGE ROAD P/S

30 HP - 1750 RPM 3φ: 200, 230/460, 575V	CP/CS 3085 Wastewater Impeller 436	SECTION 3085 SUPERSEDES 6/81	PAGE 8B ISSUED 1/84

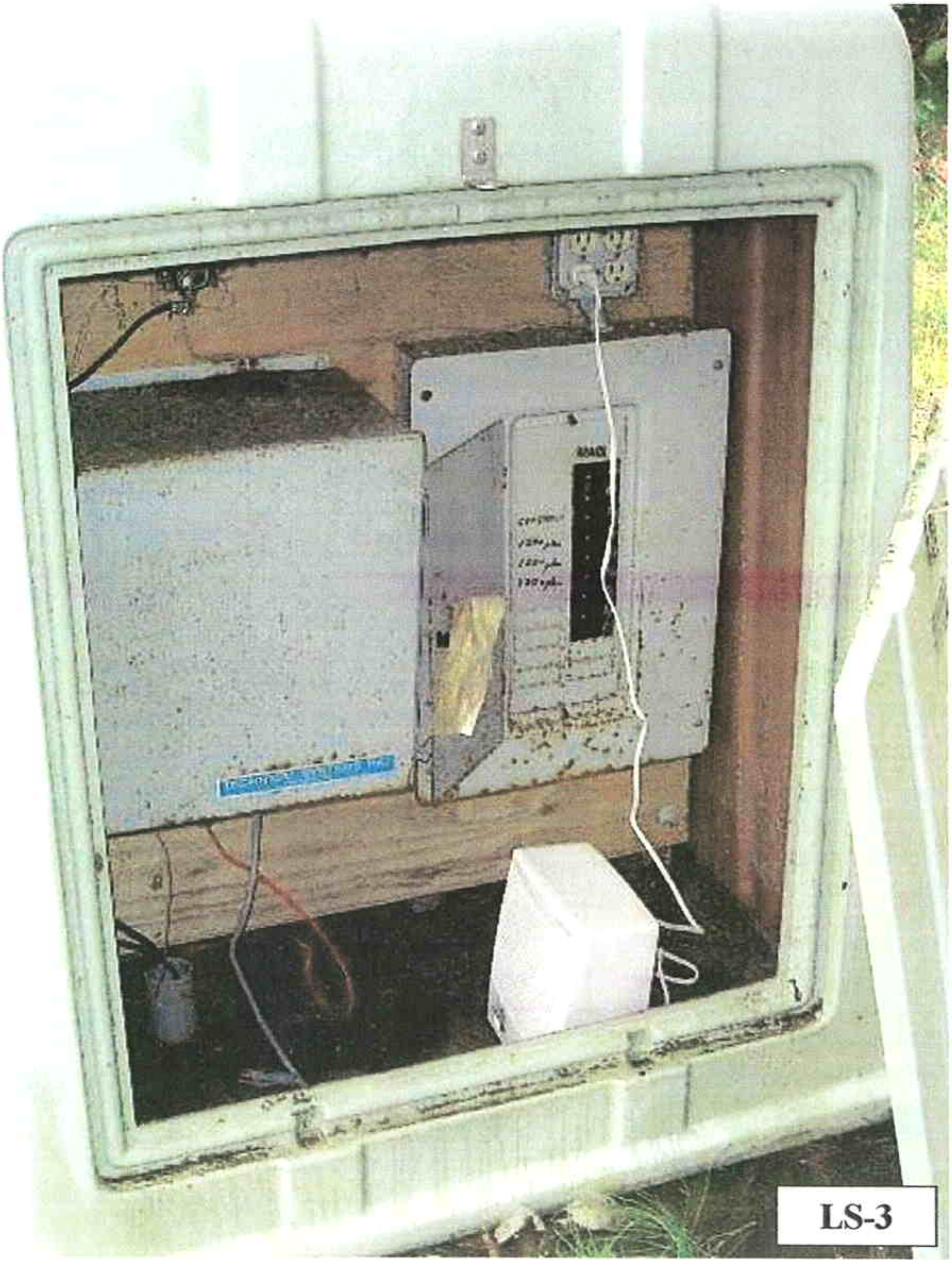


PERFORMANCE CURVES ARE BASED ON TESTS WITH CLEAR WATER AT AMBIENT TEMPERATURE.

FLYGT CORPORATION

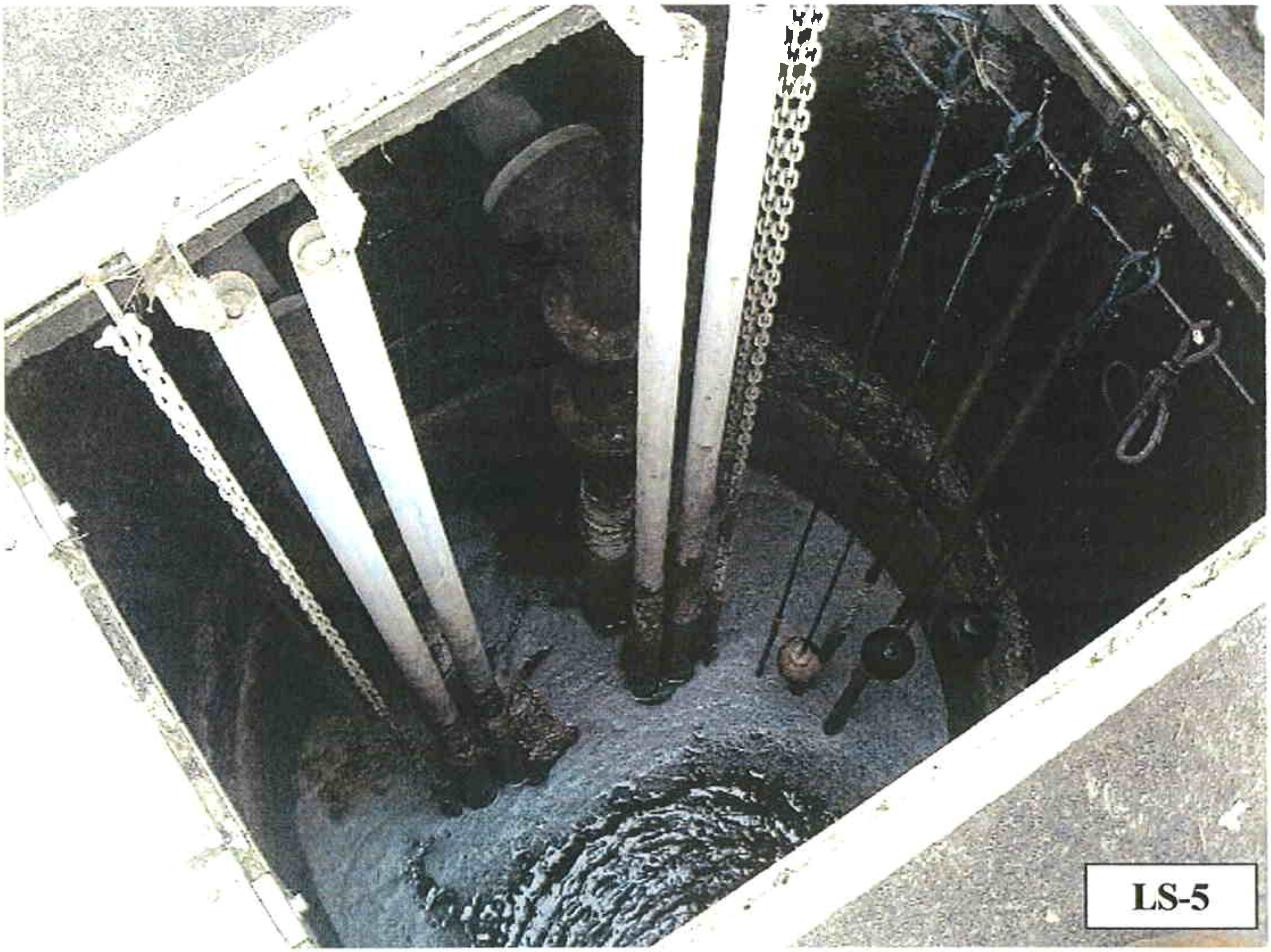

LS-1

LS-2



LS-3


LS-4


LS-5

KOA Campground Pump Station

(Connected to FT Stevens FM)

PUMP STATION REPORT

KOA CAMPGROUND PUMP STATION

DESCRIPTION:

This privately owned and maintained pump station transfers the flows from the KOA campground north by a shared force main to downtown Hammond. Approximate construction date 1990.

It is a HYDRONIX fiberglass unit station, see photo KOA-1 and KOA-2, Model 183, with split, locking fiberglass hoods. It is a duplex station with 10 hp direct coupled, #40 MPV belt driven, self-priming pumps, see photo KOA-3. Both pumps and check valves were found to be operational. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. One pump and motor assembly appeared to be rebuilt for this 2002 camping season, see photos KOA-3 and KOA-4. The floats were cleaned, new cables added, and re-adjusted for the 2002 camping season.

The discharge gate valves/force main header assembly did not have the required gauges. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines. Testing and measurements were conducted in accord with these guidelines.

The controls were inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident. It should be noted that the motor control panel was solidly mounted inside the station and with the proper sealing and panel latch. The electrical service to the panel comes from underground up to an electrical service panel mounted on the north, outside frame of the station.

The alarm is not visible from Ridge Road. Since the station is privately owned, the station alarm system is n ot tied into the central alarm console in the Warrenton Pubic Works Shop. This station does have an alarm light mounted on top of the station, see photo KOA-5, and another warning light mounted on the KOA park maintenance building, see photo KOA-6. The campground security patrol monitors the station alarms (two times every 24 hours) to report incidents.

No provision for an alternate power source, no manual transfer switch, and no plug-in receptacle for a portable plug-in generator, exist at this station. No odor control equipment or air compressor is used at this pump station. The pump curve and pump station photos are attached to this report. A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found in the Hammond section.

Construction plans, as-built drawings and technical specifications for this pump **station were not available** in the City of Warrenton archives.

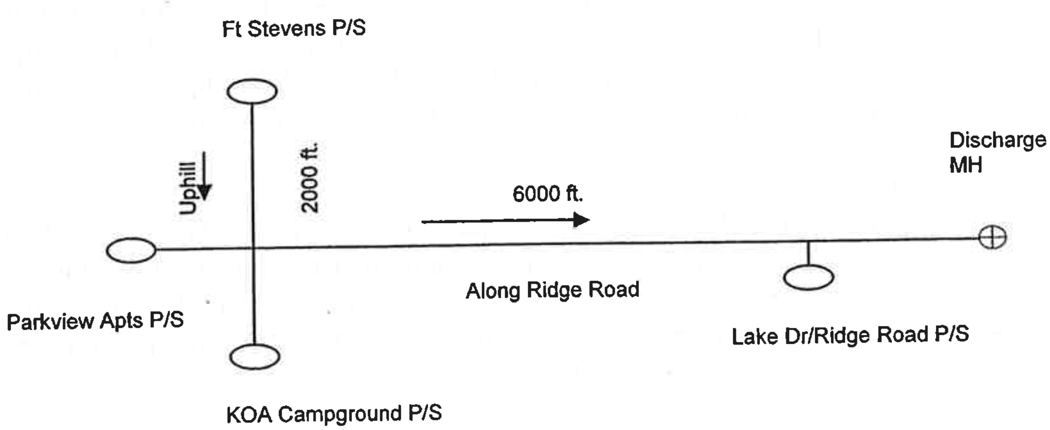
PUMP FLOWRATE/EFFICIENCIES:

The following table is based upon a design maximum flow rate of 150 gpm, and a TDH of 65 feet for a new pump operating at approximately 33% efficiency. The pump flows were measured during single pump, station operation. It should be noted that flow rates will likely decrease with the operation of the three (3) other stations that share the Ft. Stevens force main. However, the tested flows were very good when compared to design requirements. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	180 gpm	120 %	0 % (apparent)
#2	195 gpm	130 %	0 % (apparent)

Explanation of the columns: Measured flow is typically from a DEQ flowrate test. Percentage of new pump capacity is: New pump flow divided by measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

(See the DEQ Flow Rate Check spreadsheet and pump curve for additional information.)



FORCE MAIN SCHEMATIC

FORCE MAIN:

The force main length is approximately 1,580 feet +/- as measured from the pump station to its point of connection on Ridge Road. This station shares a common force main and discharge manhole as illustrated above, in the diagram "Force Main Schematic". This force main has approximately 40 feet of elevation change to its point of connection with the shared force main. The profile would be flat starting at the station, for about 800 feet, and gradually rising to Ridge Road. No construction plans were available. By visual inspection the force main header assembly at the pump station and the discharge manhole appear to be in good condition.

It should be noted that the common force main currently used by the four stations as shown, is not operating in accordance with DEQ guidelines. The pump stations, depending on pumping cycles tend to run longer when all (or more than one) pump station is operating. Hence, there is more electrical use, more pump wear, and the resulting lower flows.

This situation could be remedied by one of 2 options:

1) a gravity sewer, 8-12" in diameter, run at minimum slope from the intersection of the KOA Campground and Ft. Stevens entrance road on Ridge Road and along Ridge Road north, into the current common discharge manhole being used by the force main. This manhole is located in Hammond, approximately 6,000 feet away,

2) a parallel force main, or mains, used by all pump stations except the Ft. Stevens, which would remain separate. Additional analysis is required to determine sizing and costs.

At some point, however, growth, and additional capacity needs in this area will necessitate additional sewer infrastructure.

HYDROGEN SULFIDE:

The pump station wet well did not appear to have significant hydrogen sulfide damage. No exposed aggregate or concrete cracking was observed.

The discharge manhole appeared in good condition. The force main was in operation when this manhole was observed. No exposed aggregate or concrete cracking was observed. No ground water infiltration was observed coming in through the base, individual manhole sections, manhole cone or the pipe collars. The steel steps going into the manhole were in good condition. A high velocity of effluent was observed going into the gravity side of the manhole. The high velocity would indicate that remedial action (such as the additional sewer piping options mentioned above) will be necessary soon. No photo exists of this discharge manhole.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation. Overflow would come out the top of the pump station, and flow east into the wetland drainage, then north, toward the Columbia River.

REPAIRS NEEDED:

This station is well maintained. The new motor/pump assembly, float adjustments, and the solid motor controls indicate good maintenance.

- Regular maintenance, cleaning.
- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.
- Consideration should be given to modifying the station to accept an alternate power source, thus upgrading its reliability class.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	245	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	251	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	12	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	18	inches	
Depth of fluid to pump eye (suction lift to start)	180	inches	START
Depth of fluid to pump eye (suction lift to stop)	189	inches	STOP

PRESSURE DATA

	Pump #1	Pump #2
ShutOff head, direct guage reading,	25 psig	25 psig
SO head, translated to eye of pump+eye to mid-pool	74.63 FT	74.63 FT
Discharge head		
Guage reading @ pump start, psig	21 psig	20 psig
Reading adj. to impeller eye (add guage off.+start)	65.01 FT	62.70 FT
Guage reading @ pump stop	19 psig	19 psig
Reading adj. to impeller eye (add guage off.+stop)	61.14 FT	61.14 FT

TOTAL DYNAMIC HEAD

TDH @ pump start	65.01 FT	62.70 FT
TDH @ pump stop	61.14 FT	61.14 FT

FLOWRATE DATA @ Pump RPM of: 1750 RPM

Flowrate @ pump start (curve interpolation)	135 GPM	165 GPM
Flowrate @ pump stop (curve interpolation)	225 GPM	225 GPM
Average Flow, gpm	**180** GPM	**195** GPM
Design GPM	150 GPM	150 GPM
% of new capacity	120%	130%

Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

Date of spreadsheet calcs: Jan. 5, 2002
STATION: **KOA CAMPGROUND PS**
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

Conversion factors:
1" Hg = 1.13 feet of water column
1 psi = 2.31 feet of water column

MAX CAPACITY
psig*2.31 + guage offset from eye + suction lift@start + mid-pool.
(TRACE SHUTOFF HEAD INTO CURVE)

psig*2.31+guage offset + start

psig*2.31 + guage offset + stop

(TAKE THESE NUMBERS INTO CURVE)

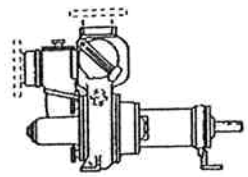
Mean

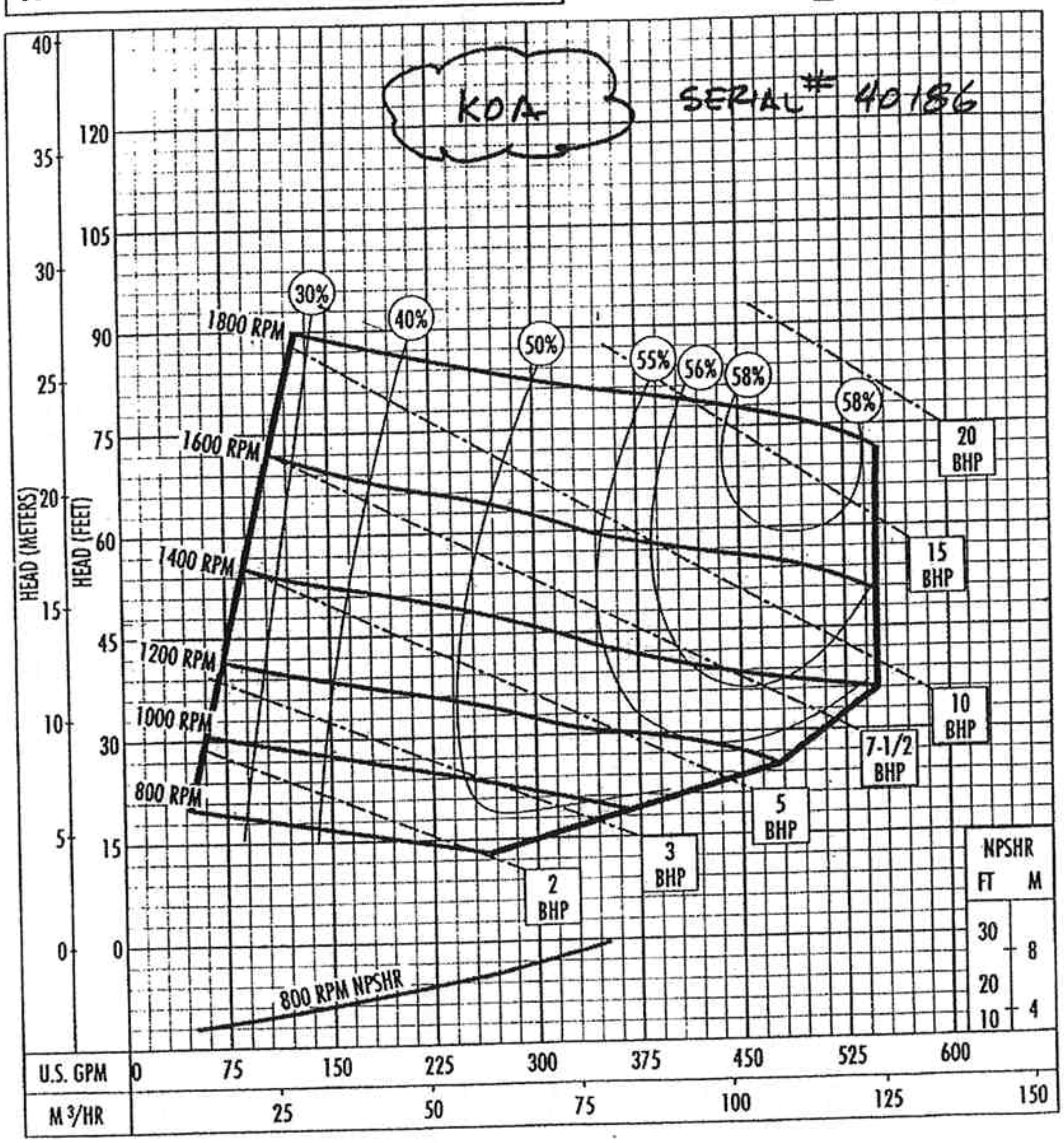
From Curve:
TDH: 65' @ 150 GPM
Impeller: 9-5/32"
HP = 10

KOA CAMPGROUND P/S

Section **SELF-PRIMER** Page **116**
Dated **SEPTEMBER 1993**

Performance Curve	**40MP/MPSF**
RPM: **Variable**	Discharge: **4"**
Solids: **3"**	Impeller: **9-5/32"**

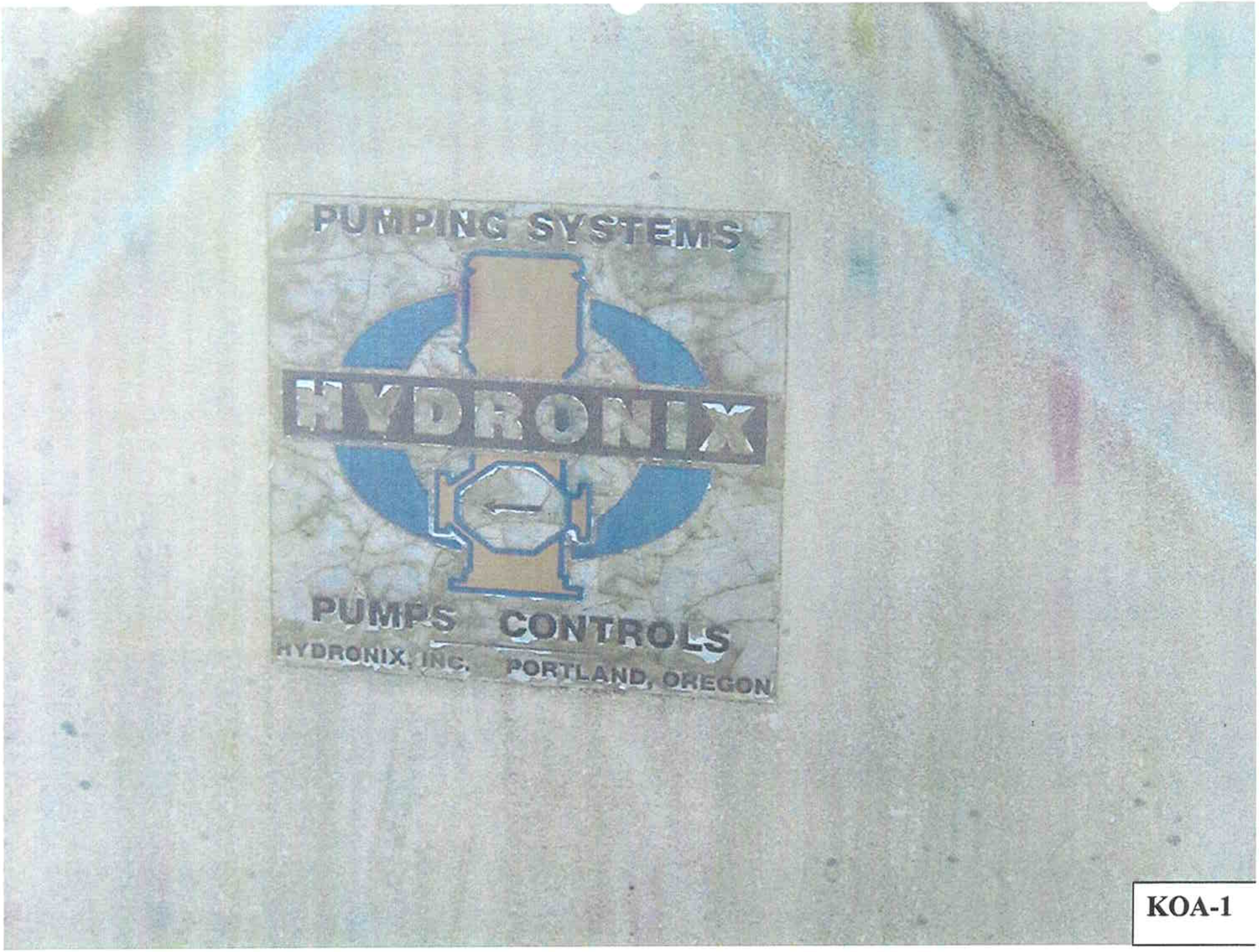




Operation is recommended in the bounded area with operational point within the curve limit.
Performance curves are based on actual tests with clear water at 70° F. and 1280 feet site elevation.

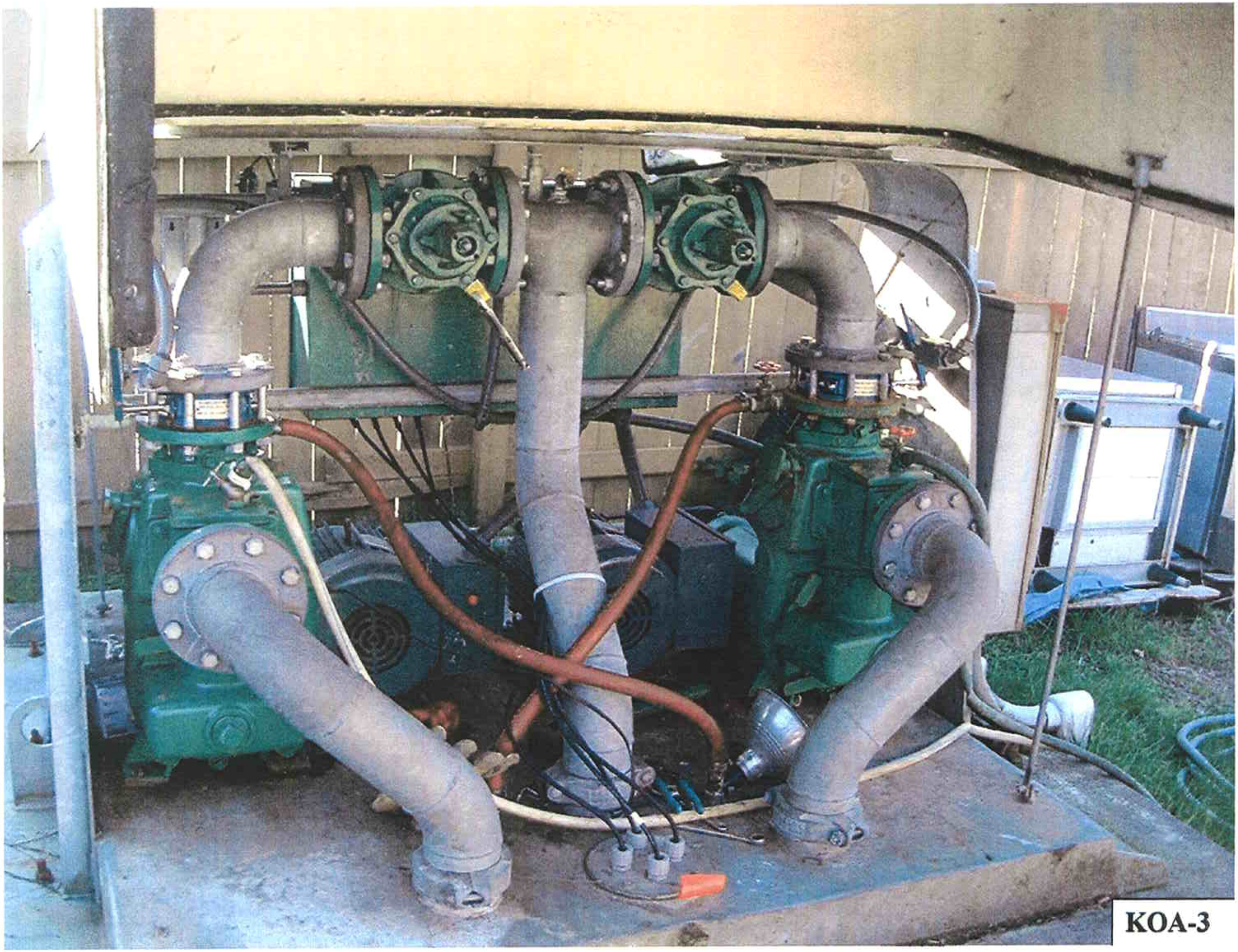
HYDROMATIC" PUMPS

Conditions of Service:
GPM: 150 TDH: 65


PUMPING SYSTEMS
HYDRONIX
PUMPS CONTROLS
HYDRONIX, INC. PORTLAND, OREGON

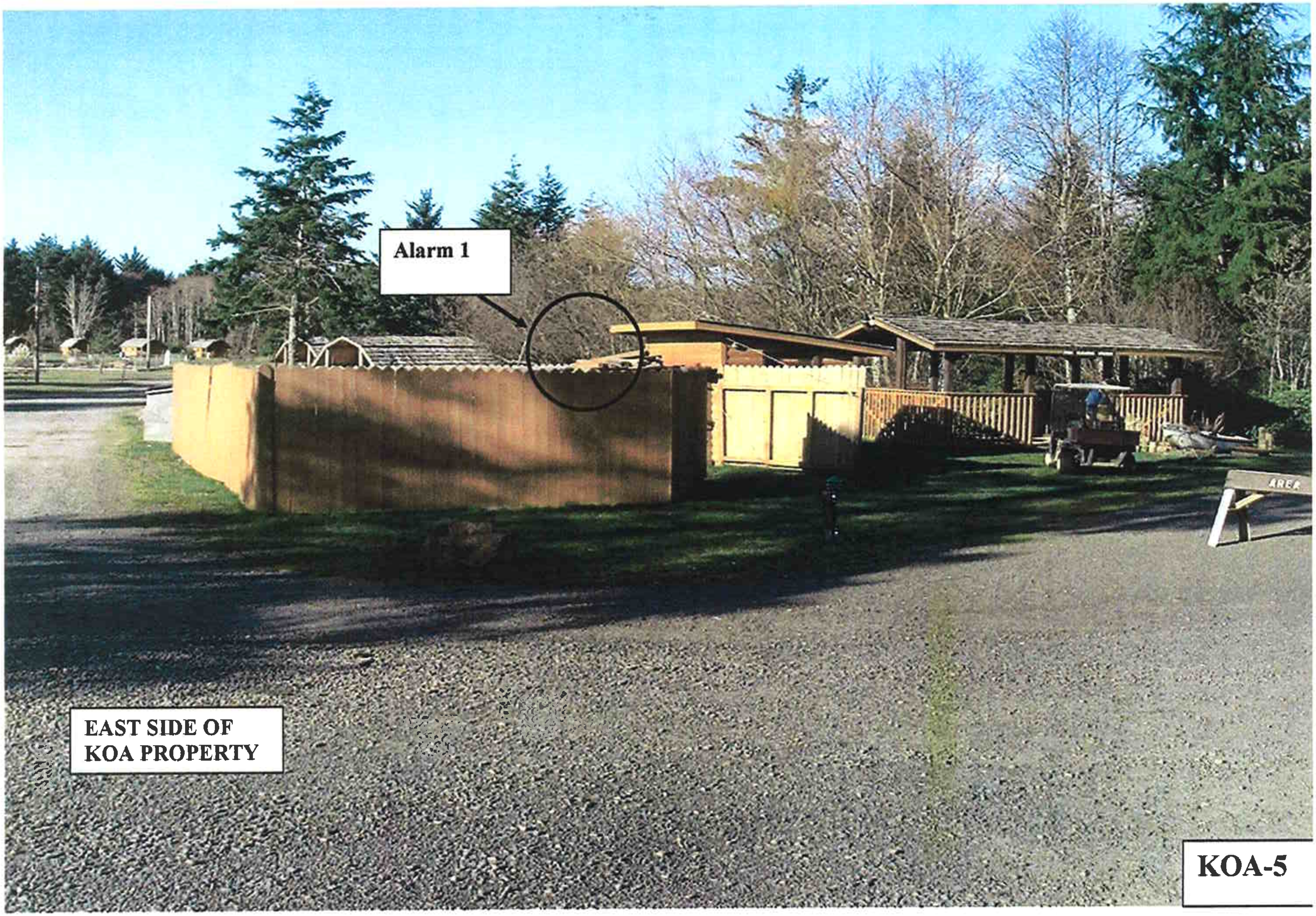
KOA-1

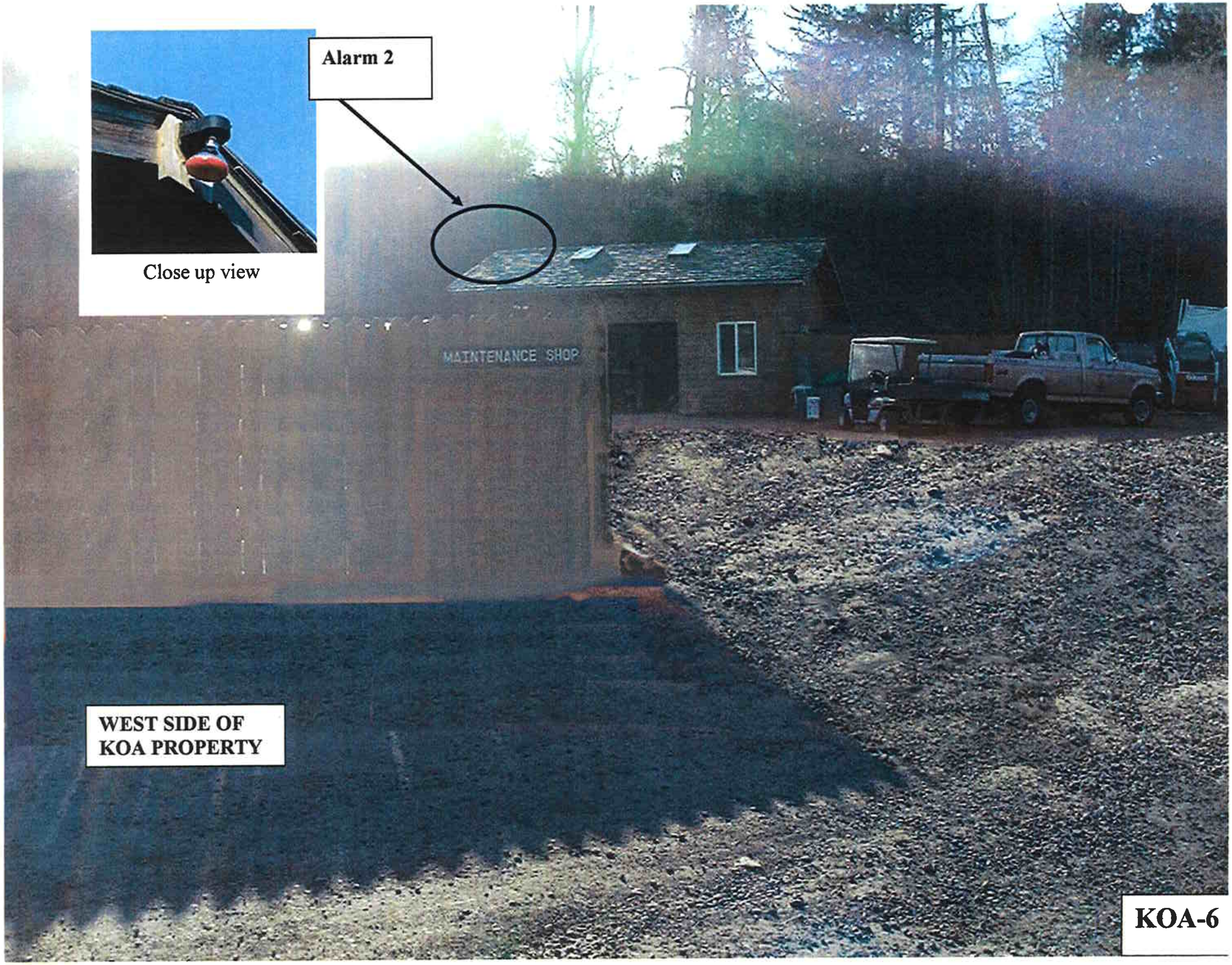

Alarm 1
KOA-2



KOA-3

KOA-4


Alarm 1
EAST SIDE OF
KOA PROPERTY
KOA-5


Close up view
Alarm 2
MAINTENANCE SHOP
WEST SIDE OF
KOA PROPERTY
KOA-6

Parkview Apartments Pump Station

(Connected to FT Stevens FM)

PUMP STATION REPORT

PARKVIEW APTS. STATION

DESCRIPTION:

This pump station handles the flows from just the Parkview Apartments, south of Fort Stevens Campground. This station was constructed approximately April 1993.

It is a concrete wet well, duplex station, with submersible 7.5 hp Flygt brand pumps mounted on a rail system. The wet well cover is concrete with an aluminum hatch cover, (see photos Parkview-1 and Parkview-2).

A concrete valve vault is located outside of wet well and north of the fence in photo, (see PV-1). This vault contains the gate valves, (hand-wheel operated) and swinging check valve assembly (see photo PV-4). The gate valves and check valve assembly were found to be operational, although sticky. The discharge gate valves/check valve assembly did not have the required gauges. Gauge port saddles and gauges were added for the testing procedure. The photo PV-4 was taken before the addition of the testing saddles and gauges.

The electrical controls for this station are separate from the wet well, above ground, and protected by a fiberglass shelter. They were inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any component. The controls were tested through operational cycling during the flowrate testing. The control panel appears to be a NEMA 4, coated panel (see photo Parkview-3), with the proper sealing and panel latch.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, located just below the control panel, inside the fiberglass shelter.

No odor control equipment is used at this pump station. It was noted that the air compressor piping was in place. An 8 CFM and 40 PSI continuous duty air compressor and 110 volt heater is included in the specifications; however, both were missing from the interior of the fiberglass shelter.

The alarm system is mounted on a separate pole, which is shown on photo PV-1. The alarm is mounted on a pole just north of the station, and appeared to function properly. The alarm is clearly visible from the public entrance into the Parkview Apartments and Ridge Road. The station's alarm system is also tied into a central alarm console, which is located in the City of Warrenton Public Works Shop.

Testing and measurements were conducted in accord with the DEQ Flowrate Guidelines. A DEQ Guidelines based flow rate spreadsheet with explanatory notes was developed, which is part of this report. The testing procedure requires a station specific pump curve, also attached to this report. This was located at Queen Pump, which is now handled by Famillian Northwest. Photos of the pump station are attached to this report.

Construction plans for this pump station were available in the City of Warrenton archives. A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found at the beginning of the Hammond Section. The format of this spreadsheet is taken from the current DEQ Guidelines.

PUMP FLOWRATE/EFFICIENCIES:

See attached pump curve, obtained from the pump manufacturer. Based upon a design maximum flow rate of 120 gpm, the calculated TDH is 80 feet for a new pump. The pump flows were measured with only this pump station operating. The three other pump stations connected to the common force main were in the "off" position during the testing. Flow rates will likely decrease with multiple pump stations operating simultaneously. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump Chamber
#1	68 gpm	56%	44%
#2*	105 gpm	88%	12%

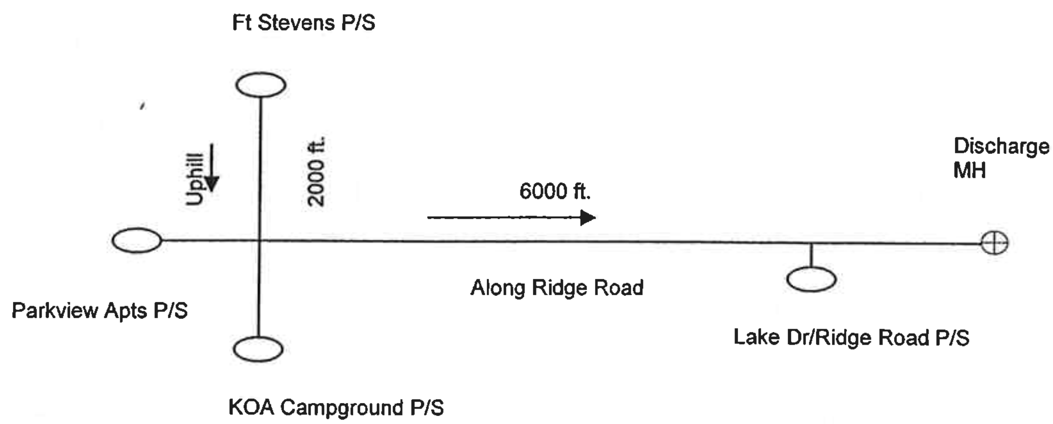
*noisy

Explanation of the columns: Measured flow is typically from a DEQ flow rate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. The last column is especially important to review during annual testing.

FORCE MAIN:

The force main length is approximately 3,400 feet and is constructed of 4"ϕ PVC. This force main has no vacuum break or air release appurtenances. It runs from the Parkview Apartments east to Ridge Road, then north along Ridge Road until it intersects and ties into the Fort Stevens/KOA Campground common 6"ϕ force main. At this tie-in location, there is an existing manhole with an air-release assembly.

This common force main then runs another 6,000 feet along Ridge Road to a discharge manhole in Hammond. See Force Main Schematic below.



FORCE MAIN SCHEMATIC

It should be noted that the common force main (6,000 feet) that is currently used by the four stations is not operating in accordance with DEQ guidelines. The pump stations, depending on pumping cycles tend to run longer when all (or more than one) pump station is operating. Hence, there is more electrical use, more pump wear, and the resulting lower flows. This situation could be remedied by one of 2 options:

1) A gravity sewer, 8-12" in diameter, run at minimum slope from a manhole in the intersection of the Ft. Stevens/KOA campgrounds entrance roads (on Ridge Road), then north, along Ridge Road, into the current common discharge manhole, approximately 6,000 feet away. This would require the addition of 12 manholes to meet current DEQ guidelines.

2) A parallel force main, or mains, used by all pump stations except the Ft. Stevens, which would remain separate. Additional analysis is required to determine sizing and costs.

At some point, however, growth, and additional capacity needs in this area will necessitate some additional sewer infrastructure.

HYDROGEN SULFIDE:

The pump station wet well did not appear to have significant hydrogen sulfide damage, (see photo Parkview-1).

By visual inspection, both the vault force main gate/check valve assembly also appears sound, (see photo Parkview-4). No exposed aggregate or concrete cracking was observed.

The discharge manhole appeared in good condition. As shown in the force main schematic, and stated above, this is the discharge manhole for the four (4) pump stations tied to a common force main. The common force main was in operation when this manhole was observed. No exposed aggregate or concrete cracking was observed. No ground water infiltration was observed coming in through the base, individual manhole sections, manhole cone or the pipe collars. The steel steps going into the manhole were in good condition. A high velocity of effluent was observed going into the gravity side of the manhole. The high velocity would indicate that remedial action (such as the additional sewer piping options mentioned above) will be necessary soon. No photo exists of this discharge manhole.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. It would then flow, across the parking lot, into the storm drainage for the Parkview Apartments, then into a shallow drainage swale, (just west of the Apartments). This condition is not anticipated, though, due to the low cycle times of the pump station, and the availability of a portable generator set.

RECOMMENDATIONS:

This station is in good condition, however;

- ☐ Immediate investigation should be made of the noisy pump #2.
- ☐ Continued regular maintenance, cleaning, as the City is doing.
- ☐ The pump discharge valves and check valves located in separate vault should be exercised and lubricated during the maintenance program.
- ☐ A physical check of the air relief valve operation, located at about 3,500 feet from the pump station, at the intersection of KOA/Ft. Stevens Park entrance roads, should also be made part of this station's scheduled maintenance.
- ☐ Replacement of the missing compressor and connections.
- ☐ Replacement of the missing 110 volt heater.
- ☐ An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.
- ☐ Investigation of alternatives/routes/costs to multiple connections to force main.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUBMERSIBLE PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	179.89	inches	(Datum typically lid of wetwell/vault)	
Depth of pump eye to datum	172	inches	(Datum typically lid of wetwell/vault)	
Offset of pressure guage to datum	-32	inches	This is a negative number, (below datum)	Datum typically the floor or grating in the station, in this case, datum is the top of separate wet well and vault. Gauge is below datum.
Offset of pressure guage to pump eye	140	inches	(Pump eye elevation = 0.0 typically)	
Depth of fluid to guage (for start)	63.6	inches	**START**	
Depth of fluid to guage (for stop)	111	inches	**STOP**	

PRESSURE DATA

	Pump #1	***Pump #2***	
			SUBMERSIBLE:
Shutoff head, direct guage reading,	39 psig	40 psig	
Shutoff head, translated to eye of pump, then mid-pool.	**97.37** FT	**99.68** FT	(psig x 2.31) + (avg pumped distance) **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	35 psig	35 psig	
Reading adj. to impeller eye (add guage off.)	92.52 FT	92.52 FT	(psig@start x 2.31) + (guage offset)
Guage reading @ pump stop	38 psig	38 psig	
Reading adj. to impeller eye (add guage off.)	99.45 FT	99.45 FT	(psig@stop x 2.31) + (guage offset)

TOTAL DYNAMIC HEAD

TDH @ pump start, (discharge head - wtr over eye)	**86.15** FT	**86.15** FT	BACK OUT THE WETWELL WATER LEVEL: discharge head @ start - water over pump eye @ start
TDH @ pump stop, (discharge head - wtr over eye)	**97.03** FT	**97.03** FT	discharge head @ stop - remaining water over pump eye @ stop **(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1750 RPM

Flowrate @ pump start (curve interpolation using TDH)	125 ***GPM***	160 ***GPM***	
Flowrate @ pump stop (curve interpolation using TDH)	10 ***GPM***	50 ***GPM***	
Average Flow, gpm, (mid-pool)	**68** ***GPM***	**105** ***GPM***	Mean average

Design GPM	120 ***GPM***	120 ***GPM***
% of new capacity	56%	88%

SPREADSHEET CALCS DATE: Jan 5, 2002
STATION: **PARKVIEW APTS PS**
CURVE: Yes, attached
DATE OF FIELD TESTING: Dec. 12, 2001
FIELD PERSON: GGL CHECKED BY:

Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

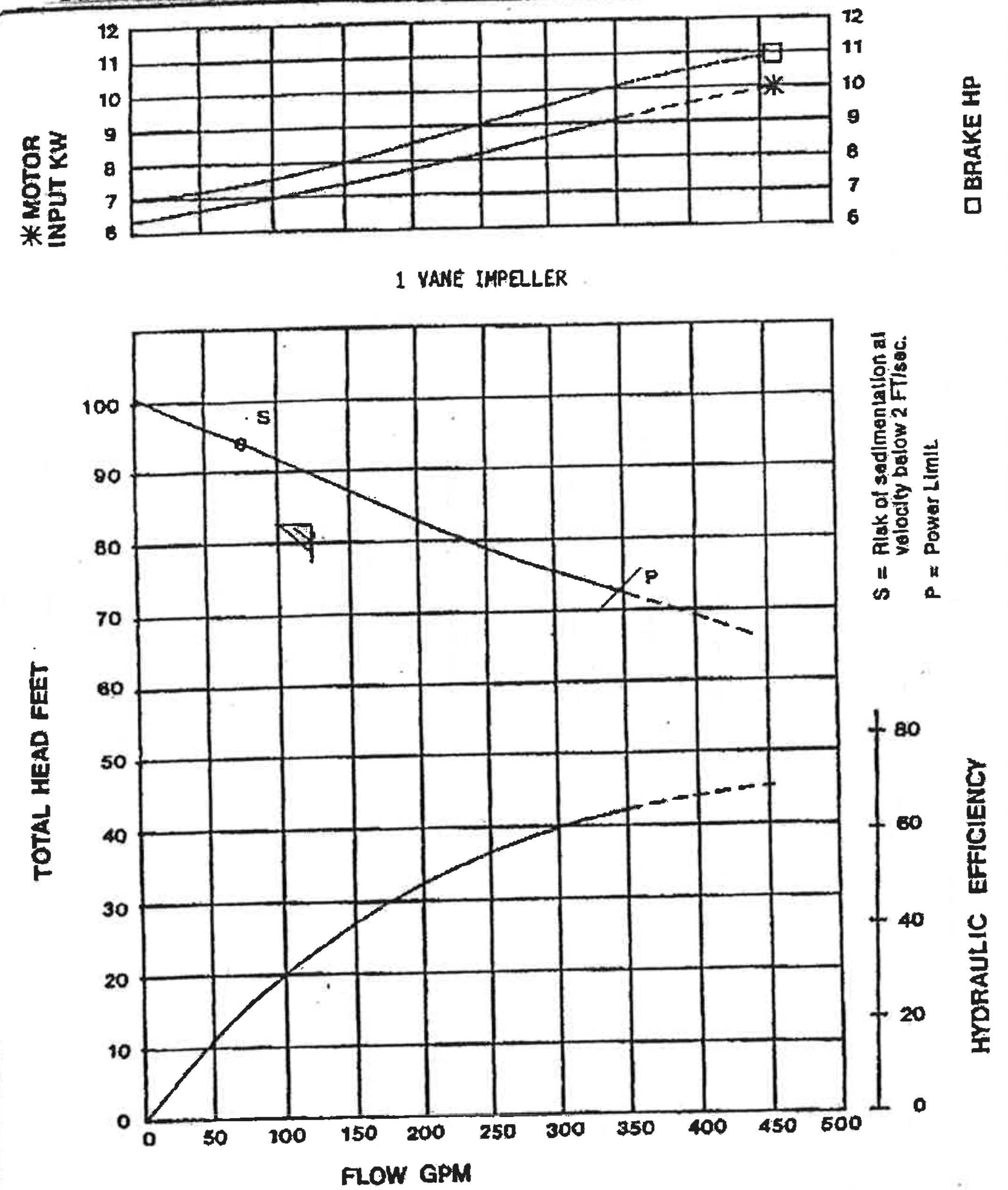
PARKVIEW P/S

H.P. - 1750 RPM
200, 230/460, 575V
Parkview Apartments

CP-3127

Wastewater Impeller 481

3127	8/481
SUPERSEDES	ISSUED 4/86



PERFORMANCE CURVES ARE BASED ON TESTS WITH CLEAR WATER AT AMBIENT TEMPERATURE.

FLYGT CORPORATION
A SUBSIDIARY OF ITT
129 GLOVER AVE., NORWALK, CT. 06856

PV-1

PV-2

PV-3

PV-4

Peacock Street Pump Station

(Battery Russell)

PUMP STATION REPORT

PEACOCK STREET PUMP STATION
(Originally Battery Russell P/S)

DESCRIPTION:

This pump station transfers the flows from the Battery Russell subdivision to the sewer system in Hammond. The sewage is then conveyed by pressure and gravity sewer to the City of Warrenton Lagoons.

A fiberglass equipment enclosure houses pump controls and auxiliary power transfer switch control, see photos PEA-1, PEA-2, and PEA-3. This pump station is a concrete wet-well type with submersible, duplex 3.0 hp pumps mounted on a rail system. The rail system appeared in good condition, see photos PEA-4 and PEA-5. No outside gate valve vault was evident, outside of the wet-well nor is any shown in the as-built plans. The force main, a dual pipe assembly did not have the required test ports or gauges. Therefore, both pumps were tested by the drawdown method, rather than the pressure method. Both pumps were found to be operational, when tested for drawdown. No DEQ flowrate spreadsheet is provided for this station, as no vault/check valve arrangement exists in the current station configuration.

The controls were inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch, see photo PEA-2.

The alarm system is mounted on top of the fiberglass equipment shelter, with the telemetry inside, which is shown in photos PEA-1 and PEA-3. The alarm is clearly visible from Seventh Drive. It appeared to function properly. The station alarm system is also tied into a central alarm console, which is located in the City of Warrenton Public Works Shop.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, mounted in the equipment shelter with the cord just visible from the top-backside of the control panel. See attached photo PEA-3.

This station was constructed in March, 1993, from the City's as-built record. These drawings (with the exception of the pump curve) were available in the City of Warrenton archives.

The pump curve is attached. Photos of the pump station are attached. No odor control equipment or air compressor is used at this pump station. A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found the Hammond section.

PUMP DRAWDOWN/EFFICIENCIES:

These are assumed from a pump curve, which matches the design specifications on the plans. Based upon a design maximum flow rate of 120 gpm, (plans) the apparent TDH is 25-30 feet (plans) for a new pump. Measured pump flows were as follows:

	Measured Flow	Existing Efficiency	Wear in pump chamber
Pump #1	112 gpm	93%	7%
Pump #2	100 gpm	83%	17%

FORCE MAIN:

The dual force mains from this pump station discharge into a manhole along Seventh Drive.

The force main length originally was approximately 490.0 feet and is constructed of 2-3"ϕ PVC pipes. This force main has a strong positive slope (4.3% or 0.043 ft/ft) as it leaves the station, and reaches a high point at Station 3+50 along Seventh Drive. Originally an air release valve was installed on each pipe at this station, then both pipes ran another 140 lineal feet into an existing manhole in the south shoulder of Seventh Drive. It should be noted however, that the APCO combination valves called out at Station 3+50 on the as-built plans have been removed and the dual force mains now terminate at this station. The additional 140+/- lineal feet appear to have been converted to 8"Φ gravity. See photos PEA-6, PEA-7 and PEA-8.

HYDROGEN SULFIDE:

The pump station wet well did not appear to have significant hydrogen sulfide damage. See photo PEA-5. No exposed aggregate or concrete cracking was observed.

The discharge manhole appeared in good condition with no significant hydrogen sulfide damage. The dual, 3"Φ force main was not in operation when this manhole was observed. No exposed aggregate or concrete cracking was observed. No ground water infiltration was observed coming in through the base, individual manhole sections, manhole cone or the pipe collars. The plastic steps going into the manhole were in good condition. Photos exist of this discharge manhole. See photos PEA-6, PEA-7 and PEA-8.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. Overflow would come out the top of the pump station wetwell. This condition is not anticipated, though, due the low cycle times of the pump station, and the availability of a portable generator set.

RECOMMENDATIONS:

- ☐ No reference on the as-built plans exist as to any check valves between the pump and force main assemblies near the wet-well. If this station has check valves in the wet-well, they should be removed and replaced with a short length of ductile iron spool piping and the following improvements made to the station:

- ☐ A new concrete vault should be installed next to the wetwell. A set of 2-4" Φ, swinging check valves, spring loaded, with gauge ports and 2-4"Φ gate valves should be installed in-line and in this vault assembly. Both check and gate valves would require reducers to fit existing 3"Φ existing force mains. This vault assembly should be per EPA-DEQ guidelines.

- ☐ After the vault assembly is installed, a test of this station should be made, using the current DEQ Flowrate methodology. An attempt should be made to locate the correct pump curve for the station, then pump capacity should be re-tested, recorded and compared with the drawdown method in this report. This will assist long-term planning and maintenance.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUBMERSIBLE PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	0	inches	(Datum typically lid of wetwell/vault)
Depth of pump eye to datum	0	inches	(Datum typically lid of wetwell/vault)
Impeller eye elevation	0	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	0	inches	
Depth of fluid to guage (for start)	0	inches	**START**
Depth of fluid to guage (for stop)	0	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	0 psig	0 psig	(psi*2.31) + avg pumped distance: this calculation
SO HEAD, trans. to eye of pump, then up to midpool	**0.00** FT	**0.00** FT	is the mid-pool for max pump capacity **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	0 psig	0 psig	
Reading adj. to impeller eye (add guage off.)	0.00 FT	0.00 FT	(psig*2.31) + guage offset only
Guage reading @ pump stop	0 psig	0 psig	
Reading adj. to impeller eye (add guage off.)	0.00 FT	0.00 FT	(psig*2.31) + guage offset only

Total Dynamic Head, (feet)

TDH @ pump start, (discharge head - wtr over eye)	**0.00** FT	**0.00** FT	
TDH @ pump stop, (discharge head - wtr over eye)	**0.00** FT	**0.00** FT	

BACK OUT THE WETWELL WATER LEVEL:
discharge head @ start - water over pump eye @ start
discharge head @ stop - remaining water over pump eye @ stop
(TAKE THESE NUMBERS INTO CURVE)

FLOWRATE DATA @ Pump RPM of: 1750 RPM

Flowrate @ pump start (curve interpolation)	0 *GPM*	0 *GPM*	
Flowrate @ pump stop (curve interpolation)	0 *GPM*	0 *GPM*	
Average Flow, gpm, (mid-pool)	**0** *GPM*	**0** *GPM*	Mean average
Design GPM	120 *GPM*	120 *GPM*	
% of new capacity	0%	0%	

STATION: PEACOCK **(orig. Battery Russel)**
CURVE Yes, attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:
DATE OF OFFICE CALCS: Jan. 4, 2002

Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

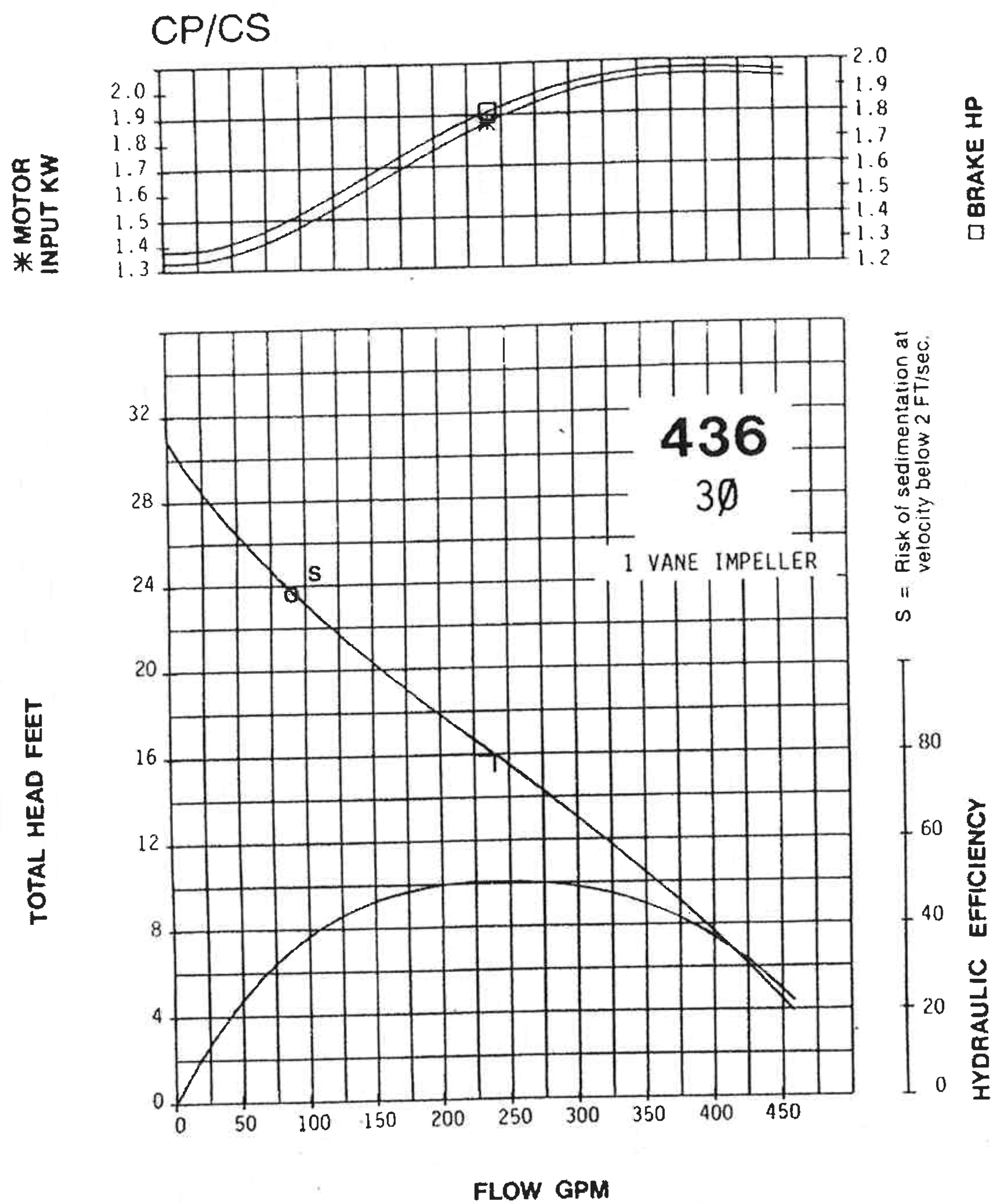
Note:
This spreadsheet and the notes that follow are off of the worksheet and published DEQ Guidelines; "O&M NOTES FOR GAUGES ON SEWAGE PUMPS".

Design: 120 gpm, approx TDH 30.0'
Impeller: ??"
Design hp = 3

Peacock P/S
(Assumed from As-builts)

IMPELLER PERFORMANCE CURVES

C-3085



PEA-1

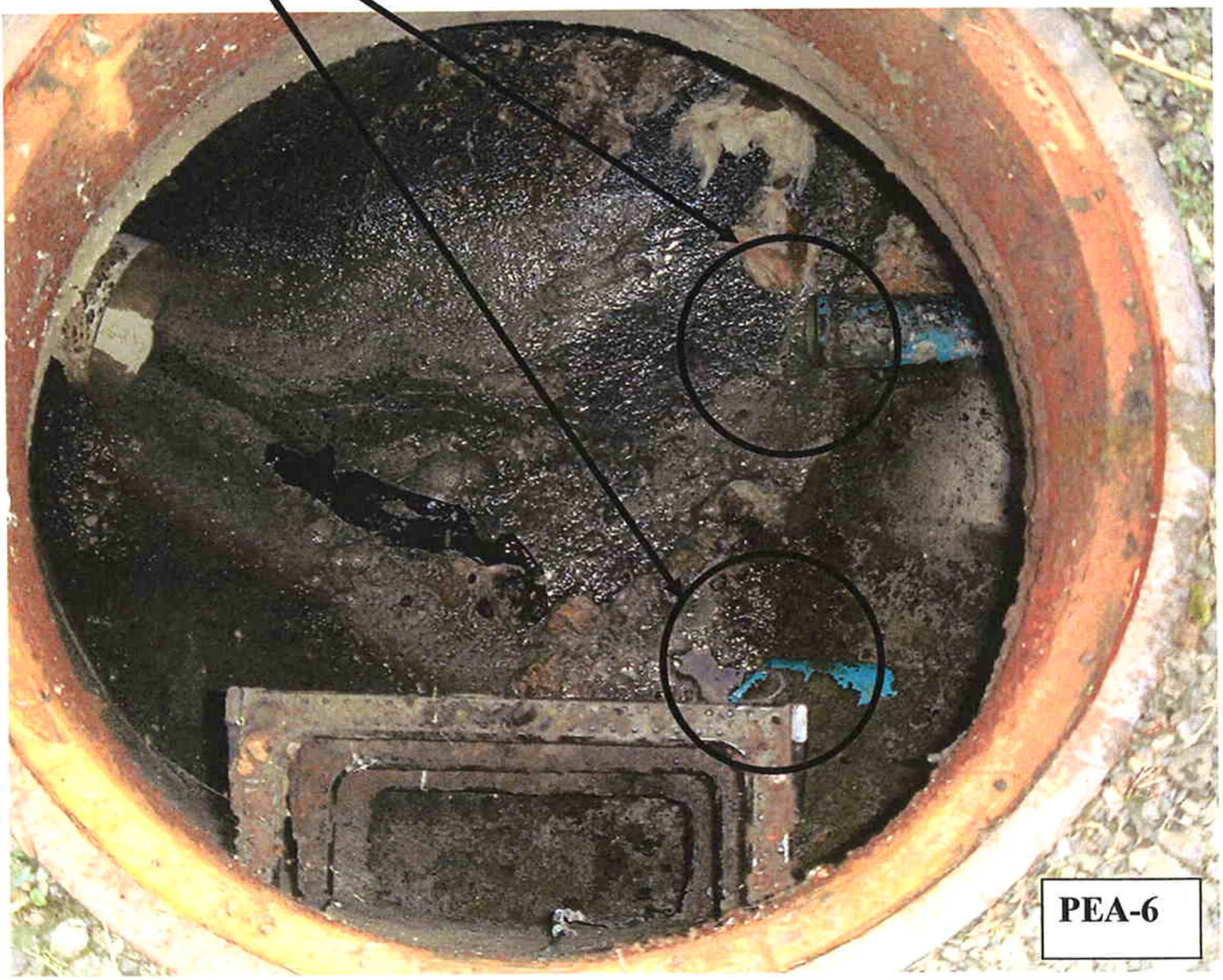
PEA-2


PEA-3

PEA-4

PEA-5

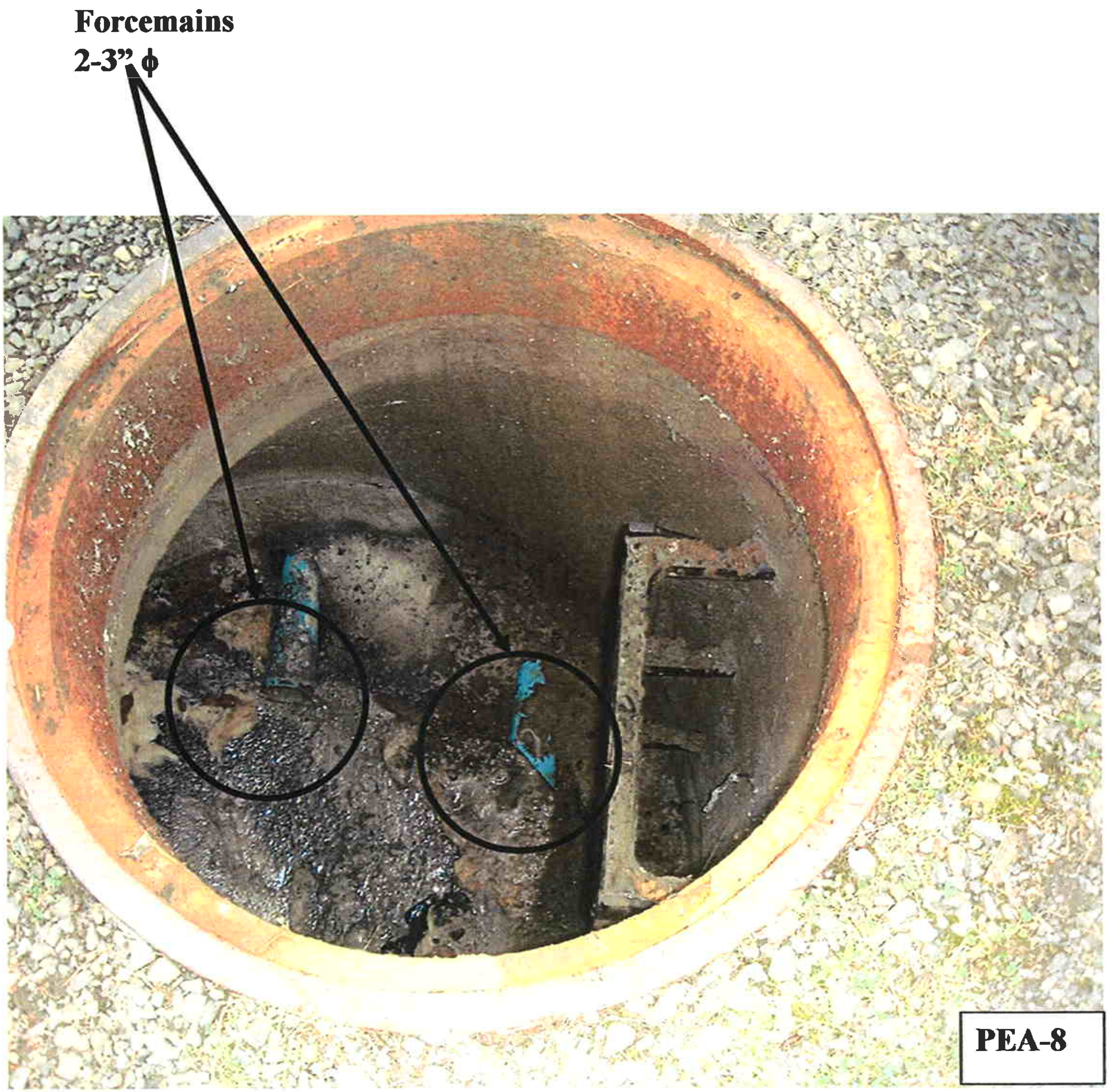
Force Mains
Dual 3" ϕ



Discharge Manhole

8" ϕ Gravity

Discharge Manhole



Discharge Manhole

EAST WARRENTON INTERCEPTOR - PUMP STATION EQUIPMENT INVENTORY							
PUMP STATION	**E. Harbor / S.E. Ensign (EWI - P/S #1)**	**E. Harbor / S.E. Heron (EWI-P/S #2)**	**2nd / Marlin Ave. (EWI P/S #3)**	**Young's Bay Plaza (Tributary to P/S #3)**	**Shilo Hotel (Tributary to P/S #3)**	**S.E. Marlin / 101 (EWI P/S #4)**	**S.E. 12th / Clatsop Airport (EWI P/S #5)**
Location	Intersection	Intersection	Harbor St.	Shopping Center, N. End	S.W. Entrance to Shilo	S.E. Corner of Intersection	Airport
Date Constructed	1975	1975	1975	1976	1988	1975	1975
Type	Duplex/Suction Prime	Duplex/Suction Prime	Duplex/Suction Prime	Duplex/Suction Prime	Duplex/Suction Prime	Duplex/Suction Prime	Duplex/Suction Prime
Pump Manufacturer	Hydronix	Hydronix	Hydronix	Hydronix	Hydronix	Hydronix	Hydronix
Model #	40MMP	40MMP	40MMP	40MMP	40MMP	40MMP	40MMP
Rated Cap. (EA) @ TDH	275 GPM @ 18' TDH	230 GPM @ 31' TDH	175 GPM @ 33' TDH	185 GPM @ 30' TDH Est. From Curve	185 GPM @ 62' TDH	200 GPM @ 32.5' TDH	200 GPM @ 33' TDH
Pump Hp (EA)	7.5 / 5.0	5.0	5.0	5.0	7.5	5.0	5.0
Impeller	Original = 8 - 0" Trim	Original = 9 - 1/8" Trim	Original = 9 - 1/8" Trim	Original = 8 - 0" Trim	Original = 8 - 1/2" Trim	Original = 9 - 1/8" Trim	Original = 9 - 1/8" Trim
Level Control	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float	Mercury Float
Wet Well Diameter, Depth	72" Dia. 129" Deep	72" Dia. 116" Deep	72" Dia. 134" Deep	72" Dia. 94" Deep	72" Dia. 178" Deep	72" Dia. 164" Deep	72" Dia. 160" Deep
OVERFLOW							
O. Point	-	-	-	-	-	-	-
O. Discharge	-	-	-	-	-	-	-
O. Elevation	Ground	Ground	Ground	Ground	Ground	Ground	Ground
O. Alarm Elevation	-	-	-	-	-	-	-
AUXILIARY POWER							
Type	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator	Aux. Generator	Auxiliary Generator
Location	City Shops	City Shops	City Shops	City Shops	City Shops	City Shops	City Shops
Transfer Switch	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FORCE MAIN							
Diameter, Length	6" Dia. 839'	4" Dia. 353'	6" Dia. 806'	4" Dia. 170'	4" 1560'	4" 551'	6" 4367'
Material	PVC / Iron	PVC	PVC	PVC	PVC	PVC	PVC
Profile	Under River Crossing						-
Discharge Manhole at	S.E. 1st / S.E. Anchor	S.E. Harbor, south shoulder, 353' W. of Station	S.E. Harbor, south shoulder, 806' W. of Station	N.W. Parking Lot at Costco	N.W. Parking Lot at Costco	S.W. Corner of Intersection	Airport Road
Air Release Valves	Yes	None	-	None	None	None	None
Vacuum Release Valves	Yes	None	-	None	None	None	None
SULFIDE CONTROL							
Back Drainage System	None	None	None	None	None	None	None
Air Injection Comp.	None	None	None	None	None	None	None
Chemical Feed	None	None	None	None	None	None	None

*(Original Name or Tributary Connection)

yellow

East Harbor / SE Ensign Pump Station

(Originally East Warrenton Interceptor P/S #1)

PUMP STATION REPORT

EAST HARBOR / SE ENSIGN PUMP STATION
(Originally East Warrenton Interceptor P/S #1)

DESCRIPTION:

This pump station transfers the flows from East Warrenton area west, by force main under the Skipanon River, then west one block, to a downtown discharge manhole. This is the first (of 5) pump stations in the East Warrenton Interceptor, with approximate construction during 1975. A station location diagram is included with each of the five (5) reports on the East Warrenton Interceptor. This diagram also shows system flow.

This pump station is a HYDRONIX fiberglass unit station mounted over a concrete wet well. This station has a split, locking fiberglass cover. *See photo HAR/ENS-1* and *HAR/ENS-2*. It is a duplex station with a 7.5 hp direct coupled, #40MMP, double suction, self-priming pump, and a 5.0 hp direct coupled, #40MMP, double suction, self-priming pump. The effect of the different motor ratings is discussed below. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational. *See photo HAR/ENS-3*. Please note recommendations section for this station.

The discharge gate valves/force main header assembly did not have the required gauges. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flow rate Check Sheet guidelines. Testing and measurements were conducted in accord with these guidelines. It should be noted that this station was tested 3 times, once with draw down testing on June 14, 2000, tested according to the DEQ Flow rate testing procedure on December 14, 2001, and again on March 8, 2002. Testing results do not match pump curve as explained later in report.

The controls were tested through operational cycling during flowrate testing. The control panel inside the station appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, mounted in the equipment shelter and visible in the lower left of the photo HAR/ENS-3.

The alarm system is mounted on a separate pole, which is shown on photo HAR/ENS-4. The alarm is mounted on a pole just East of the station, and appeared to function properly. The alarm is clearly visible from Harbor Street, and on the Skipanon Bridge. The station alarm system is also tied into a central alarm console, which is located in the City of Warrenton Public Works Shop.

No odor control equipment or air compressor are used at this pump station.

Note that since the original five pump stations were constructed in 1975, ***two (2) additional*** pump stations have been added in the East Warrenton Interceptor area. They are the Young's Bay Plaza station and the Shilo station. The sewage flows from these two stations ***increase the loading*** on the East Warrenton Interceptor.

The East Warrenton Interceptor Construction drawings and pump station O&M manuals for the five (5) original stations were available at the City of Warrenton Public Works building.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found at the beginning of the East Warrenton section. The format of this spreadsheet is taken from the current DEQ Guidelines. The pump curve, photos, and a location map of the pump station are attached. A DEQ Guidelines based flow rate spreadsheet with explanatory notes was developed and is also part of and attached to this report.

PUMP FLOWRATE/EFFICIENCIES:

It was impossible to apply the original pump curve to the DEQ flowrate spreadsheet. See attached pump curve, obtained from the O&M manual. From the O&M manual, the station should have 5.0 hp motors with 8.0" impellers. It should be noted that one motor has been upgraded to 7.5 hp, with an unknown size of impeller.

As originally designed, a 5.0 hp pump was used here. Based upon a design maximum flow rate of 275 gpm, the calculated TDH is 18.0 feet for a new pump. Since neither pump is operating on this curve, it is also impossible to use the original curve. The attached DEQ flow rate spreadsheet is included for its shutoff head information, and also future testing and measurements. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	Unknown gpm	Unknown %	Unknown %
#2	Unknown gpm	Unknown %	Unknown %

Explanation of the columns: Measured flow is typically from a DEQ flowrate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow x 100. Wear in pump chamber is 100% minus % of New Pump Capacity x 100. Note that the last column is especially important to review during annual testing.

Information is available that would indicate that in June 1976 the pumps were upgraded to 7.5 hp, with a TDH of 60.0' and flow rate of 185 gpm. However, the curve for this application was not available for this report. Also, since a 5.0 hp motor is paired with a 7.5 hp as indicated earlier, the pump r.p.m.'s are not matched. The 7.5 hp motor turns at

1745 rpm (motor plate) while the 5.0 hp motor turns at 1150 rpm (motor plate). This would account for the high shut off head indicated during testing for pump #1. For shutoff head information see DEQ flow rate spreadsheet, attached.

FORCE MAIN:

Total length of the force main is approximately 839 feet. The initial section of the force main is approximately 462 feet and is constructed of 6"ϕ PVC. This initial section runs nearly flat until it approaches the Skipanon River. At station 3+77 a vent and cleanout assembly exist. Then the force main material changes to 6"ϕ ductile iron and goes under the Skipanon River to station 1+17. At this station, an air release and vacuum valve exist. Also at this station, the force main material changes to 6"ϕ PVC. The force main then discharges into a standard manhole at the intersection of SE First Street and SE Anchor in downtown Warrenton.

HYDROGEN SULFIDE:

The discharge manhole appeared in good condition. The force main was in operation when this manhole was observed. No exposed aggregate or concrete cracking was observed. No ground water infiltration was observed coming in through the base, individual manhole sections, manhole cone or the pipe collars. The steel steps going into the manhole were in good condition. No photo exists of this discharge manhole. One item of concern is that this manhole shows evidence of surcharging and possible overflow of sewage into the wetland area to the East of the manhole. See recommendations below for additional information.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. If the station wet-well was surcharged, the overflow would come out the top of the pump station wet well, flowing over and into the sandy ground surface and directly to the Skipanon River. This condition is not anticipated though, due the alarm system and availability of a portable generator set.

RECOMMENDATIONS:

This station is in poor condition.

- Regular maintenance, cleaning.

- A recommendation was made to the City of Warrenton to eliminate 2 downtown pump stations and build 1 new station near the intersection of Main St. and NW Warrenton Drive. Consideration should be given to re-laying a 10'-12"ϕ gravity main from the discharge manhole at SE First and SE Anchor to this new pump station. This should eliminate the surcharging that now occurs at this discharge manhole. Further flow analysis is necessary here.

- A regularly scheduled check of the vent located at 462 feet from the pump station and a regularly scheduled check of the air release/vacuum breaker on the City side of the Skipanon River bank, should be incorporated as part of the scheduled maintenance. This flat-top manhole and locked cover show signs of deferred maintenance. Blackberry bushes are growing over it. Also, the anode pack, which appears to be in this manhole should be examined/or replaced as necessary.

- As soon as possible, through coordination with the City's pump supplier, the 5.0 hp motor should be changed to match the other 7.5 hp motor. Both impellers should be matched to pump #1.

- Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this critical station, and make it possible to use the DEQ flow rate methodology for future testing.

- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

HARBOR & SE ENSIGN
LOCATION MAP

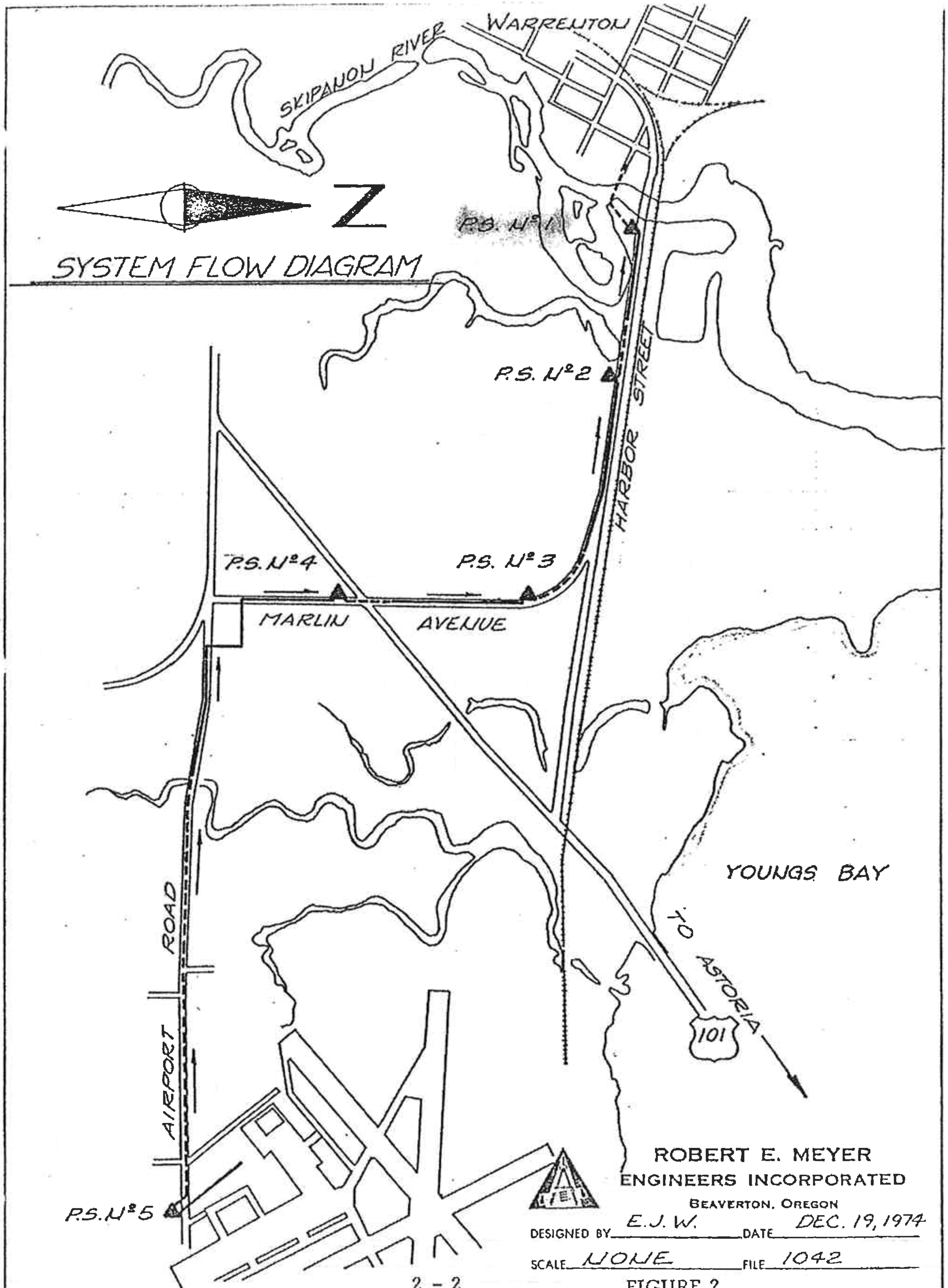


FIGURE 2

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	129	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	132	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	36	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	27	inches	
Depth of fluid to pump eye (suction lift to start)	61	inches	**START**
Depth of fluid to pump eye (suction lift to stop)	114	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	26 psig	11 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	69.60 FT	34.95 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	12 psig	4 psig	
Reading adj. to impeller eye (add guage off.+start)	35.05 FT	16.57 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	11 psig	3 psig	
Reading adj. to impeller eye (add guage off.+stop)	37.16 FT	18.68 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

TDH @ pump start (at midpool)	37.26 FT	18.78 FT	taken at mid-pool, with water column moving
TDH @ pump stop	37.16 FT	18.68 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1150 RPM

Flowrate @ pump start (curve Interpolation)	0 *GPM*	0 *GPM*	
Flowrate @ pump stop (curve interpolation)	0 *GPM*	0 *GPM*	
Average Flow, gpm	0 *GPM*	0 *GPM*	Mean
Design GPM	275 *GPM*	275 *GPM*	Est. from curve
% of new capacity	0%	0%	Design SO Head: 18'

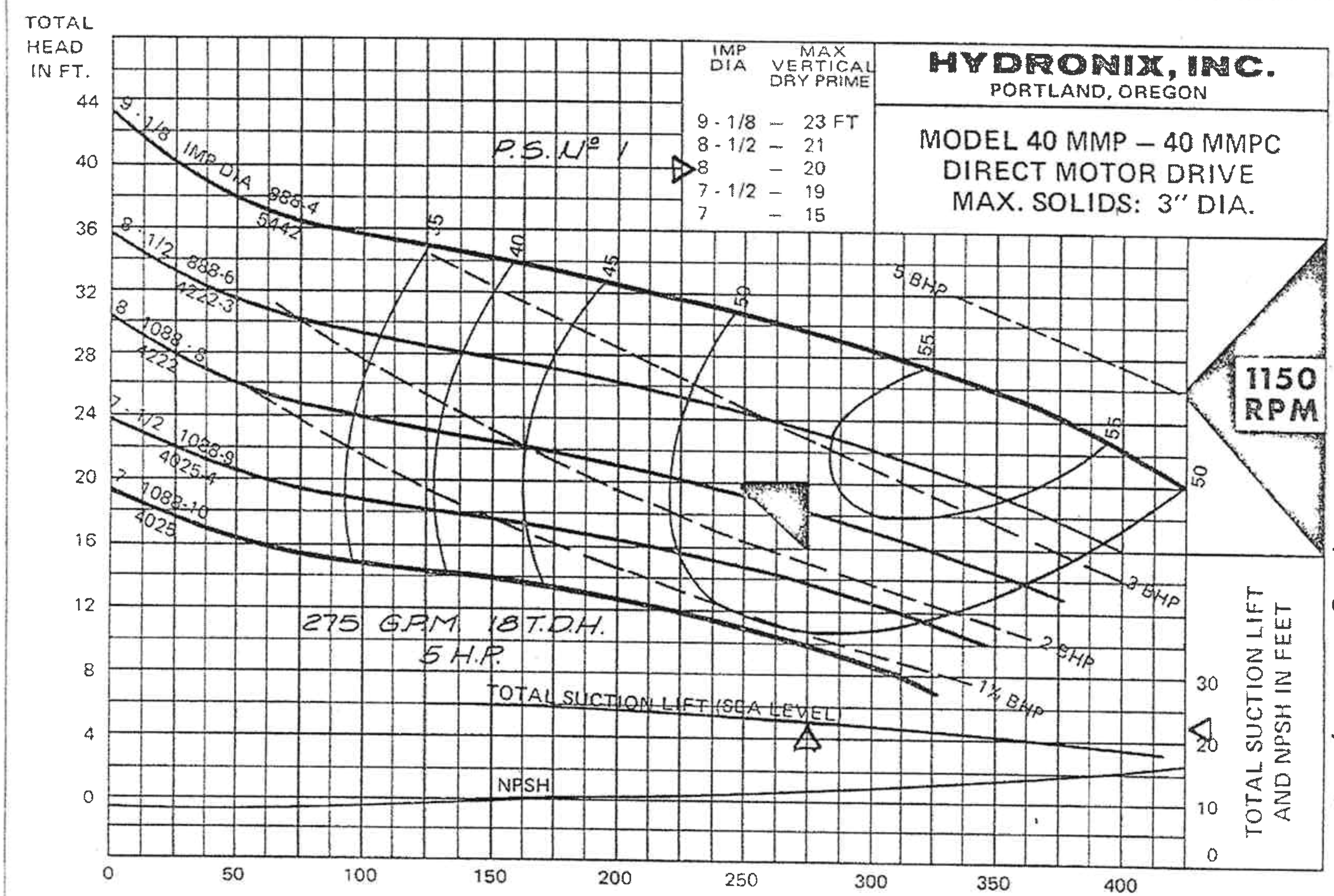
Date of spreadsheet calcs: Jan. 8, 2002
STATION: **E. HARBOR/SE ENSIGN PS (orig. EWI #1**
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

Impeller: 8.0"
5 HP

Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

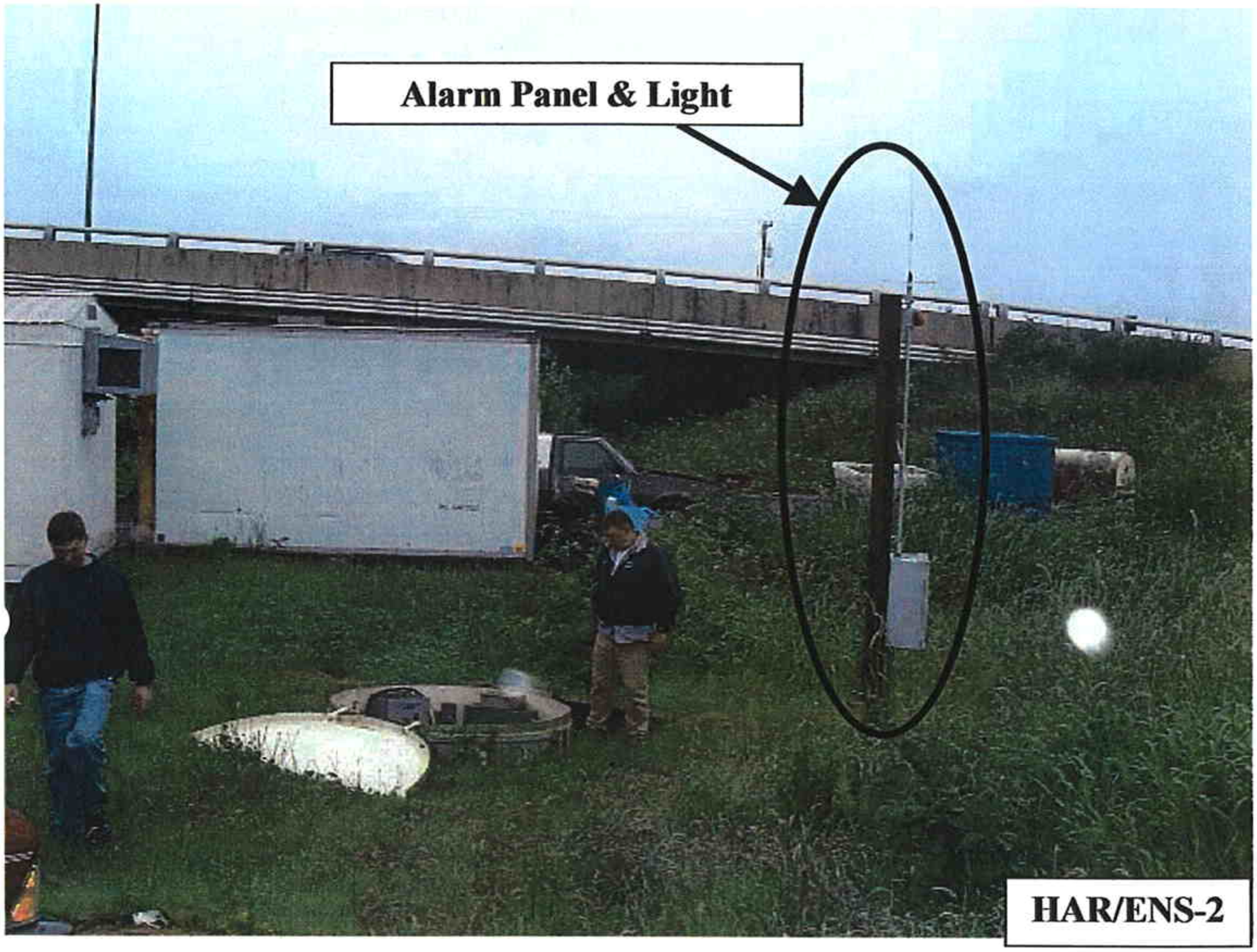
HARBOR & SE ENSIGN (Orig. EWI #1)

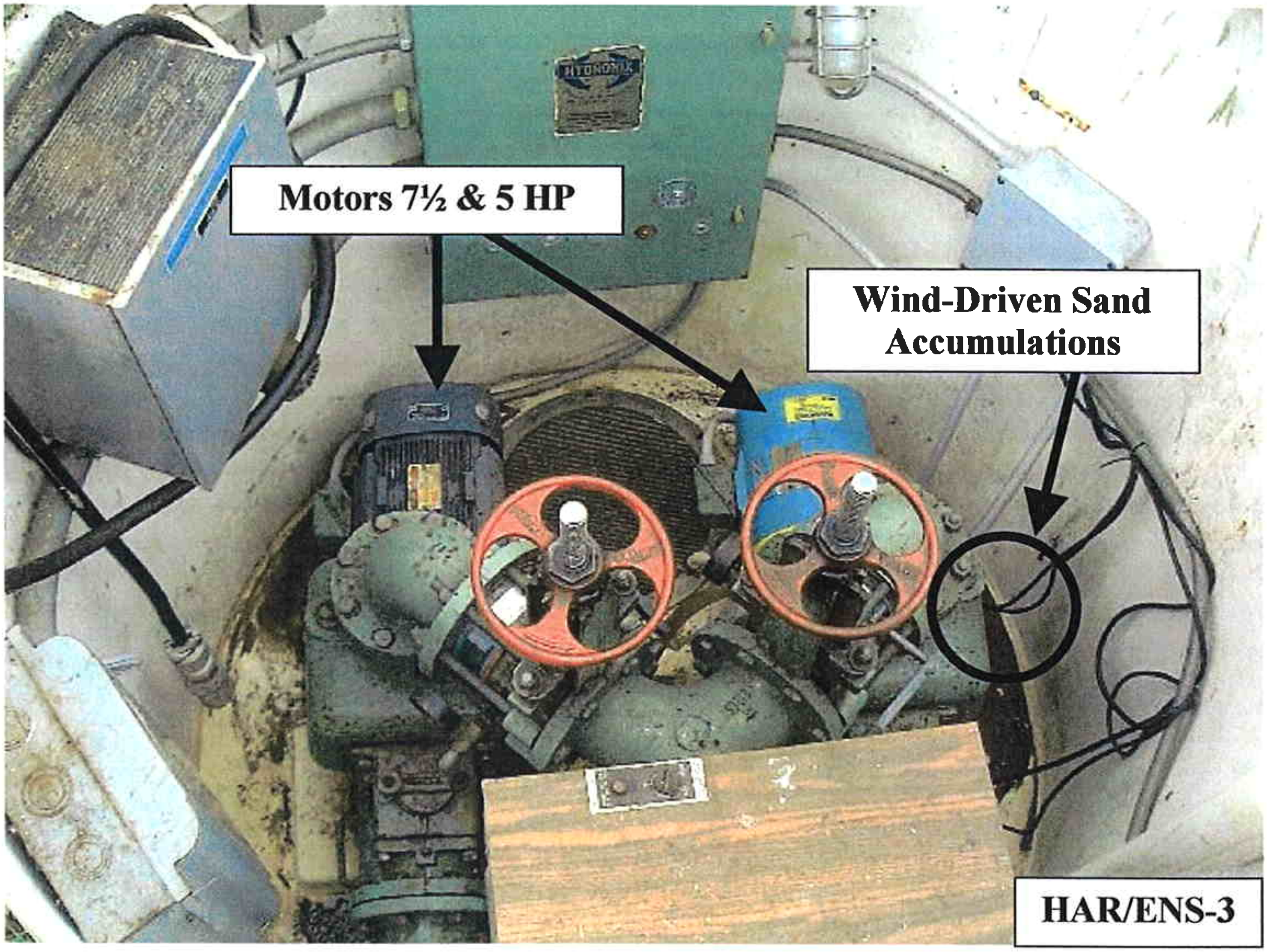


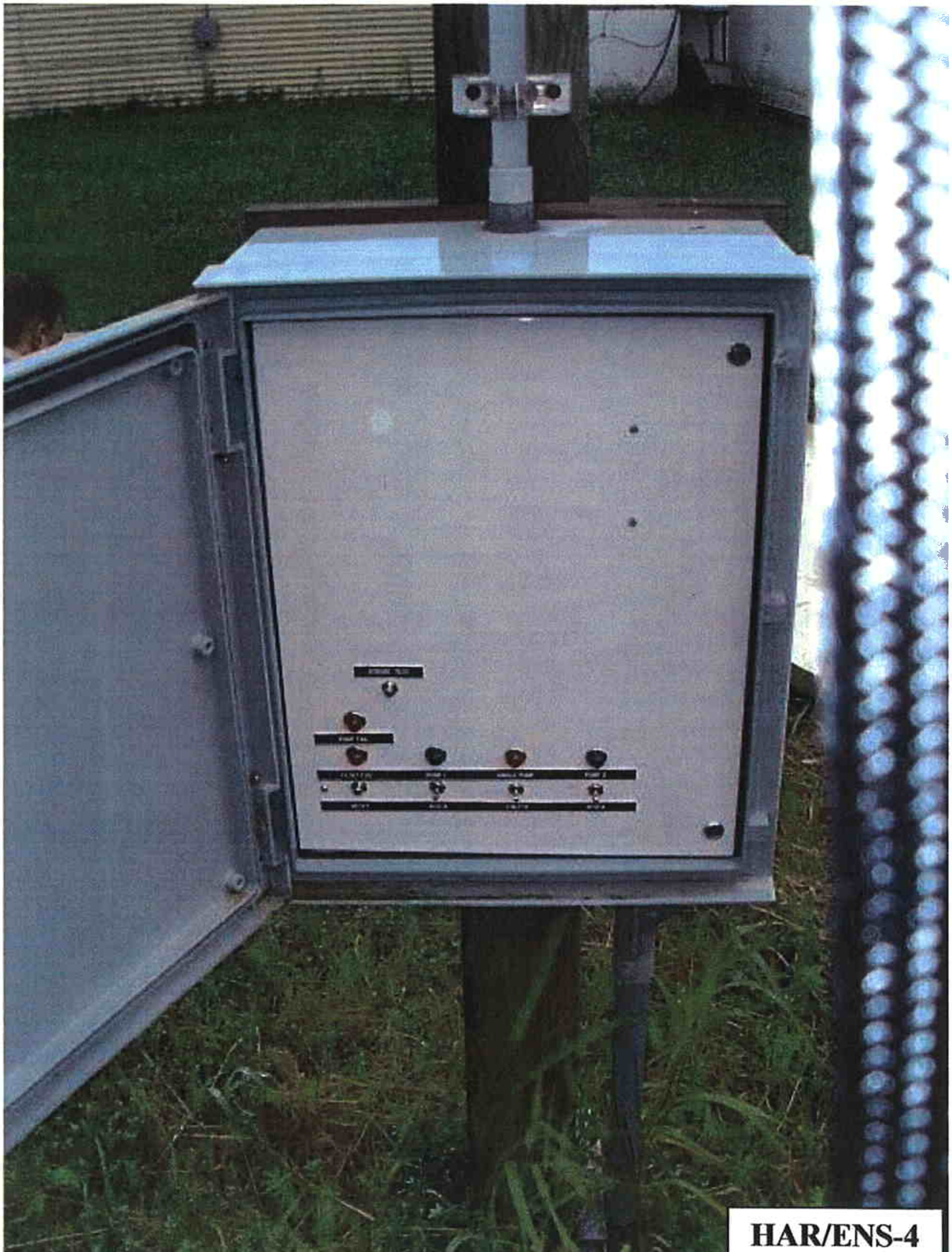
NOTE – TOTAL SUCTION LIFT CURVE MUST BE USED TO DETERMINE MAX. PUMPING CAPACITY

6042

HAR/ENS-1


Alarm Panel & Light
HAR/ENS-2


Motors 7½ & 5 HP
Wind-Driven Sand
Accumulations
HAR/ENS-3



HAR/ENS-4

East Harbor / SE Heron Pump Station

(Originally East Warrenton Interceptor P/S #2)

PUMP STATION REPORT

<u>EAST HARBOR / SE HERON PUMP STATION</u>
(Originally East Warrenton Interceptor P/S #2)

DESCRIPTION:

This pump station transfers the flows from East Warrenton area west, by force main to the East Harbor/SE Ensign pump station. This is the second (of 5) pump stations in the East Warrenton Interceptor, with approximate construction during 1975. A station location diagram showing the location of the original station is included with each of the 5 reports on the East Warrenton Interceptor. This diagram also shows system flow.

This pump station is a HYDRONIX fiberglass unit station mounted over a concrete wet well. This station has a split, locking fiberglass cover. See photo HAR/HER-1 and HAR/HER-2. It is a duplex station with a 5.0 hp direct coupled, #40MMP, double suction, self-priming pumps. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational. The pump's motors appear to be by different manufacturers. See photo HAR/HER-3. Please note recommendations section for this station.

The discharge gate valves/force main header assembly did not have the required gauges. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flow rate Check Sheet guidelines. Testing and measurements were conducted in accord with these guidelines. It should be noted that this station was tested 3 times, once with draw down testing on June 14, 2000, tested according to the DEQ flow rate testing procedure on December 14, 2001, and again on March 8, 2002. Testing results do not match pump curve as explained later in report.

The controls were tested through operational cycling during flow rate testing. The control panel inside the station appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch. See photo HAR/HER-4.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, mounted under the fiberglass split covers and visible in the lower right of the photo HAR/HER-5.

The alarm system is mounted on a separate pole, which is shown on photo HAR/HER-1. The alarm is mounted on a pole to the northwest of the station, and appeared to function properly. The alarm is clearly visible from Harbor Street. The station alarm system is also tied into a central alarm console, which is located in the City of Warrenton Public Works Shop.

No odor control equipment or air compressor are used at this pump station.

Note that since the original five pump stations were constructed in 1975, ***two (2) additional*** pump stations have been added in the East Warrenton Interceptor area. They are the Young's Bay Plaza station and the Shilo station. The sewage flows from these two stations ***increase the loading*** on the East Warrenton Interceptor.

The East Warrenton Interceptor Construction drawings and pump station O&M manuals for the five (5) original stations were available at the City of Warrenton Public Works building.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found at the beginning of the East Warrenton section. The format of this spreadsheet is taken from the current DEQ Guidelines. The pump curve, photos, and a location map of the pump station are attached. A DEQ Guidelines based flow rate spreadsheet with explanatory notes was developed and is also part of and attached to this report.

PUMP FLOWRATE/EFFICIENCIES:

It was very difficult to apply the original pump curve to the DEQ Flow rate spreadsheet. See attached pump curve, obtained from the O&M manual. From the O&M manual, the station should have 5.0 hp motors with 9-1/8" impellers. Impeller size is unknown. Although in the photo HAR/HER-3 the motors appear different, the motor plates shows both to be 5.0 hp.

Pump curve is based upon a design maximum flow rate of 230 gpm, and a design TDH of 31.0. Both pumps appear to be operating at the edge of this curve, therefore the original curve is an estimation of the flows. The attached DEQ Flow rate spreadsheet is included for its shutoff head information, and also future testing and measurements. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	320 gpm	100 % +	Unknown %
#2	255 gpm	100 % +	Unknown %

Explanation of the columns: Measured flow is typically from a DEQ Flow rate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow x 100. Wear in pump chamber is 100% minus % of New Pump Capacity x 100. Note that the last column is especially important to review during annual testing.

FORCE MAIN:

Total length of the force main is approximately 353 feet. It is constructed of 4"ϕ PVC. The force main runs parallel to Harbor Street west, then discharges into a standard manhole at the south edge of the Harbor Street shoulder. (Source: East Warrenton Interceptor Plan set.)

HYDROGEN SULFIDE:

The discharge manhole could not be located along the alignment shown on the plans for the East Warrenton Interceptor. The Harbor Street asphalt pavement overlay is covering the discharge manhole. It appears that the manhole alignment is in the south fog line. The next manhole that appears on the plans is at the intersection of Harbor and SE Galena, and this manhole has 2-10"ϕ gravity flow pipes in it.

A method of locating the discharge manhole would be to measure from the center of this gravity manhole, East 131 feet along the fogline. A mark should be placed. Then, starting at the pump station centerline, measure west, 353 feet, and place a mark. The discharge manhole should be between the marks. A metal detector would then pinpoint the exact location of the lid. This manhole should be inspected, as it has no way to vent to the atmosphere with the ac overlay covering the vent holes and rim. Therefore, it may be very susceptible to hydrogen sulfide damage.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. If the station wet-well was surcharged, the overflow would come out the top of the pump station wet well, flowing over and into the sandy ground surface to the south, then directly to the Skipanon River. This condition is not anticipated though, due the alarm system and availability of a portable generator set.

RECOMMENDATIONS:

This station is in poor condition.

- □ Regular maintenance, cleaning.

- □ Location and inspection of the discharge manhole for this station, as described above.

- □ Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ Flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this critical station, and make it possible to use the DEQ flow rate methodology for future testing, should this station be up-graded as outlined below.

- Future flows may require that this station's motors, impellers and force main size be up-graded. Preliminary indications are that the motor size should be a minimum of 7.5 hp, with an impeller trim of 9.0" and the 4"ϕ force main up-graded to a 6"ϕ force main. This would require further analysis.

- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

HARBOR & SE HERON
LOCATION MAP

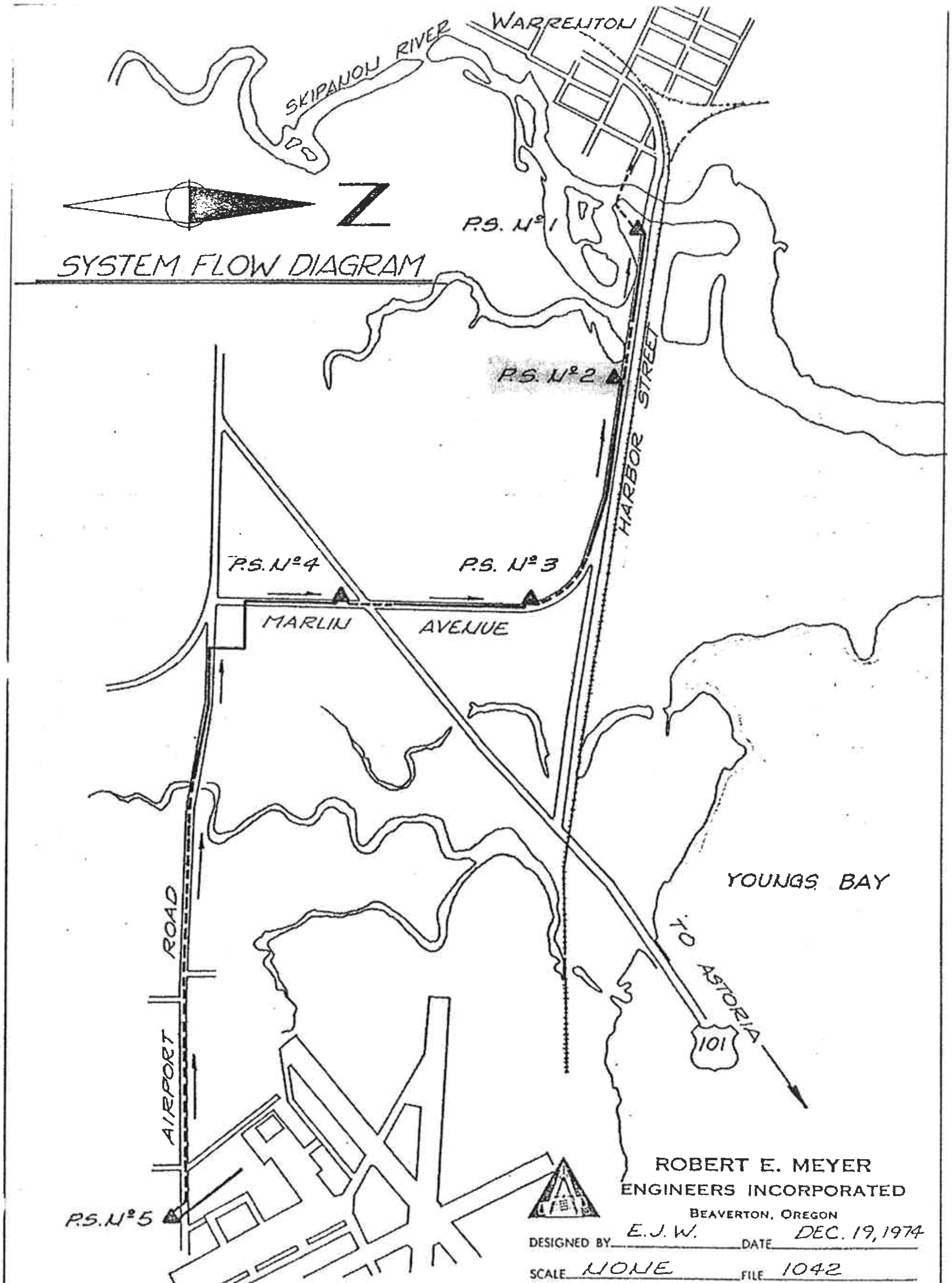


FIGURE 2

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	116	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	119	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	35	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	26	inches	
Depth of fluid to pump eye (suction lift to start)	83	inches	**START**
Depth of fluid to pump eye (suction lift to stop)	98	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	10 psig	5 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	32.81 FT	21.26 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	4 psig	1 psig	
Reading adj. to impeller eye (add guage off.+start)	18.32 FT	11.39 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	3 psig	1 psig	
Reading adj. to impeller eye (add guage off.+stop)	17.26 FT	12.64 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

TDH @ pump start (at midpool)	18.95 FT	12.02 FT	taken at mid-pool, with water column moving
TDH @ pump stop	17.26 FT	12.64 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1150 RPM

Flowrate @ pump start (curve interpolation)	335 GPM	260 GPM	
Flowrate @ pump stop (curve interpolation)	305 GPM	250 GPM	
Average Flow, gpm	**320 GPM**	**255 GPM**	Mean
Design GPM	230 GPM	230 GPM	From Curve
% of new capacity	139%	111%	Design Head: 31.0'

Date of spreadsheet calcs: Jan. 8, 2002

STATION: **HARBOR/SE HERON PS (orig. EWI #2)**

CURVE Yes - attached

DATE OF FIELD TESTING: Dec. 11, 2001

FIELD PERSON: GGL CHECKED BY:

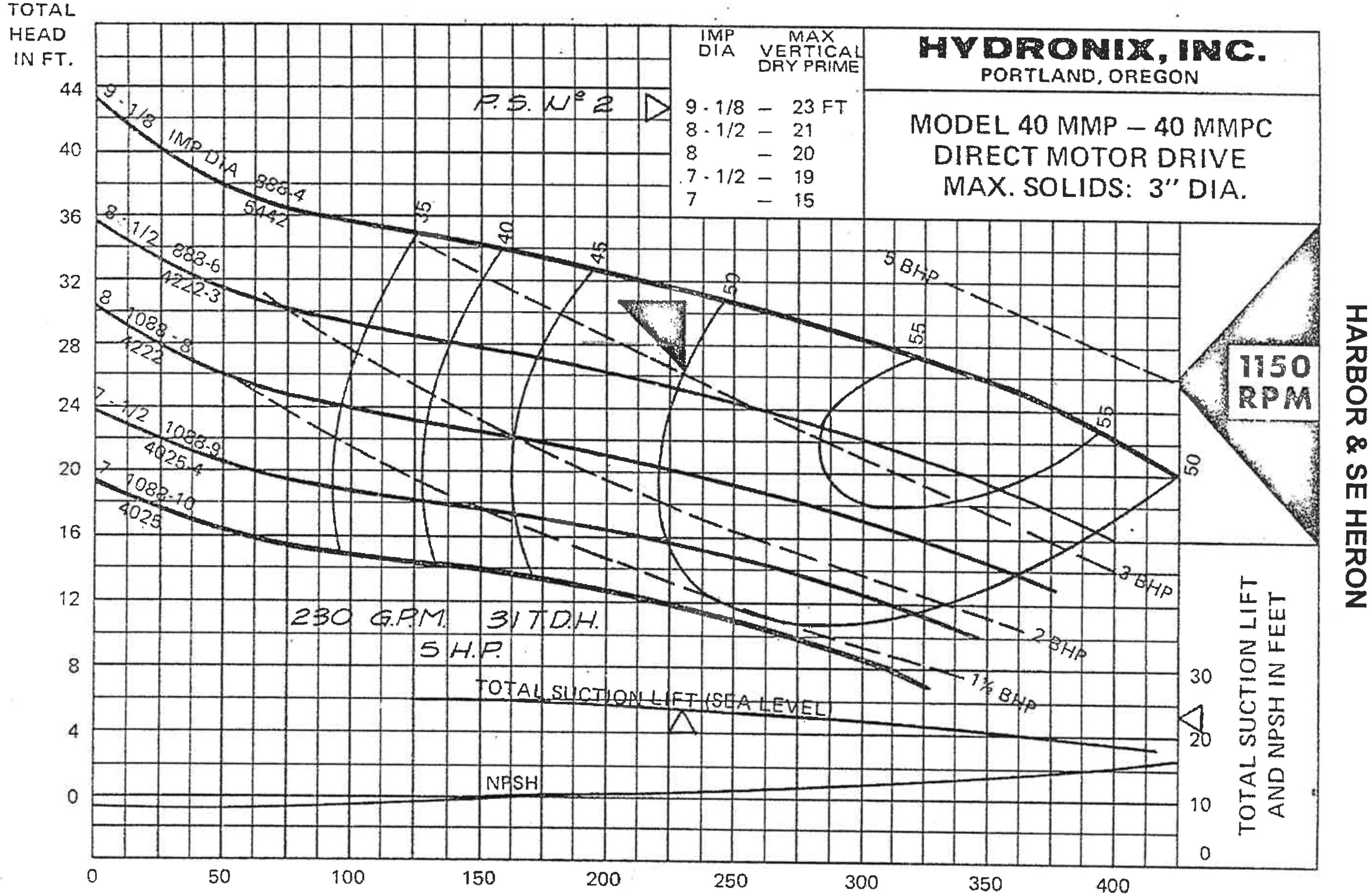
Note: The above box is added to assist report writer.

Note: No suction gauges on City of Warrenton Pump Stations.

Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

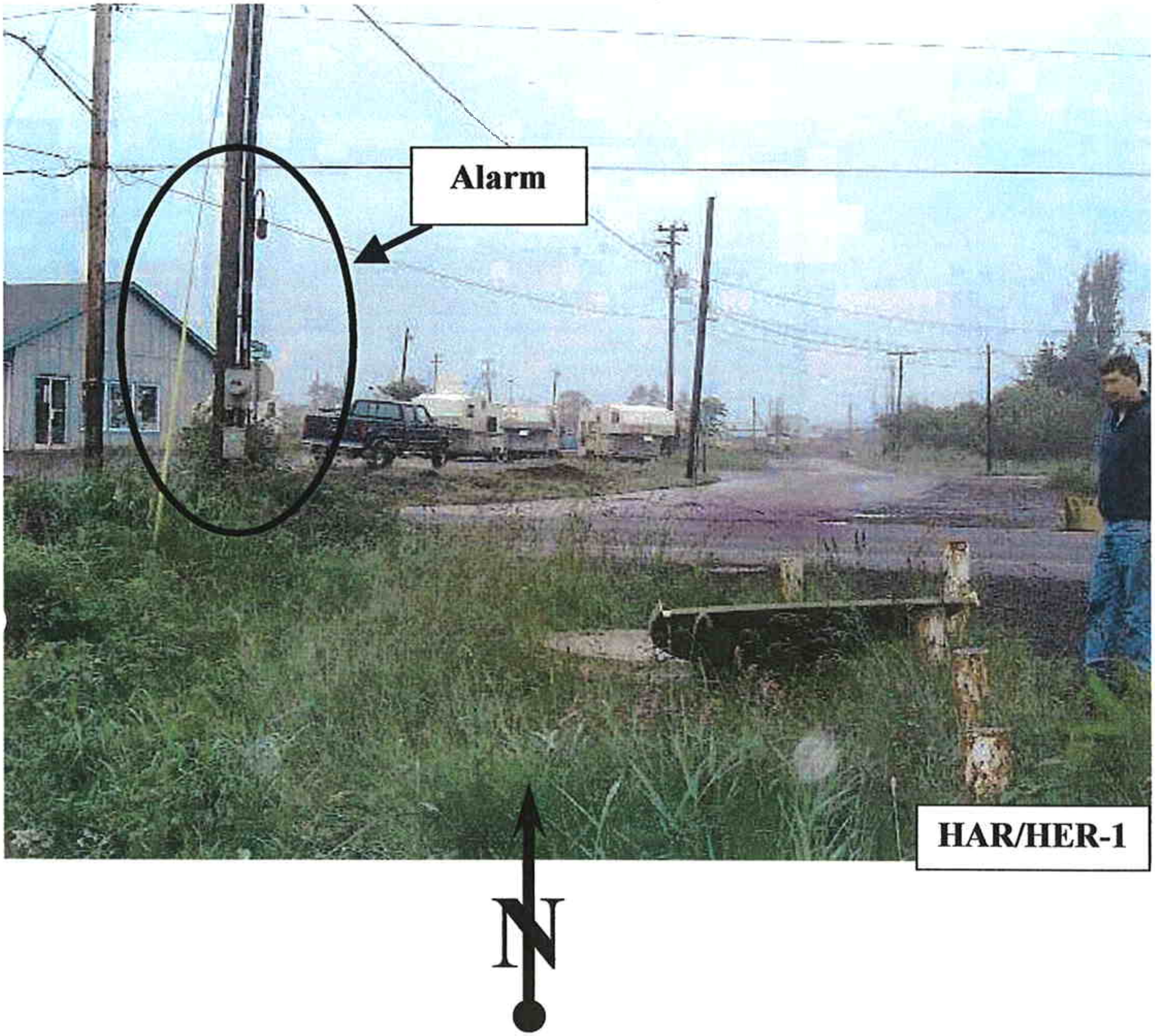
Impeller: 9-1/8"

5 HP



NOTE — TOTAL SUCTION LIFT CURVE MUST BE USED TO DETERMINE MAX. PUMPING CAPACITY

6042

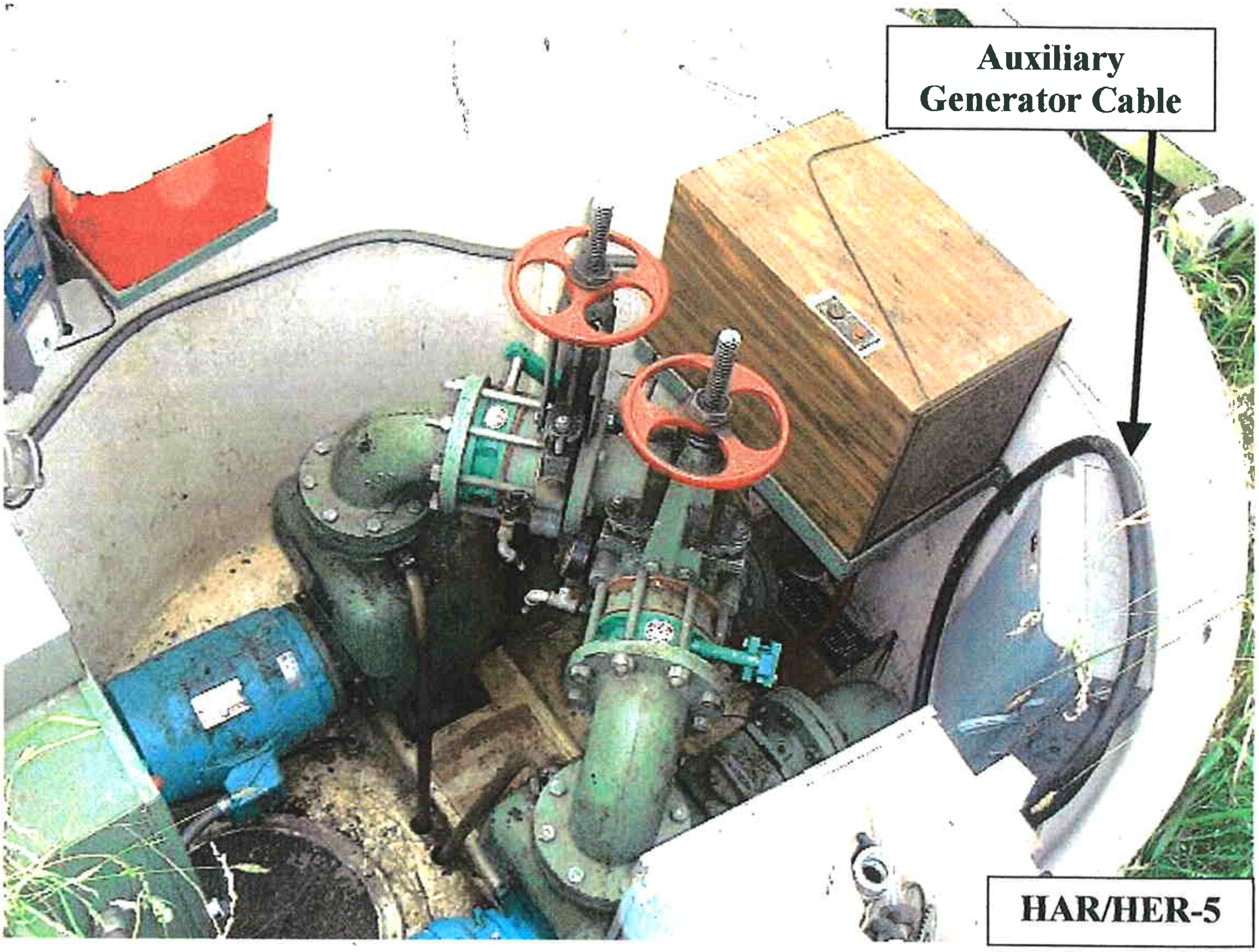

Alarm
HAR/HER-1
N


HAR/HER-2

HAR/HER-3

NOTE: Different Motors, Possibly Different Impellers


HAR/HER-4


Auxiliary
Generator Cable
HAR/HER-5

2nd / Marlin Ave. Pump Station

(Originally East Warrenton Interceptor P/S #3)

PUMP STATION REPORT

2ND & MARLIN AVE. PUMP STATION
(Originally East Warrenton Interceptor P/S #3)

DESCRIPTION:

This pump station transfers the flows from East Warrenton and the Airport area west by, force main to the Harbor/SE Heron pump station. It is located along Harbor Street, East of the Skipanon River. This is the third (of 5) pump stations, with approximate construction during 1975. A station location diagram is included with each of the five (5) reports on the East Warrenton Interceptor. This diagram also shows system flow.

This pump station is a HYDRONIX fiberglass unit station mounted over a concrete wet well. This station has a split, locking fiberglass cover. See photo MAR-1 and MAR-2. It is a duplex station with 5.0 hp direct coupled, #40MMP, double suction, self-priming pumps. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. See photo MAR-3. Both pumps and check valves were found to be operational. Please note recommendations section for this station.

The discharge gate valves/force main header assembly did not have the required gauges. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flow rate Check Sheet guidelines. Testing and measurements were conducted in accord with these guidelines. It should be noted that this station was tested 3 times, once with draw down testing on June 14, 2000, tested according to the DEQ Flow rate testing procedure on December 14, 2001, and again on March 8, 2002. Testing results do not match pump curve as explained later in report.

The controls were tested through operational cycling during flowrate testing. The control panel inside the station appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch. See photo MAR-4

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, mounted under the fiberglass split covers, and visible in the lower right center of the photo MAR-5.

The alarm system is mounted on a separate pole, which is shown on photo MAR-2. The alarm is mounted on a pole just south of the station, and appeared to function properly. The alarm is visible from SE Second Street, however, not visible from Marlin Street, which it should be. The station alarm system is also tied into a central alarm console, which is located in the City of Warrenton Public Works Shop. See recommendations section.

No odor control equipment or air compressor is used at this pump station.

Note that since the original five pump stations were constructed in 1975, ***two (2) additional*** pump stations have been added in the East Warrenton Interceptor area. They are the Young's Bay Plaza station and the Shilo station. The sewage flows from these two (2) stations ***increase the loading*** on the East Warrenton Interceptor. It is important to understand that the force mains and gravity from these two (2) stations discharge into this station.

The East Warrenton Interceptor Construction drawings and pump station O&M manuals for the 5 original stations were available at the City of Warrenton Public Works building.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found at the beginning of the East Warrenton section. The format of this spreadsheet is taken from the current DEQ Guidelines. The pump curve, photos, and a location map of the pump station are attached. A DEQ Guidelines based flow rate spreadsheet with explanatory notes was developed and is also part of and attached to this report.

PUMP FLOWRATE/EFFICIENCIES:

It was very difficult to apply the original pump curve to the DEQ flowrate spreadsheet. See attached pump curve, obtained from the O&M manual. From the O&M manual, the station should have 5.0 hp motors with 9-1/8" impellers.

As originally designed, a 5.0 hp pump was used here. Based upon a design maximum flow rate of 175 gpm, the TDH is 33.0 feet for a new pump. Since both pumps are operating at the edge of this curve, the flow information provided below are only estimates. The attached DEQ flow rate spreadsheet is included for its shutoff head information, and also future testing and measurements. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	288 gpm	164 %	Unknown %
#2	298 gpm	170 %	Unknown %

Explanation of the columns: Measured flow is typically from a DEQ flowrate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow x 100. Wear in pump chamber is 100% minus % of New Pump Capacity x 100. Note that the last column is especially important to review during annual testing.

FORCE MAIN:

Total length of the force main is approximately 806 feet. The force main discharges into a standard manhole 16.0' south of the centerline in the south shoulder of Harbor Street. The force main design was for 4"ϕ PVC, however, our observations of the discharge manhole indicate that it is a 6"ϕ PVC. This force main has a relatively flat profile, with no vacuum break or air release appurtenances.

HYDROGEN SULFIDE:

The discharge manhole appeared in good condition, with no hydrogen sulfide damage. No exposed aggregate or concrete cracking was observed. The concrete was probed, and appeared very solid. No ground water infiltration was observed coming in through the base, individual manhole sections, manhole cone or the pipe collars. The steel steps going into the manhole were in good condition. No other service laterals were tied into this manhole. This is a shallow manhole, depth approximately 5.0 feet. Typically, we would expect this manhole to be in good condition. The force main was not in operation when this manhole was observed. No photo exists of this discharge manhole.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. If the station wet-well was surcharged, the overflow would come out the top of the pump station wet well, flowing over and into the sandy ground surface and directly to the Skipanon Slough. This condition is not anticipated though, due the alarm system and availability of a portable generator set.

RECOMMENDATIONS:

This station is in poor condition. Due to its critical location and use, it should have the following maintenance/repairs:

- ☐ Regular maintenance, cleaning.
- ☐ The outside vent fan not working. This should be repaired as these stations have Confined Space Hazards from gases, depths, etc.
- ☐ The dehumidifier is not working on this station.
- ☐ A weed control agent should be added around the station and ¾"(-) gravel, graded out, to trim up the station and the pole that the alarm light is mounted on. This will make it visible from Marlin.
- ☐ Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this critical station, and make it possible to use the DEQ flow rate

methodology for future testing. The addition of the flows from the Young's Bay and Shilo pump stations should be accounted for in this station's upgrades, as well as any further growth north of Harbor Street or west of Highway 101.

It should be noted that this is a critical station even without the outside sources being added to the current sewage load pumped by the 5 stations along the East Warrenton Interceptor. Therefore, flows from the outside sources must be given careful consideration through further study and analysis if any are to be added.

- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

SE 2nd and Marlin Location Map

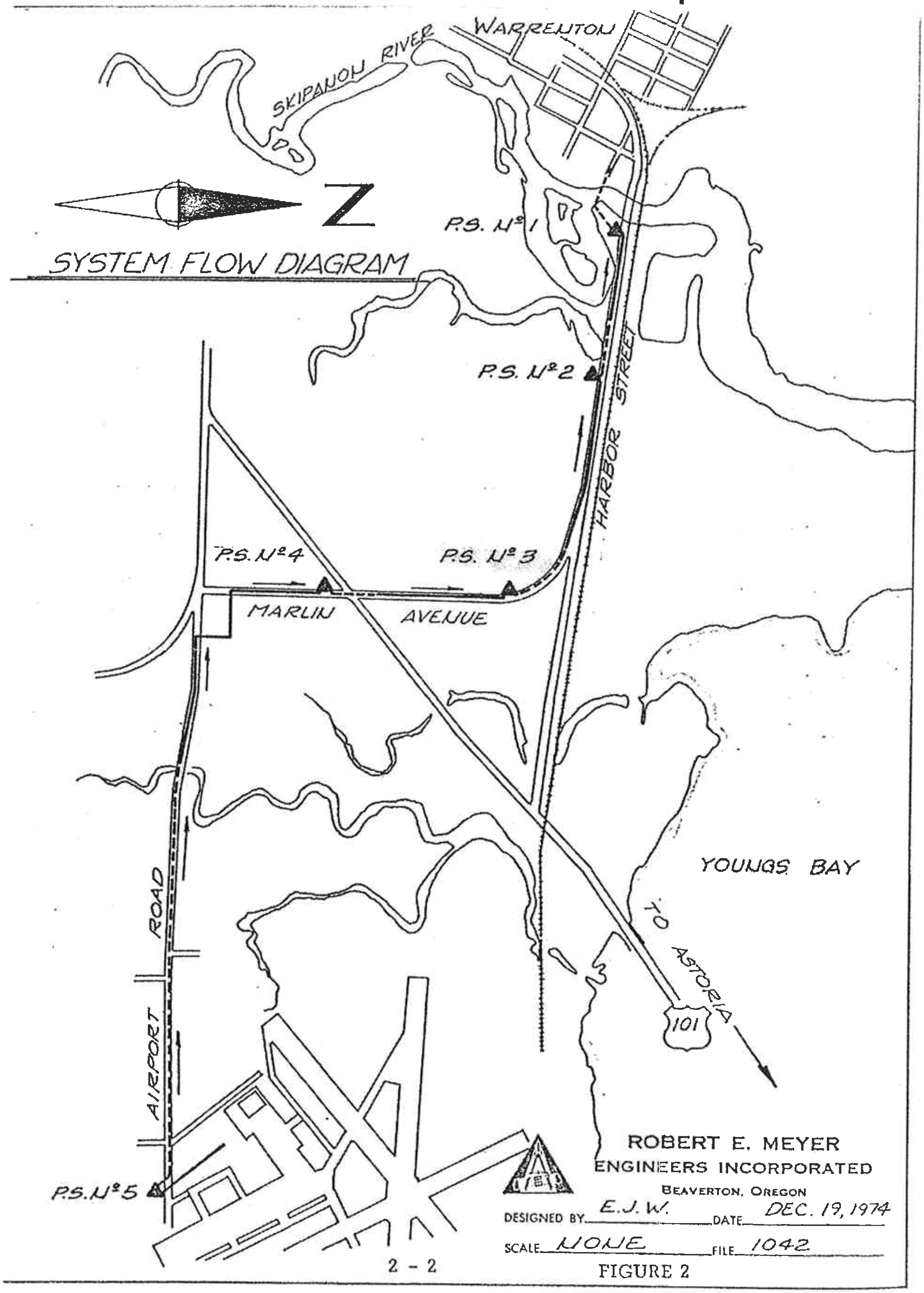


FIGURE 2

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	134	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	138	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	9	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	26	inches	
Depth of fluid to pump eye (suction lift to start)	102	inches	**START**
Depth of fluid to pump eye (suction lift to stop)	118	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	6 psig	9 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	25.19 FT	32.12 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	1 psig	1 psig	
Reading adj. to impeller eye (add guage off.+start)	12.98 FT	12.98 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	1.5 psig	1 psig	
Reading adj. to impeller eye (add guage off.+stop)	15.47 FT	14.31 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

TDH @ pump start (at midpool)	13.64 FT	13.64 FT	taken at mid-pool, with water column moving
TDH @ pump stop	15.47 FT	14.31 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1150 RPM

Flowrate @ pump start (curve interpolation)	300 *GPM*	300 *GPM*	
Flowrate @ pump stop (curve interpolation)	275 *GPM*	295 *GPM*	
Average Flow, gpm	**288** *GPM*	**298** *GPM*	Mean
Design GPM	175 *GPM*	175 *GPM*	From Curve
% of new capacity	164%	170%	Design Head: 33'

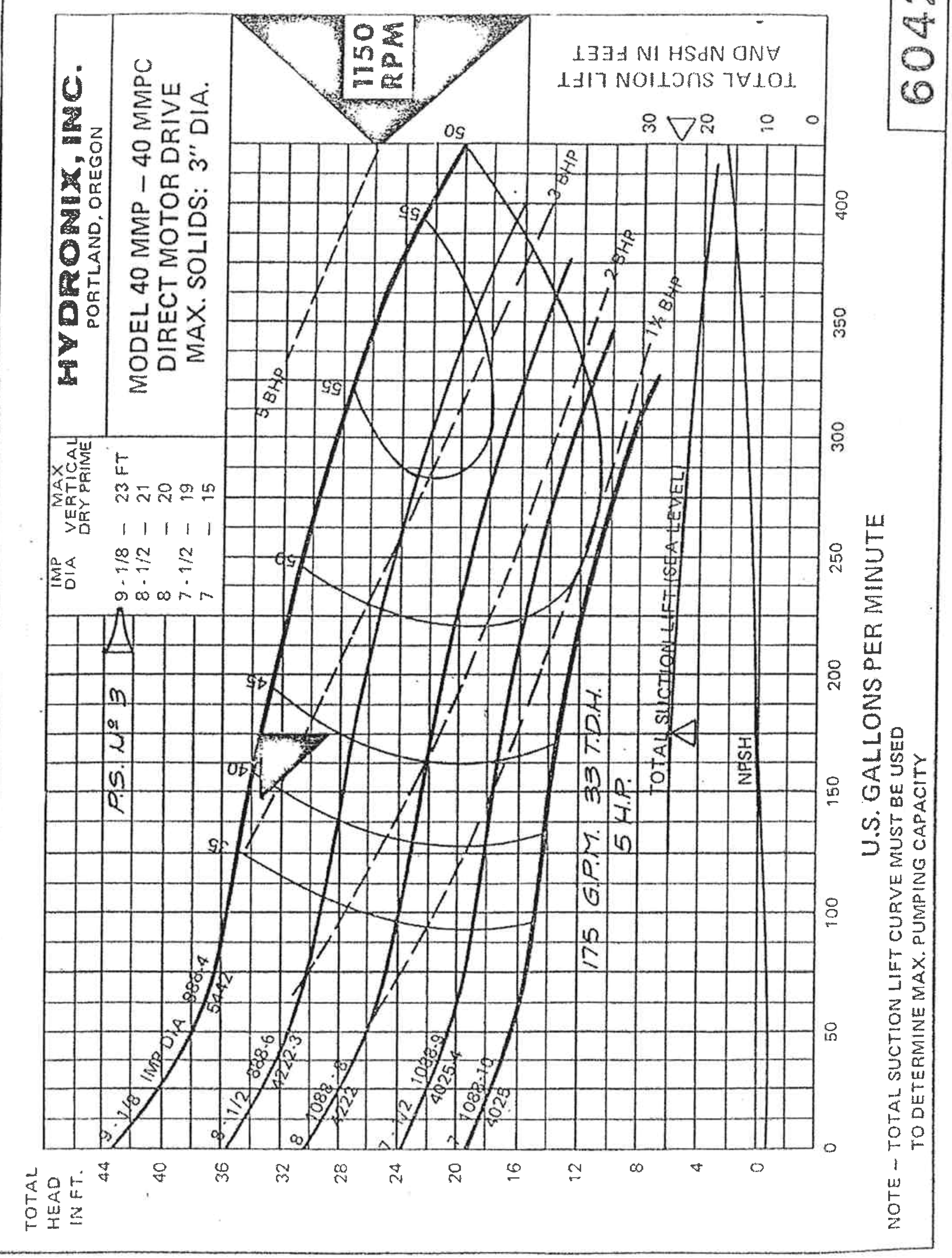
Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

Impeller: 9-1/8"
5 HP

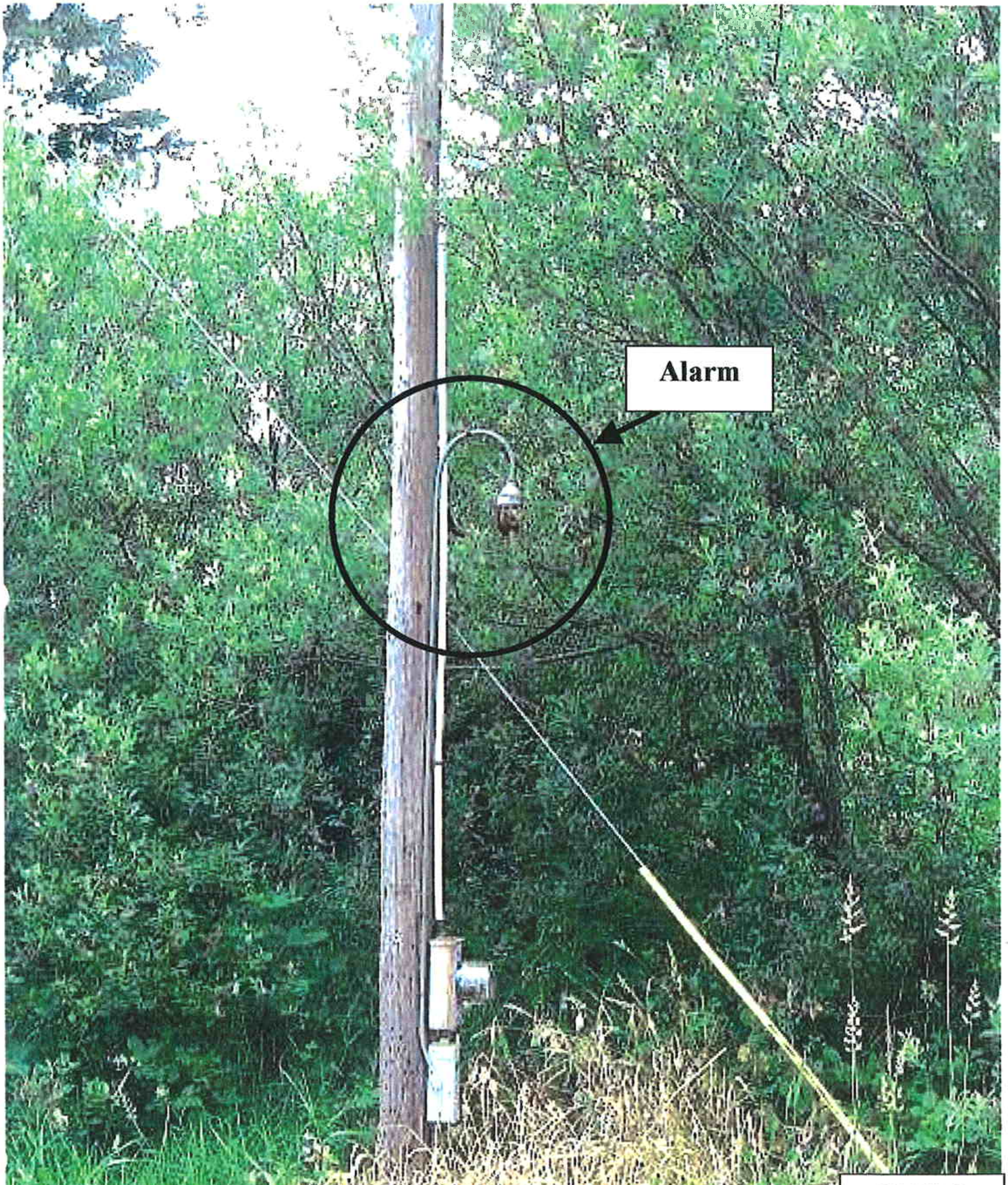
Date of spreadsheet calcs: Jan. 8, 2002
STATION: **SE 2ND-MARLIN (orig. EWI #3)**
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

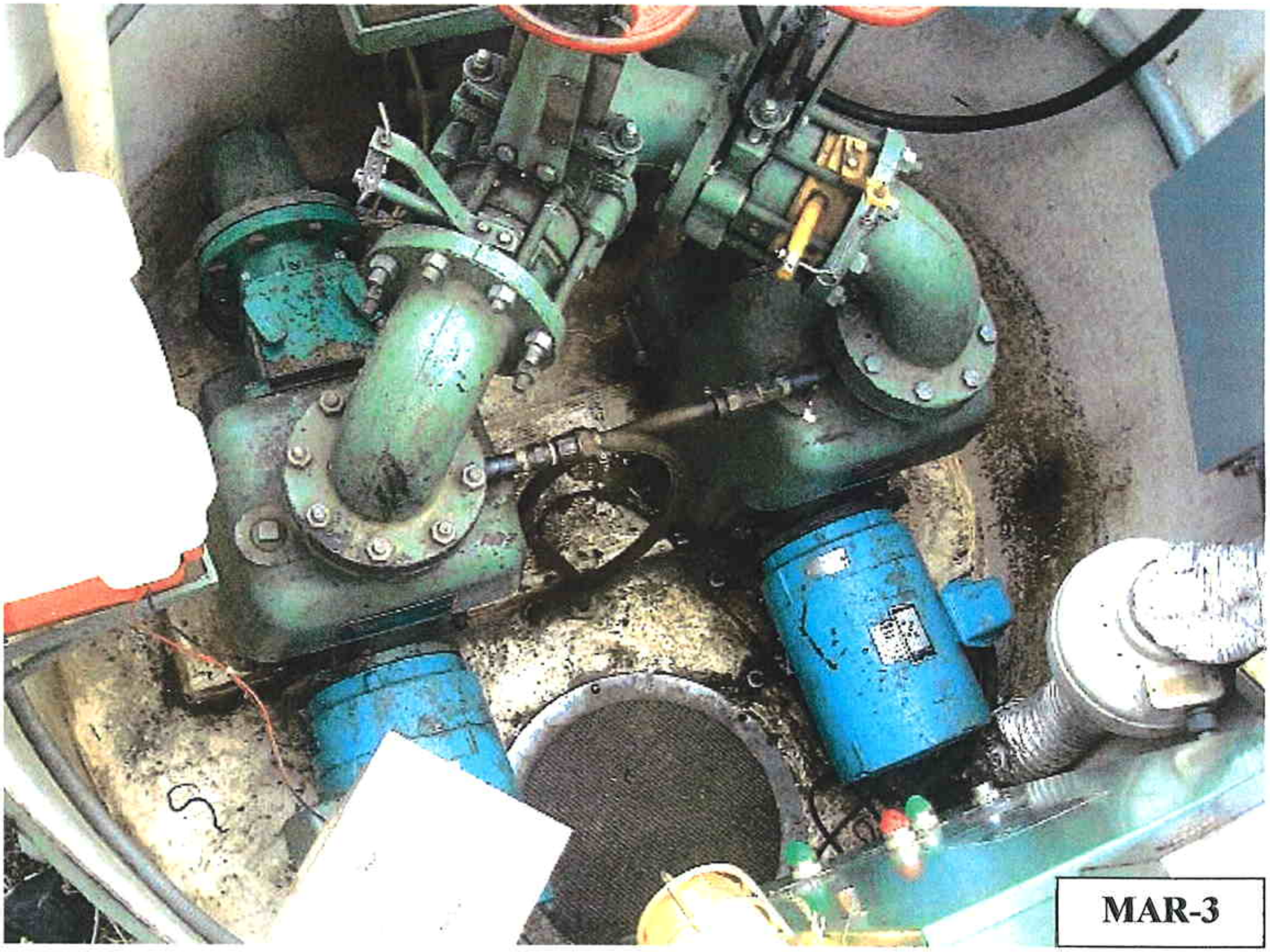
Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

SE 2nd and Marlin (Orig. EWI #3)




MAR-1


Alarm
MAR-2


MAR-3

MAR-4


MAR-5

Young's Bay Plaza
Pump Station

PUMP STATION REPORT

YOUNG'S BAY PLAZA PUMP STATION

DESCRIPTION:

This pump station transfers the flows from the Young's Bay Plaza Shopping Center by force main to an 8" gravity sewer, which then feeds into the Second and Marlin pump station. This pump station is located on the north end of the shopping center, just north of the Wauna Federal Credit Union.

This pump station is a HYDRONIX fiberglass unit station, mounted over the wet well, with a split, locking fiberglass cover. It is a duplex station with 5 hp direct coupled, #40 MMP, double suction, self-priming pumps. See photo YB-1.

The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch. See photo YB-2 Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational.

The discharge gate valves/force main header assembly did not have the required gauges. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines. Testing and measurements were conducted in accord with these guidelines.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, mounted inside, underneath the split, locking cover and visible in the lower left corner of photo YB-3.

The alarm system is mounted on a separate, short, electrical conduit, which is just visible at the left front fender of the City truck in photo YB-1. The alarm appeared to function properly. The alarm is clearly visible from the north entrance into the Young's Bay Plaza Shopping Center. The station alarm system is also tied into a central alarm console, which is located in the City of Warrenton Public Works Shop.

No odor control equipment or air compressor are used at this pump station. A DEQ Guidelines based flow rate spreadsheet with explanatory notes was developed and is also part of and attached to this report. A pump curve and photos are attached. A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found in the East Warrenton section.

PUMP FLOWRATE/EFFICIENCIES:

See attached pump curve. The flow rate is based upon a maximum flow of 185 gpm. The pump flows were measured during pump station operation, per DEQ guidelines.

One other pump station, the Shilo station, shares the force main that discharges into the Second and Marlin Station. Flow rates will likely decrease with multiple pump stations operating and sharing a 4"ϕ force main simultaneously. However, measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	169 gpm	91%	09%
#2	219 gpm	100%	None apparent

Explanation of the columns: Measured flow is typically from a DEQ flowrate test, see attached spreadsheet. Percentage of new pump capacity is: Measured flow divided by new pump flow x 100. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

FORCE MAIN:

The 4"ϕ PVC force main for this pump station ties into the force main for the Shilo Station. The initial section (unshared portion of the force main) is approximately 170 feet and is constructed of 4"ϕ PVC. Both stations then share a 4"ϕ PVC force main for approximately 1560 lineal feet, and appear to discharge into a manhole in the Costco Tire Shop Parking Lot. Sewage then flows by gravity into the 2nd and Marlin (originally EWI-#3) pump station. (From plans available at the City of Warrenton Public Works office.)

There are no air release/vacuum breaker appurtenances on this shared force main.

It should be noted that the common force main that is currently used by the two stations is not operating in accordance with DEQ guidelines. The pump stations, depending on pumping cycles tend to run longer when all (or more than one) pump station is operating. Hence, there is more electrical use, more pump wear, and the resulting lower flows.

The shared force main presents some challenges. If continued growth in the areas East of Highway 101 or north of Harbor Street, (Skipanon Industrial Park) is anticipated, options for further study are outlined below:

1. Growth East of Highway 101: A new pump station could be placed in this area. A new force main would likely run under Highway 101 west, and terminate or discharge into Shilo Pump Station wet well. This would be an obvious choice, as the Shilo Station is larger and easier to maintain.

If expansion reaches this point, the shared 4"ϕ force main that currently exists would be too small. A new 6"ϕ force main from the Shilo Station running parallel to the existing (and currently shared force main for the Shilo Station) could be added. This addition would allow the Young's Bay Plaza Station to be on its own dedicated 4"ϕ force main. Preliminary indications are that the new force main would be a 6"ϕ. This new force main would terminate at the same discharge manhole that the existing 4"ϕ force main currently is using. Any new development East of the Highway that contains commercial discharges of effluent should have sampling manholes placed in/at the service lateral.

Of course, this scenario would have implications for the Harbor/SE Heron Station, the Harbor/SE Ensign Station and/or their respective force mains, which would require further study.

2. For development north of Harbor Street, an option would be to put in a small pump station and a force main that would cross Harbor Street, run due south, and discharge into the current discharge manhole. Additional analysis is required to determine sizing and costs. Since development in this area would not be anticipated to be as great, i.e., a golf course, etc., the impacts to the 2^{nd}/Marlin, Harbor/SE Heron Station, and the Harbor/SE Ensign Station should not be significant.

At some point, however, growth, and additional capacity needs in this area will necessitate additional sewer infrastructure.

HYDROGEN SULFIDE:

The apparent discharge manhole appeared in good condition. See photos YB-4, YB-5, and YB-6. The force main was in operation when this manhole was observed. No exposed aggregate or concrete cracking was observed. No ground water infiltration was observed coming in through the base, individual manhole sections, manhole cone or the pipe collars. The steel steps going into the manhole were in good condition. A low effluent flow was observed on both the force main and the gravity side. The concrete in and around the manhole cone was probed for H2S damage. None was apparent.

Flow quantity is important. A high volume of flow over the observation period would indicate that remedial action (such as the additional sewer piping options mentioned above) would be necessary soon. However, the low flows observed indicate that the gravity and force main systems are functioning as designed.

OVERFLOWS/BYPASS:

If this station were to overflow, the effluent would flow over the curbing and into the storm drains in the area. From there, the flows would enter Holbrook Slough, and then into the Columbia River. This station receives regular maintenance, and due to the proximity of an auxiliary generator, the overflow condition is not anticipated.

RECOMMENDATIONS:

This station is in good condition.

- Regular maintenance, cleaning.
- An attempt should be made to obtain the correct curve for these pumps.
- If growth in the area dictates it, additional pump station(s) and force main(s) should allow this station to have sole use of the existing force main. See options above, under the heading "FORCE MAIN".
- An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared with the correct curve. This will assist long-term planning and maintenance.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	94	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	95	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	7	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	26	inches	
Depth of fluid to pump eye (suction lift to start)	58	inches	START
Depth of fluid to pump eye (suction lift to stop)	72	inches	STOP

PRESSURE DATA

	Pump #1	Pump #2	Notes
Shutoff head, direct guage reading,	8 psig	7 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	26.06 FT	23.75 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	4 psig	4 psig	
Reading adj. to impeller eye (add guage off.+start)	16.24 FT	16.24 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	3 psig	4 psig	
Reading adj. to impeller eye (add guage off.+stop)	15.10 FT	17.41 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

	Pump #1	Pump #2	Notes
TDH @ pump start (at midpool)	16.82 FT	16.82 FT	taken at mid-pool, with water column moving
TDH @ pump stop	15.10 FT	17.41 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1150 RPM

	Pump #1	Pump #2	Notes
Flowrate @ pump start (curve interpolation)	125 GPM	225 GPM	
Flowrate @ pump stop (curve interpolation)	212 GPM	212 GPM	
Average Flow, gpm	**169** GPM	**219** GPM	Mean
Design GPM	185 GPM	185 GPM	Est. from curve: 185 gpm
% of new capacity	91%	118%	

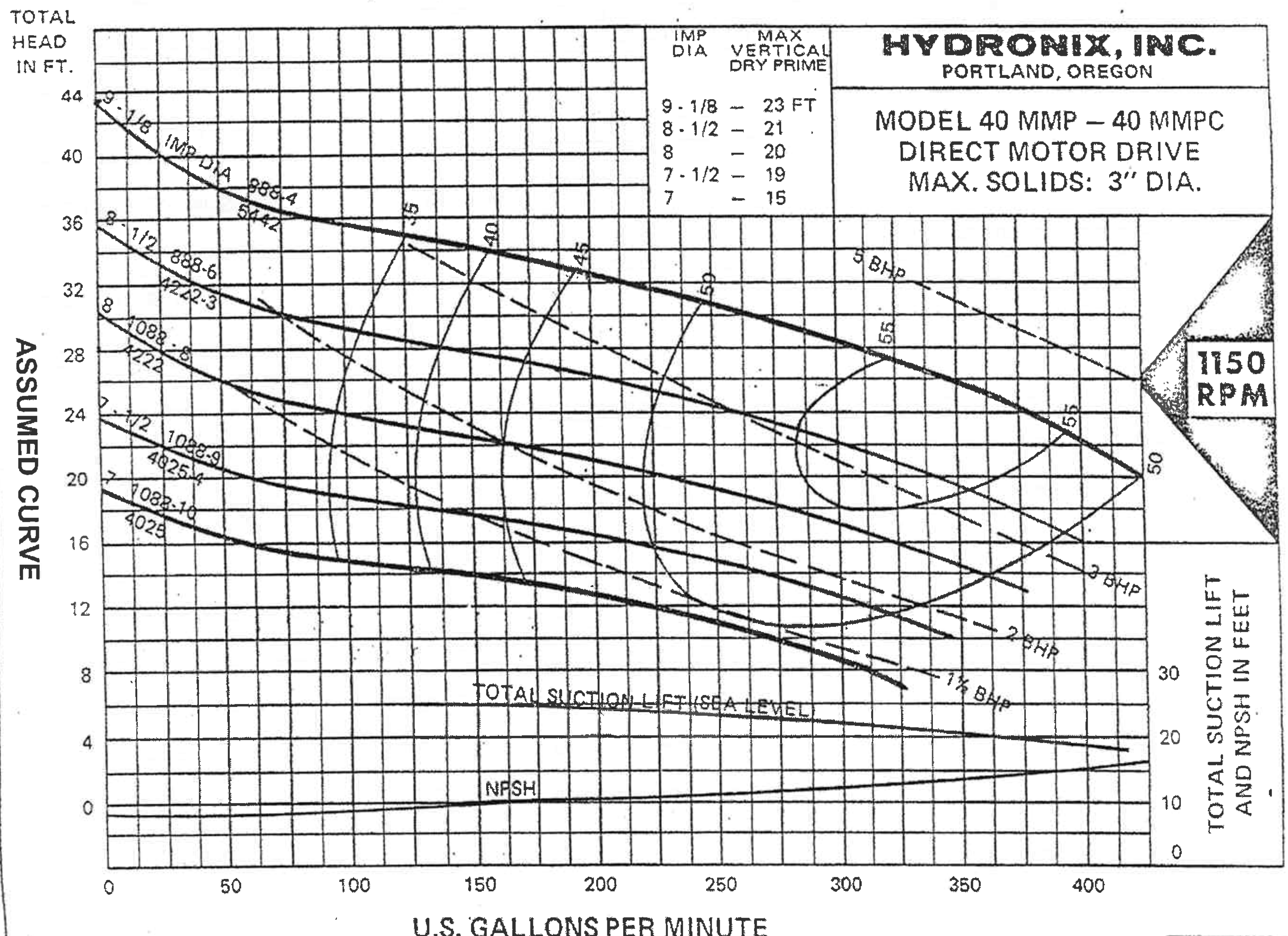
Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

Date of spreadsheet calcs: Jan. 8, 2002
STATION: **YOUNGS BAY PLAZA PS**
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

Design Head: Unknown
Impeller: 8.0"
5 HP

YOUNGS BAY PLAZA

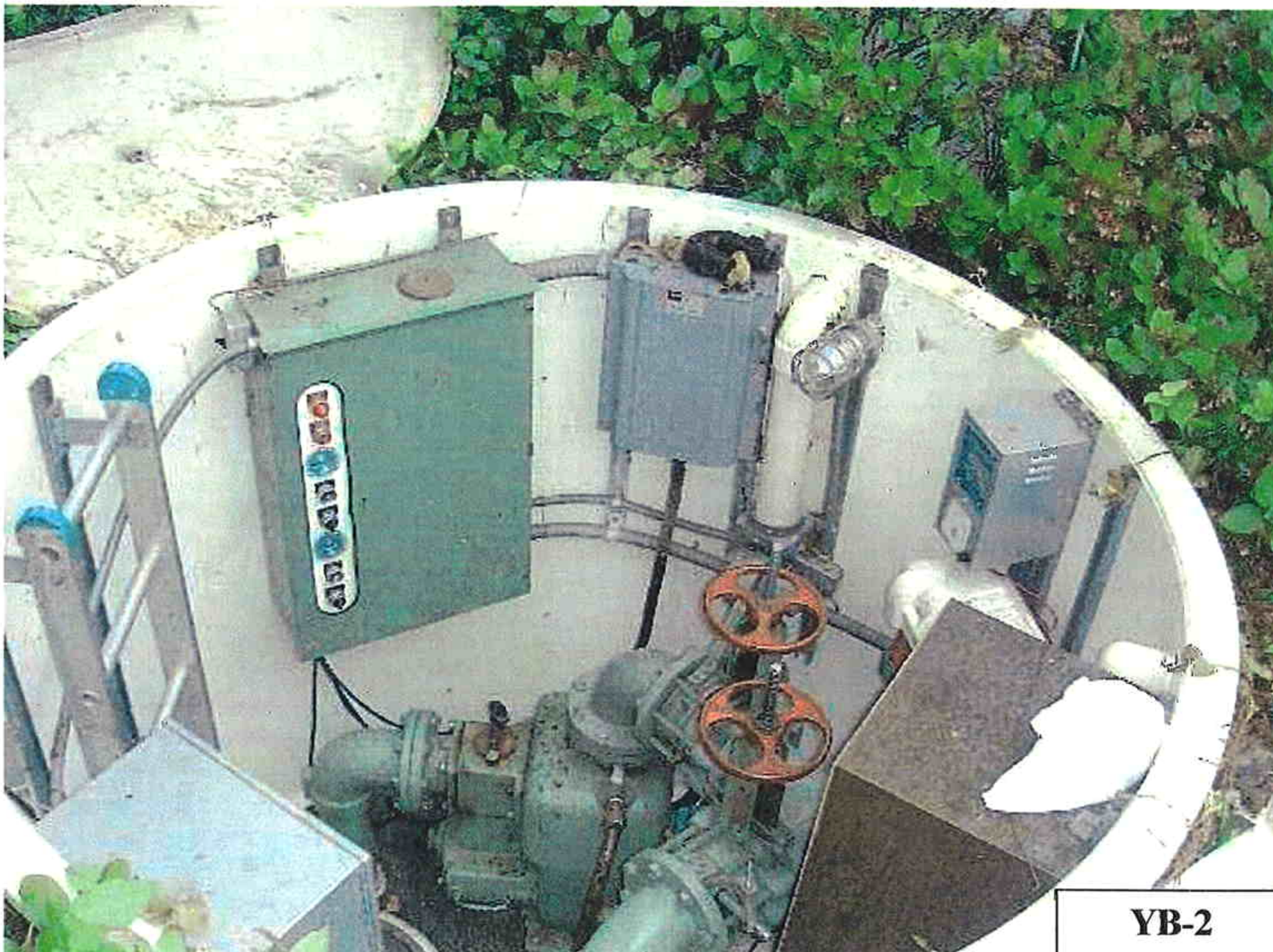


ASSUMED CURVE

NOTE – TOTAL SUCTION LIFT CURVE MUST BE USED TO DETERMINE MAX. PUMPING CAPACITY

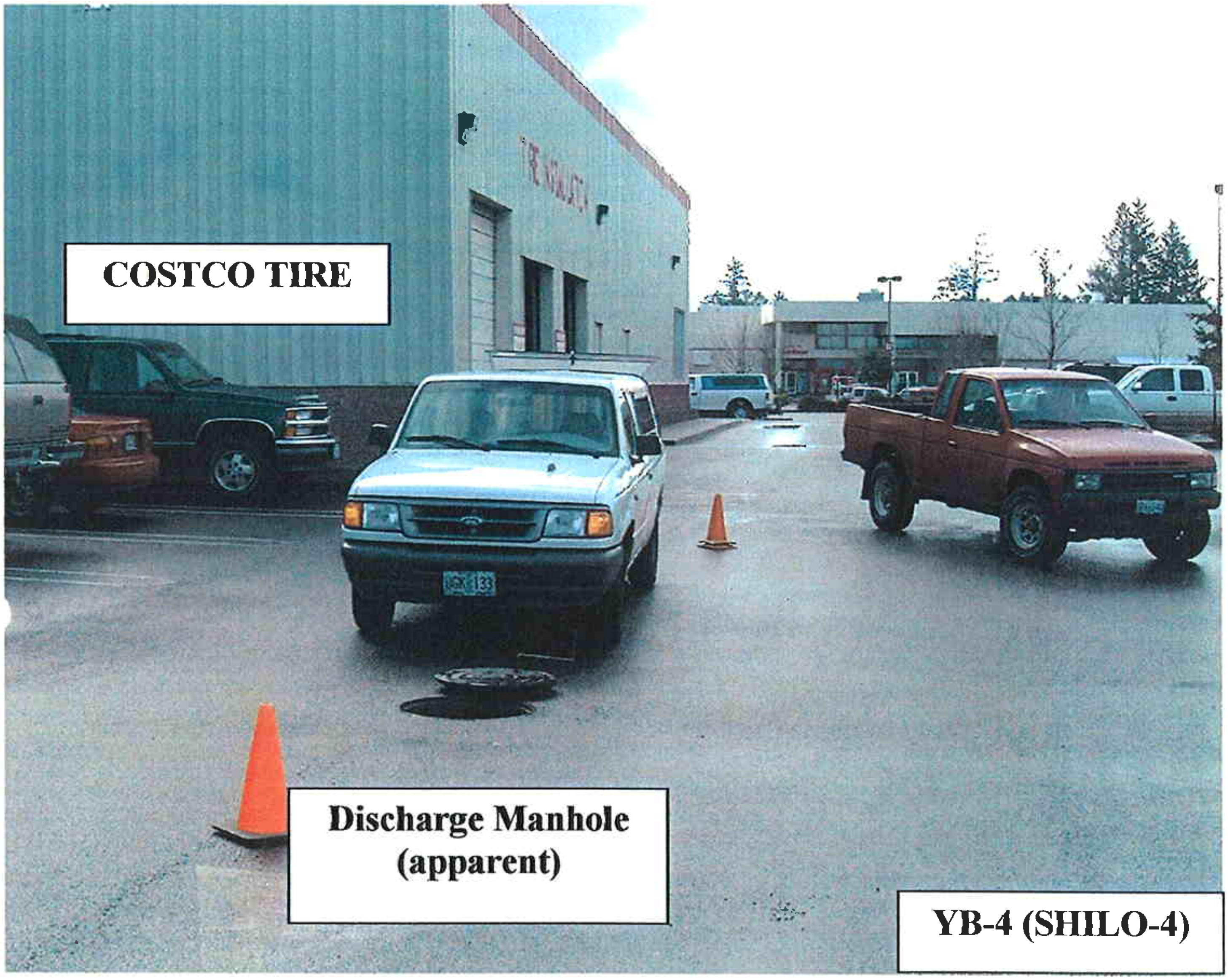
6042

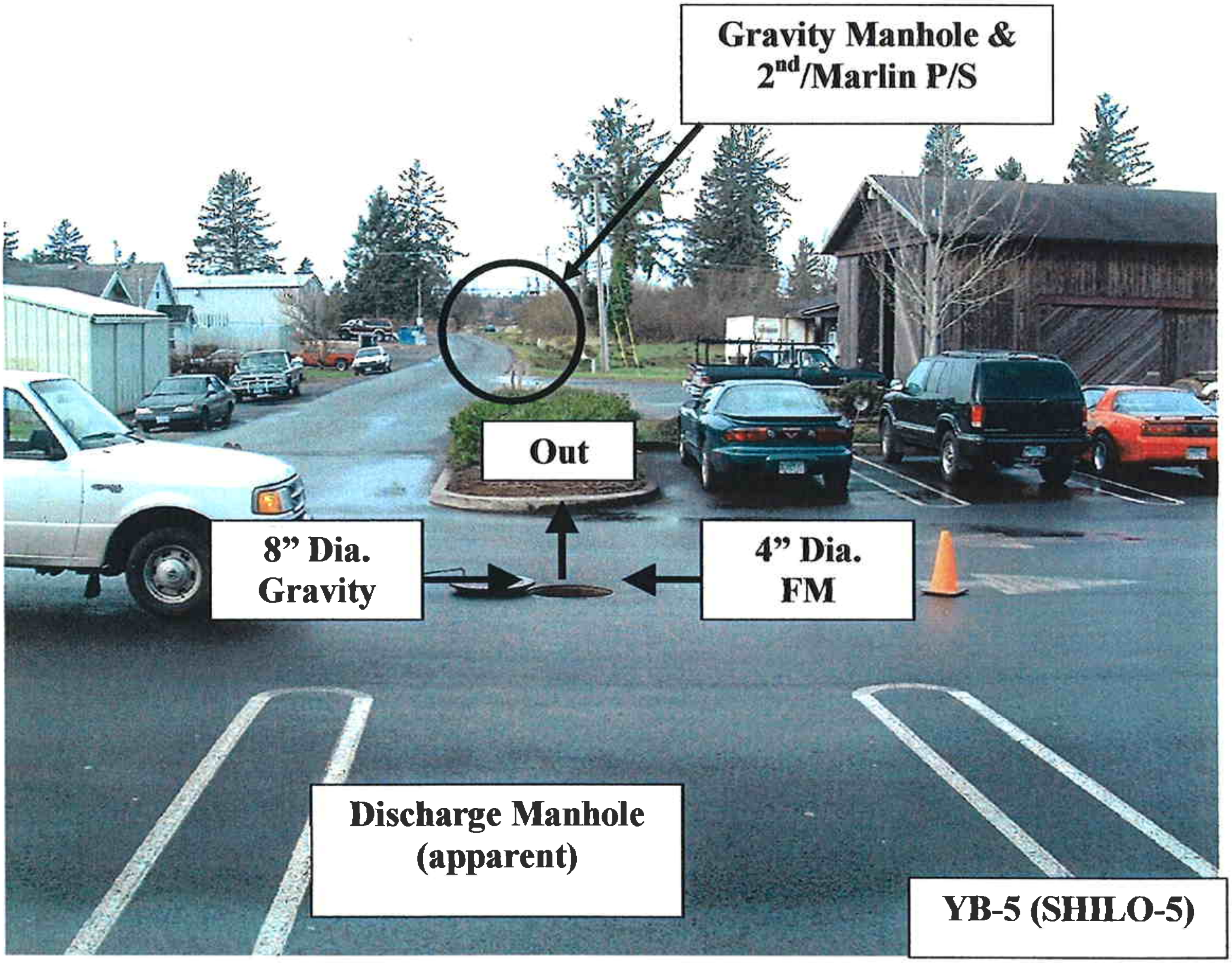
YB-1

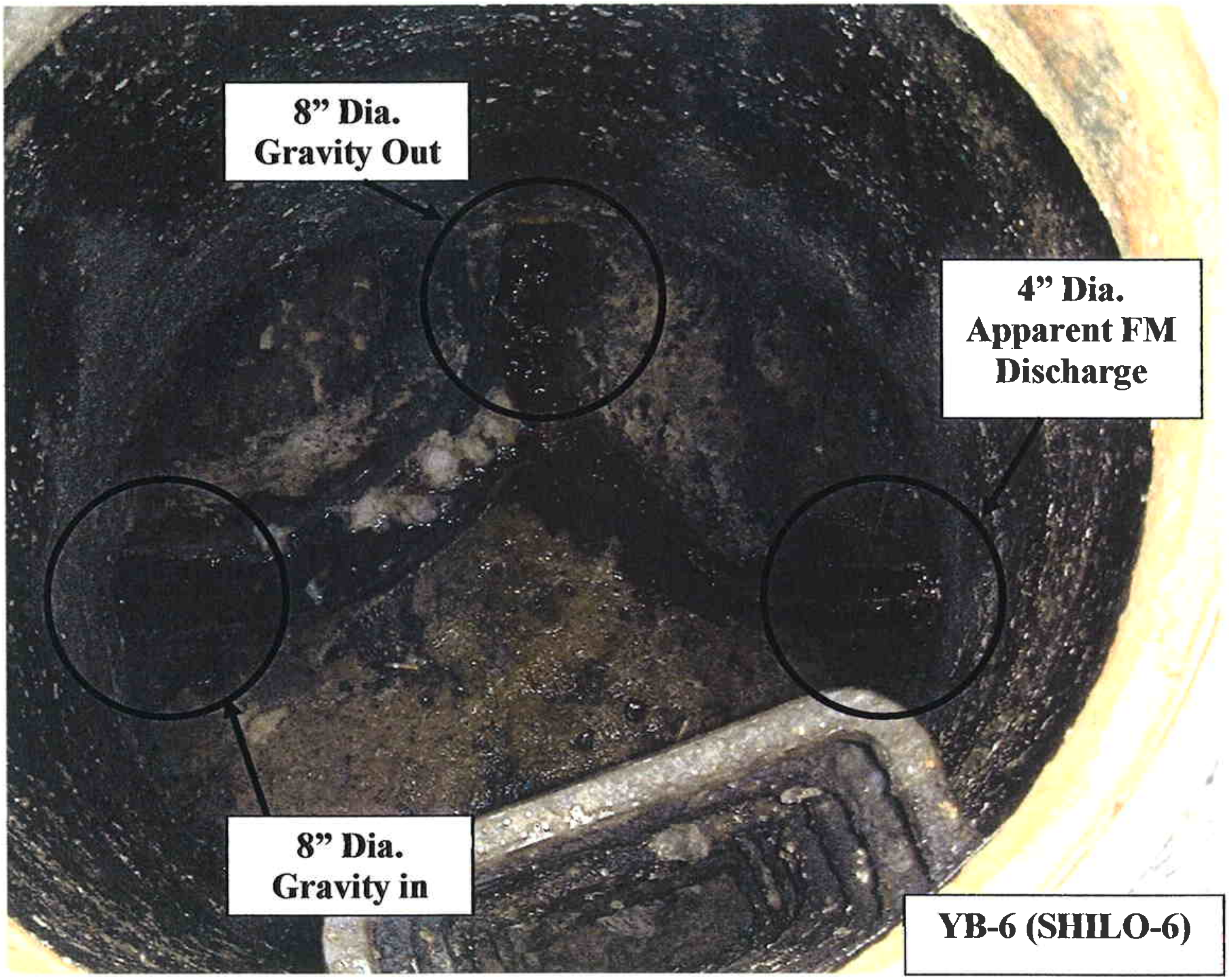


YB-2

YB-3


COSTCO TIRE
Discharge Manhole
(apparent)
YB-4 (SHILO-4)


Gravity Manhole &
2nd/Marlin P/S
Out
8" Dia.
Gravity
4" Dia.
FM
Discharge Manhole
(apparent)
YB-5 (SHILO-5)


8” Dia.
Gravity Out
4” Dia.
Apparent FM
Discharge
8” Dia.
Gravity in
YB-6 (SHILO-6)

Shilo Hotel
Pump Station

PUMP STATION REPORT

SHILO HOTEL PUMP STATION

DESCRIPTION:

This pump station transfers the flows from the Premarq Shopping Center, which includes the Shilo Hotel, by shared force main (with the Young's Bay Plaza station), then by gravity, to the Second and Marlin pump station. This pump station is located on the north side of Harbor Street, next to the southwest reentrant corner of the Shilo Inn restaurant.

It is a HYDRONIX, Model 182, fiberglass unit station, mounted over a concrete wet well. This station has locking fiberglass hoods. See photos SHILO-1 and SHILO-2. It is a duplex station with 7.5 hp direct coupled, #40 MMP close-coupled, self-priming pumps, see photo SHILO-3. Both pumps and check valves were found to be operational. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly.

The discharge gate valves/force main header assembly did not have the required gauges. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines. Testing and measurements were conducted in accord with these guidelines.

The controls were inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident. See photo SHILO-2. It should be noted that the motor control panel was solidly mounted inside the station and with the proper sealing and panel latch. The electrical service to the panel comes from underground up to an electrical service panel mounted on the north, outside frame of the station.

The alarm is visible from Harbor Street. The station alarm system is tied into the central alarm console in the Warrenton Pubic Works Shop. This station does have an alarm light mounted on top of a pole next to the station, see photo SHILO-1.

A provision for an alternate power source, manual transfer switch, and plug-in receptacle for a portable plug-in generator, exist at this station. See photo SHILO-3. No odor control equipment or air compressor is used at this pump station. The pump curve and pump station photos are attached to this report. A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found in the East Warrenton Interceptor section.

Construction plan drawings for this pump station were available in the City of Warrenton archives.

PUMP FLOWRATE/EFFICIENCIES:

The following table is based upon a design maximum flow rate of 185 gpm, and a TDH of 62 feet for a new pump. The pump flows were measured during single pump, station operation. It should be noted that flow rates will likely decrease with the operation of the other station (Young's Bay) that shares the force main. Since both pumps are operating in the extreme radial thrust area, the following are only estimates of the flow. The tested flows are higher than design requirements. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	378 gpm	204 %	0 % (apparent)
#2	205 gpm	111 %	0 % (apparent)

Explanation of the columns: Measured flow is typically from a DEQ Flow rate test. Percentage of new pump capacity is: New pump flow divided by measured flow. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing. See recommendations below.

FORCE MAIN:

By visual inspection the force main header assembly at the pump station and the discharge manhole appear to be in good condition. The 4"ϕ PVC force main comes from the station, crosses Harbor Street and tees into the force main from the Young's Bay Plaza station. From there, the force main goes west, and its shared length is approximately +/-1,560 feet as measured from the tee to its shared discharge manhole. Sewage then flows by gravity into the 2nd and Marlin (originally EWI-#3) pump station. (From plans available at the City of Warrenton Public Works office.)

There are no air release/vacuum breaker appurtenances on this shared force main.

It should be noted that the common force main that is currently used by the two stations is not operating in accordance with DEQ guidelines. The pump stations, depending on pumping cycles tend to run longer when all (or more than one) pump station is operating. Hence, there is more electrical use, more pump wear, and the resulting lower flows.

The shared force main presents some challenges. If continued growth in the areas east of Highway 101 or north of Harbor Street, (Skipanon Industrial Park) is anticipated, options for further study are outlined below:

1. Growth east of Highway 101: A new pump station could be placed in this area. A new force main would likely run under Highway 101 west, and terminate or discharge into Shilo Pump Station wet well. This would be an obvious choice, as the Shilo Station is larger and easier to maintain.

If growth/expansion reaches this point, the shared 4"ϕ force main that currently exists would be too small. A new 6"ϕ force main from the Shilo Station which would parallel the existing, (and currently shared force main for the Shilo Station), could be added. This addition would allow the Young's Bay Plaza Station to be on its own dedicated 4"ϕ force main. Preliminary indications are that the new force main would be a 6"ϕ. This new force main would terminate at the same discharge manhole that the existing 4"ϕ force main currently is using. Any new development east of the Highway that contains commercial discharges of effluent should have sampling manholes placed in/at the service lateral.

The scenario outlined above would have implications for the Harbor/SE Heron Station, the Harbor/SE Ensign Station and/or their respective force mains, which would require further study.

2. For development north of Harbor Street, an option would be to put in a small pump station and a force main that would cross Harbor Street, run due south, and discharge into the current discharge manhole. Additional analysis is required to determine sizing and costs. Since development in this area would not be anticipated to be as great, i.e., a golf course, etc., the impacts to the 2nd/Marlin, Harbor/SE Heron Station, and the Harbor/SE Ensign Station should not be significant.

At some point, however, growth, and additional capacity needs in this area will necessitate additional sewer infrastructure.

HYDROGEN SULFIDE:

The apparent discharge manhole appeared in good condition. See photos SHILO-4 (YB-4), SHILO-5 (YB-5), and SHILO-6 (YB-6) also attached to this report The force main was in operation when this manhole was observed. No exposed aggregate or concrete cracking was observed. No ground water infiltration was observed coming in through the base, individual manhole sections, manhole cone or the pipe collars. The steel steps going into the manhole were in good condition. A low effluent flow was observed on both the force main and the gravity side. The concrete in and around the manhole cone was probed for H2S damage. None was apparent.

Flow quantity is important. A high volume of flow over the observation period would indicate that remedial action (such as the additional sewer piping options mentioned above) would be necessary soon. However, the low flows observed indicate that the gravity and force main systems are functioning as designed.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation. Overflow would come out the top of the pump station, and flow west into Holbrook Slough, then north, toward the Columbia River.

RECOMMENDATIONS:

This station is in good condition.

- ☐ Regular maintenance, cleaning.
- ☐ An attempt should be made to obtain the correct curve for these pumps, such as outlined below.
- ☐ Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this critical station, and make it possible to use the DEQ flow rate methodology for future testing.
- ☐ If growth in the area dictates it, additional pump station(s) and force main(s) should allow this station to have sole use of the existing force main. See options above, under the heading "FORCE MAIN".
- ☐ An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared with the correct curve. This will assist long-term planning and maintenance.

END OF REPORT

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	178	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	185	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	13	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	17	inches	
Depth of fluid to pump eye (suction lift to start)	109	inches	**START**
Depth of fluid to pump eye (suction lift to stop)	128	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	20 psig	24 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	57.49 FT	66.73 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	12 psig	14 psig	
Reading adj. to impeller eye (add guage off.+start)	38.22 FT	42.84 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	20 psig	14 psig	
Reading adj. to impeller eye (add guage off.+stop)	58.28 FT	44.42 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

TDH @ pump start (at midpool)	39.01 FT	43.63 FT	taken at mid-pool, with water column moving
TDH @ pump stop	58.28 FT	44.42 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1750 RPM

Flowrate @ pump start (curve interpolation)	375 GPM	410 GPM	
Flowrate @ pump stop (curve interpolation)	380 GPM	0 GPM	
Average Flow, gpm	**378** GPM	**205** GPM	Mean

Design GPM	185 GPM	185 GPM
% of new capacity	204%	111%

Note: The above box is added to assist report writer.

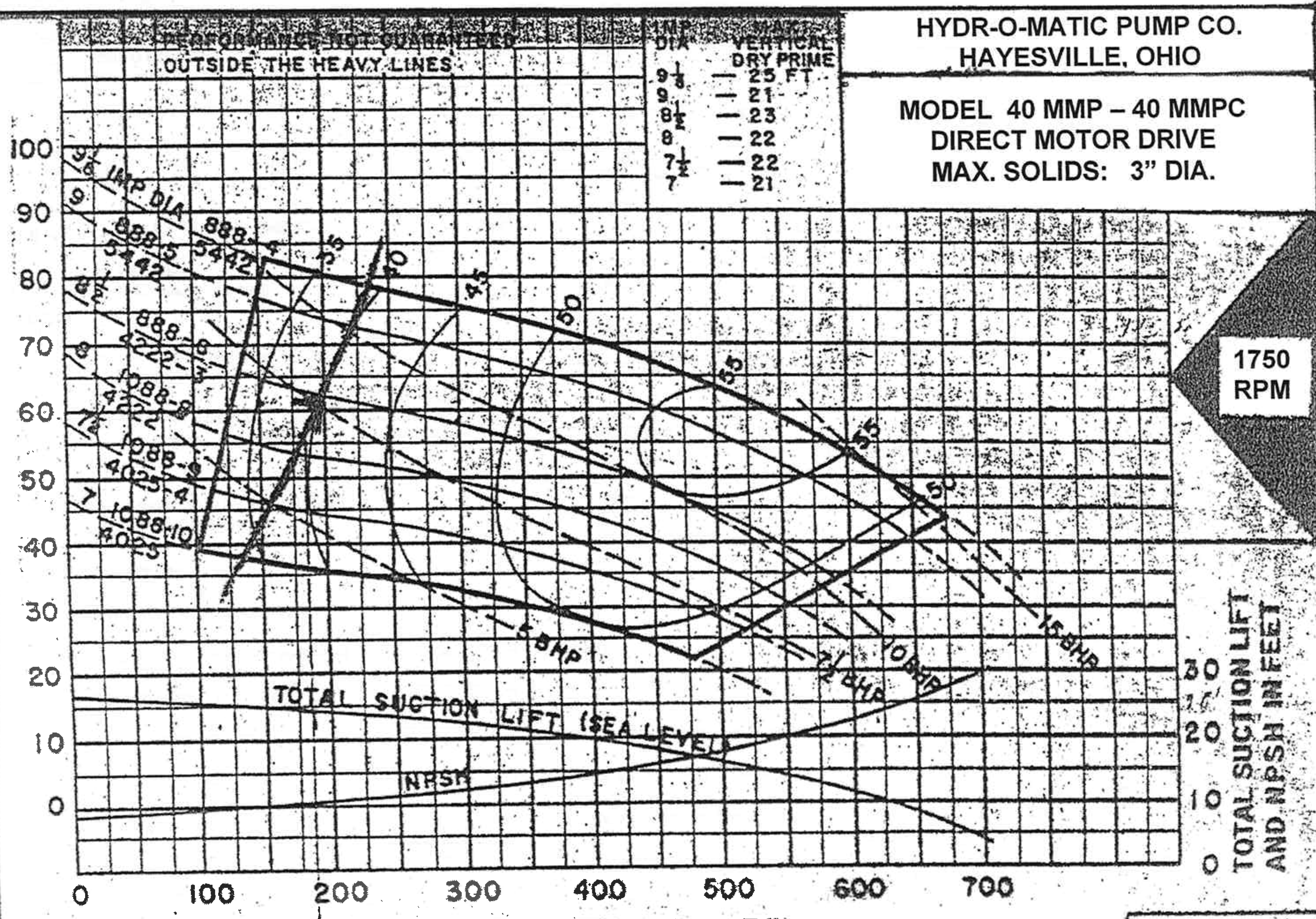
Note: No suction gauges on City of Warrenton Pump Stations.

Date of spreadsheet calcs: Jan. 9, 2002
STATION: **SHILO HOTEL PS**
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

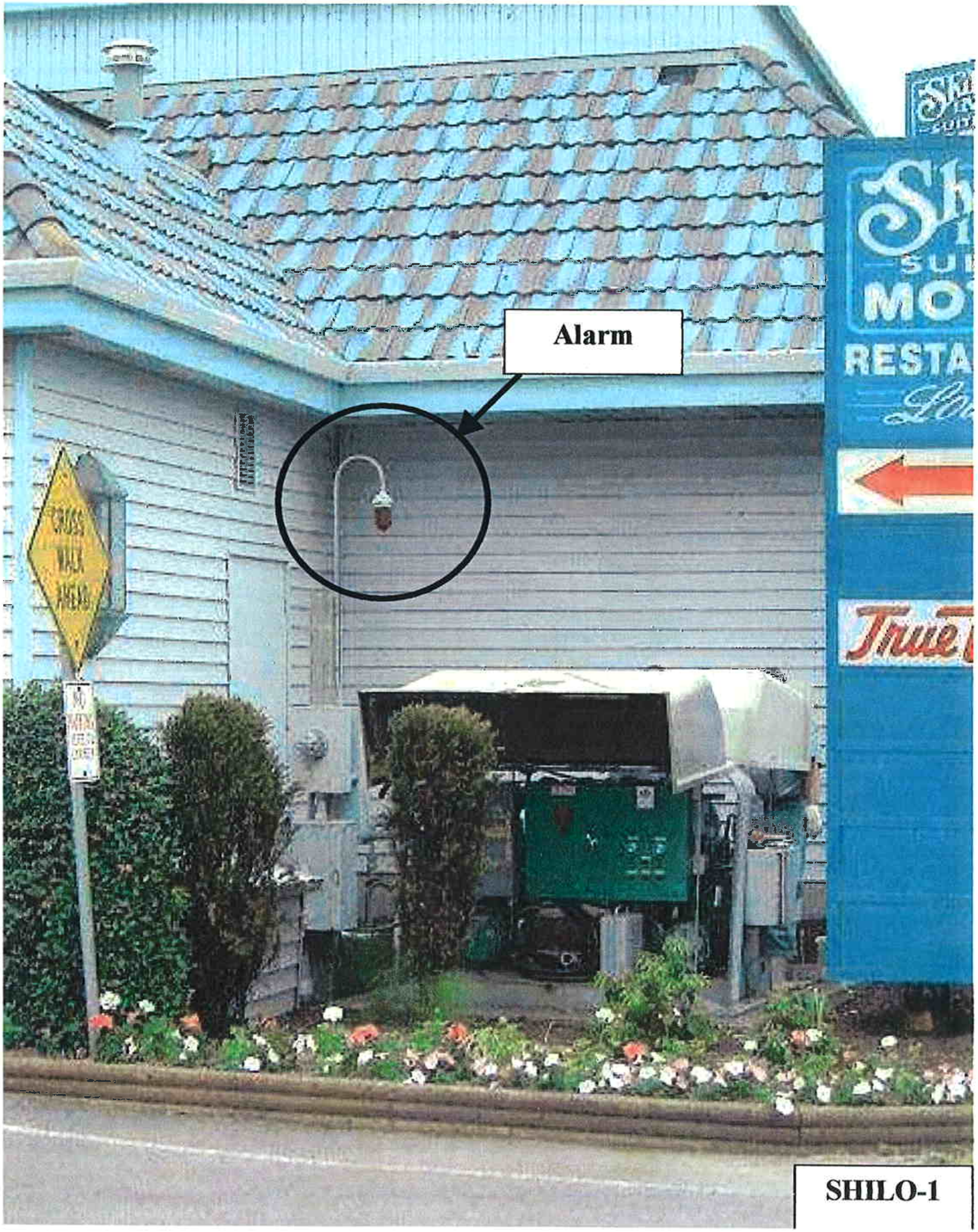
Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

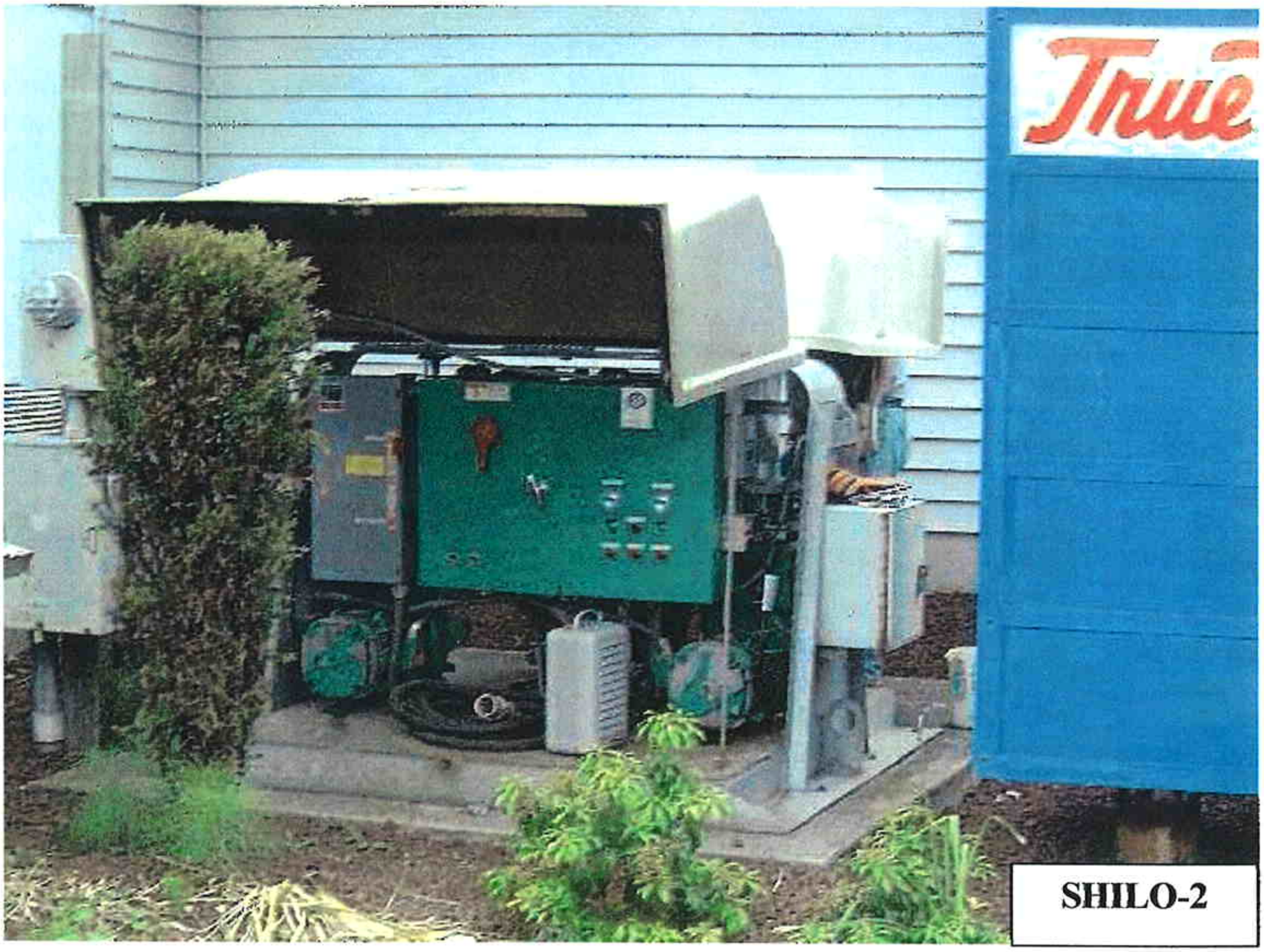
Design: 185 gpm
Design TDH: 62
Design: Impeller appears to be 8-1/2"
Design: 7.5 HP
Design: Model 182

SHILO

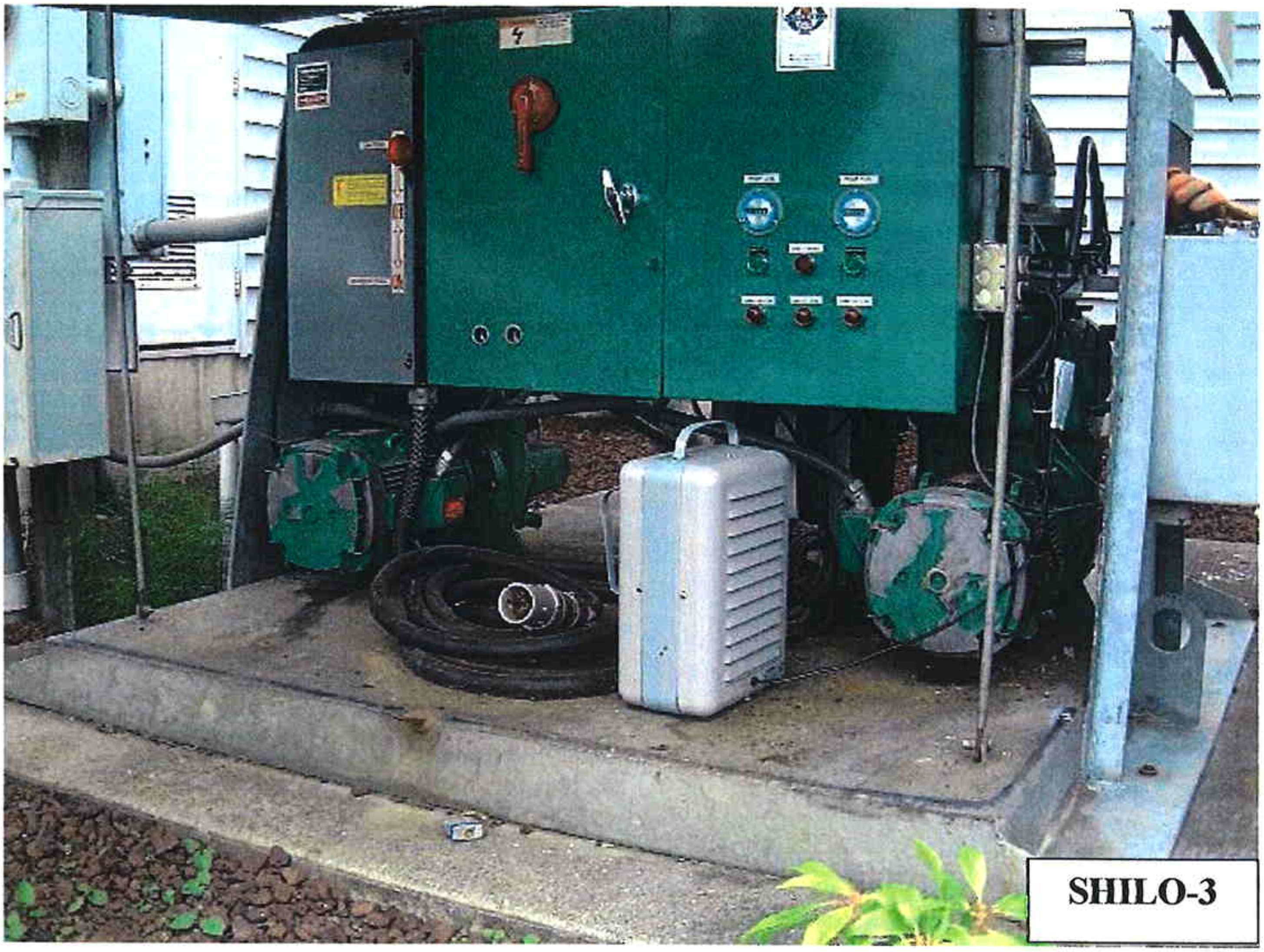


NOTE – TOTAL SUCTION LIFT CURVE MUST BE USED
TC 'RMINE MAX PUMPING CIRCUIT

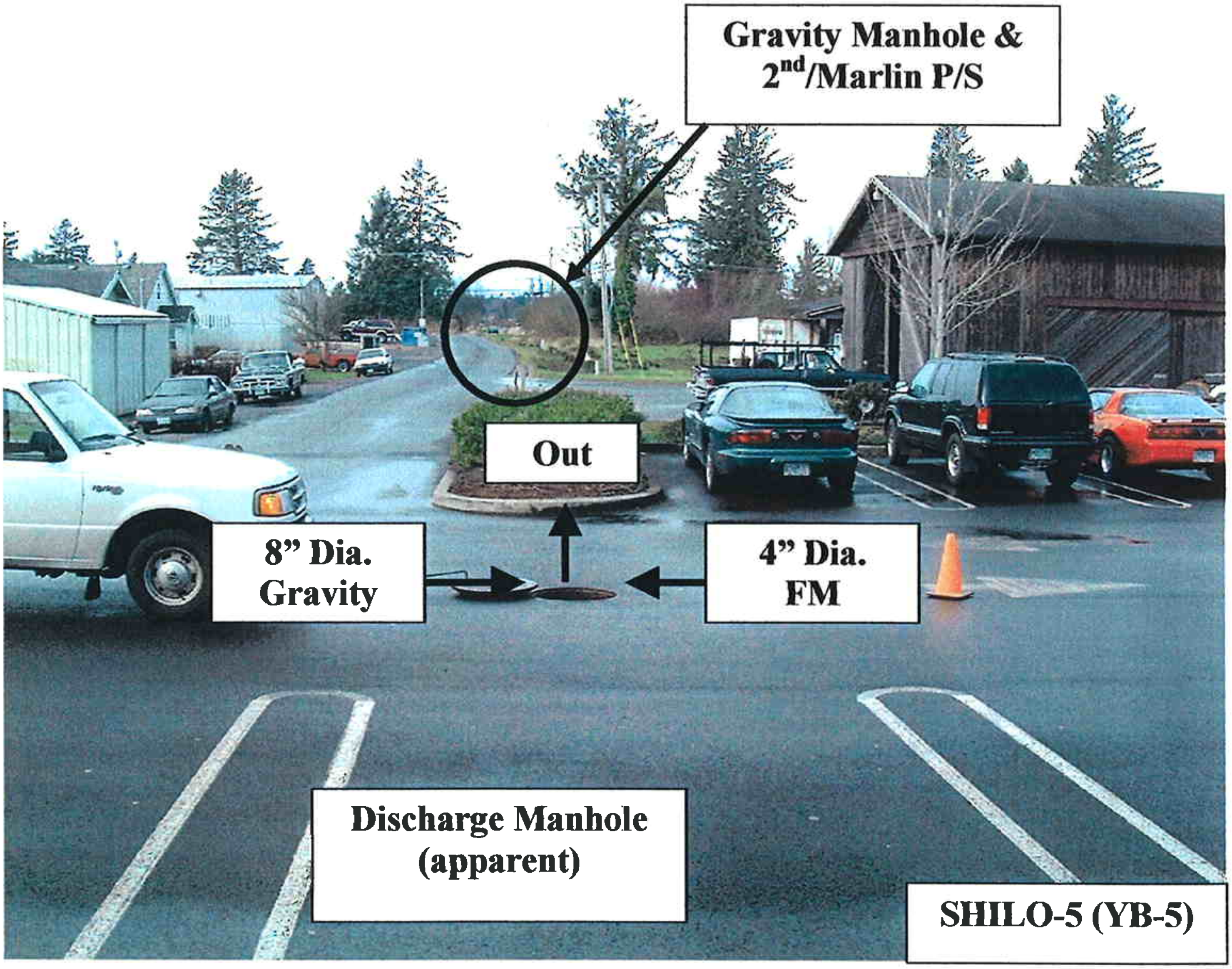

Alarm
CROSS WALK AHEAD
MOT
RESTA
SHILO-1

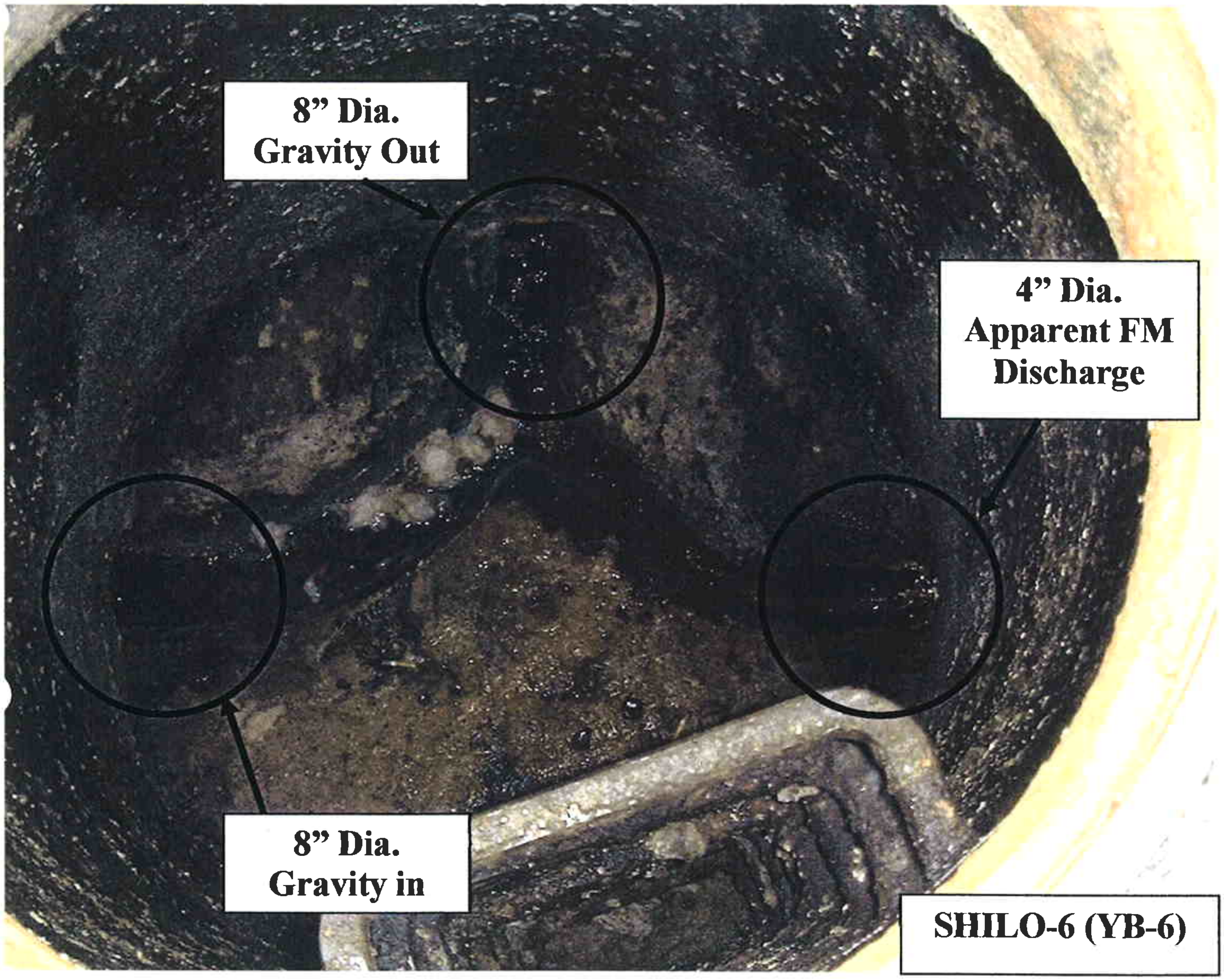


SHILO-2


SHILO-3


COSTCO TIRE
Discharge Manhole
(apparent)
SHILO-4 (YB-4)


Gravity Manhole &
2nd/Marlin P/S
Out
8" Dia.
Gravity
4" Dia.
FM
Discharge Manhole
(apparent)
SHILO-5 (YB-5)


8" Dia.
Gravity Out
4" Dia.
Apparent FM
Discharge
8" Dia.
Gravity in
SHILO-6 (YB-6)

SE Marlin / 101
Pump Station

(EWI P/S #4)

PUMP STATION REPORT

SE MARLIN/101 PUMP STATION
(Originally East Warrenton Interceptor P/S #4)

DESCRIPTION:

This pump station transfers the flows from East Warrenton and the Airport area west, under Highway 101, by force main to the 2nd & Marlin Avenue pump station. This is the fourth (of 5) pump stations, with approximate construction during 1975. A station location diagram showing the location of the original station is included with each of the five (5) reports on the East Warrenton Interceptor. This diagram also shows system flow.

This pump station is a HYDRONIX fiberglass unit station, mounted over a concrete wet well, with a split, locking fiberglass cover. See photo MAR/101-1. It is a duplex station with 5 hp direct coupled, #40 MMP, double suction, self-priming pumps.

The pump controls were visually inspected and did not appear to have any maintenance related problems such as corrosion or overheating damage of any components. The control panel appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch. See photo MAR/101-2. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational.

The discharge gate valves/force main header assembly did not have the required gauges. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flowrate Check Sheet guidelines. See photo MAR/101-3. Testing and measurements were conducted in accord with these guidelines.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, mounted inside, underneath the split, locking cover and visible in the lower right corner of photo MAR/101-3.

The alarm system is mounted on a separate pole, to the north of the station. The alarm appeared to function properly. The alarm is clearly visible from SE Marlin and Highway 101. See photo MAR/101-4. The station alarm system is also tied into a central alarm console, which is located in the City of Warrenton Public Works Shop.

No odor control equipment or air compressor is used at this pump station. A DEQ Guidelines based flow rate spreadsheet with explanatory notes was developed and is also part of and attached to this report. A pump curve and photos are attached. A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found in the East Warrenton section.

PUMP FLOWRATE/EFFICIENCIES:

See attached pump curve. The flow rate is based upon a maximum flow of 200 gpm, with a TDH of 32.5 feet. The pump flows were measured during pump station operation, per DEQ guidelines. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	209 gpm	105%	None apparent
#2	209 gpm	105%	None apparent

Explanation of the columns: Measured flow is typically from a DEQ Flow rate test, see attached spreadsheet. Percentage of new pump capacity is: Measured flow divided by new pump flow x 100. Wear in pump chamber is 100% minus % of New Pump Capacity. Note that the last column is especially important to review during annual testing.

FORCE MAIN:

The 4"ϕ PVC force main for this pump station goes under Highway 101 in an 8"ϕ x 110 foot steel casing, and continues west. Total force main length is 551.0 lineal feet.

There are no air release/vacuum breaker appurtenances on this shared force main. However, a cleanout exists on the west side of Highway 101.

Several conditions appear to be of serious concern:

1. Growth east of Highway 101: A new pump station could be placed in this area. A new force main would likely run into this station's wet well. If this came about, either through growth near the airpark, Coast Guard or others, this station's 4"ϕ force main would become too small.

2. Additional sewage loads to the City of Warrenton's WWTP from outside sources. Since the casing going under Highway 101 is 8"ϕ, the 4"ϕ force main would probably have to be replaced with a 6"ϕ or larger, force main. Anything larger than the 6"ϕ would probably have to be re-bored for a larger casing.

Of course, this scenario would have implications for the SE Second/Marlin station, Harbor/Heron station Harbor/SE Ensign station and/or their respective force mains, which would require further study.

At some point, however, growth, and additional capacity needs in this area will necessitate additional sewer infrastructure.

HYDROGEN SULFIDE:

The discharge manhole appeared in good condition. No hydrogen sulfide damage was apparent. This is a shallow manhole, and due to atmospheric exposure, none would be anticipated. No photo exists of this manhole. The force main was in operation when this manhole was observed. No exposed aggregate or concrete cracking was observed. No ground water infiltration was observed coming in through the base, individual manhole sections, manhole cone or the pipe collars. The steel steps going into the manhole were in good condition. A low effluent flow was observed on the gravity side. The concrete in and around the manhole cone was probed for H2S damage. None was apparent.

OVERFLOWS/BYPASS:

If this station were to overflow, the effluent would flow west and into the storm drain ditch along the east shoulder of 101. From there, the flows would enter the Skipanon Slough, flow north, then into the Columbia River. This station receives regular maintenance, and due to the proximity of an auxiliary generator, the overflow condition is not anticipated.

RECOMMENDATIONS:

This station is in fair condition.

- □ Regular maintenance, cleaning.
- □ If growth in the area dictates it, additional pump station(s) and force main(s) will require re-sizing the existing force main. See options above, under the heading "FORCE MAIN".
- □ An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared with the correct curve. This will assist long-term planning and maintenance.

END OF REPORT

SE MARLIN/HWY 101 LOCATION MAP

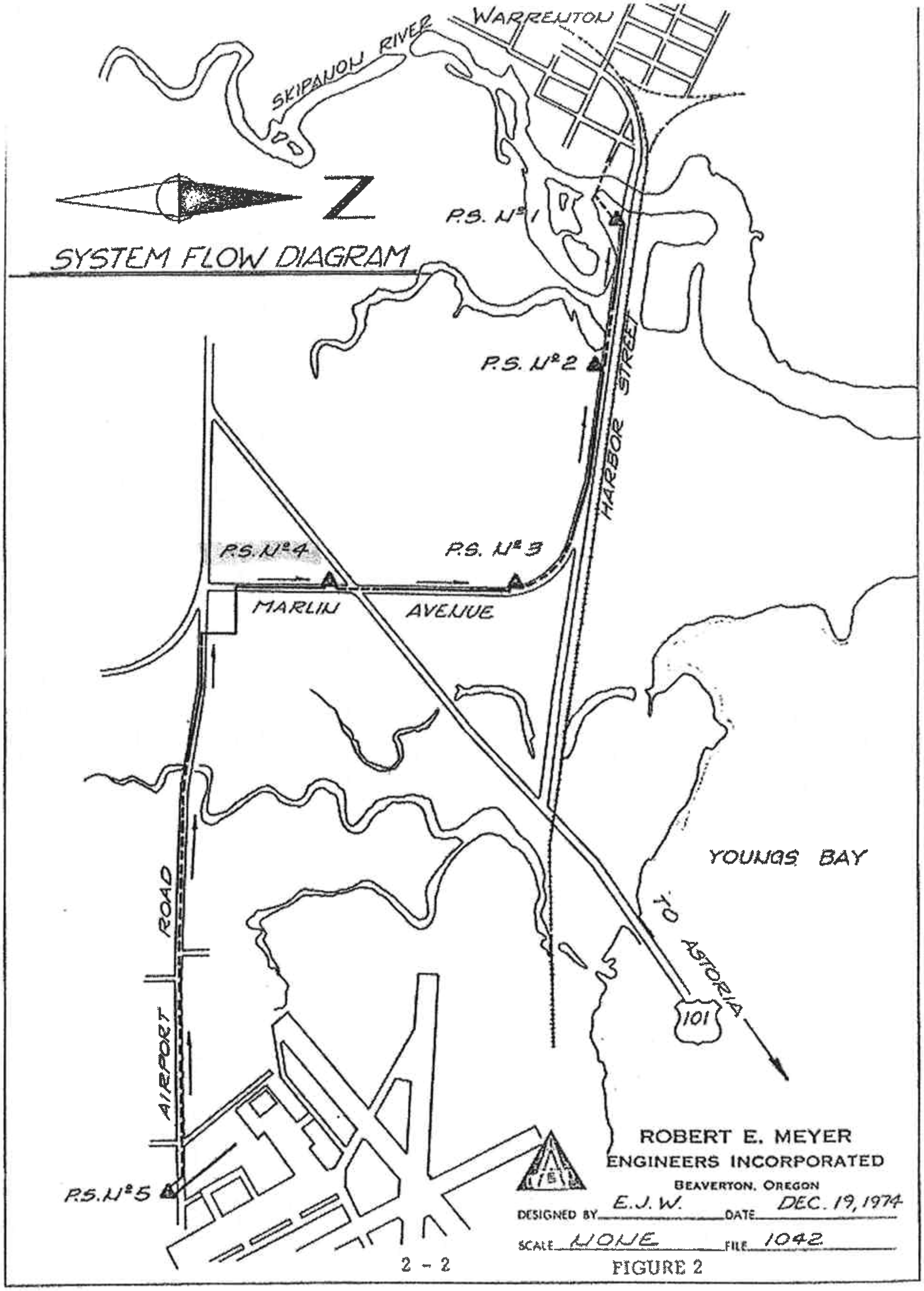


FIGURE 2

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	164	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	167	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	13	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	17	inches	
Depth of fluid to pump eye (suction lift to start)	105	inches	START
Depth of fluid to pump eye (suction lift to stop)	120	inches	STOP

PRESSURE DATA

	Pump #1	Pump #2	Note
Shutoff head, direct guage reading,	10 psig	10 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	33.89 FT	33.89 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	6 psig	6 psig	
Reading adj. to impeller eye (add guage off.+start)	24.03 FT	24.03 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	5 psig	5 psig	
Reading adj. to impeller eye (add guage off.+stop)	22.97 FT	22.97 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

	Pump #1	Pump #2	Note
TDH @ pump start (at midpool)	24.65 FT	24.65 FT	taken at mid-pool, with water column moving
TDH @ pump stop	22.97 FT	22.97 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1150 RPM

	Pump #1	Pump #2	Note
Flowrate @ pump start (curve interpolation)	180 GPM	180 GPM	
Flowrate @ pump stop (curve interpolation)	238 GPM	238 GPM	
Average Flow, gpm	**209** GPM	**209** GPM	Mean
Design GPM	200 GPM	200 GPM	Est. from curve
% of new capacity	105%	105%	

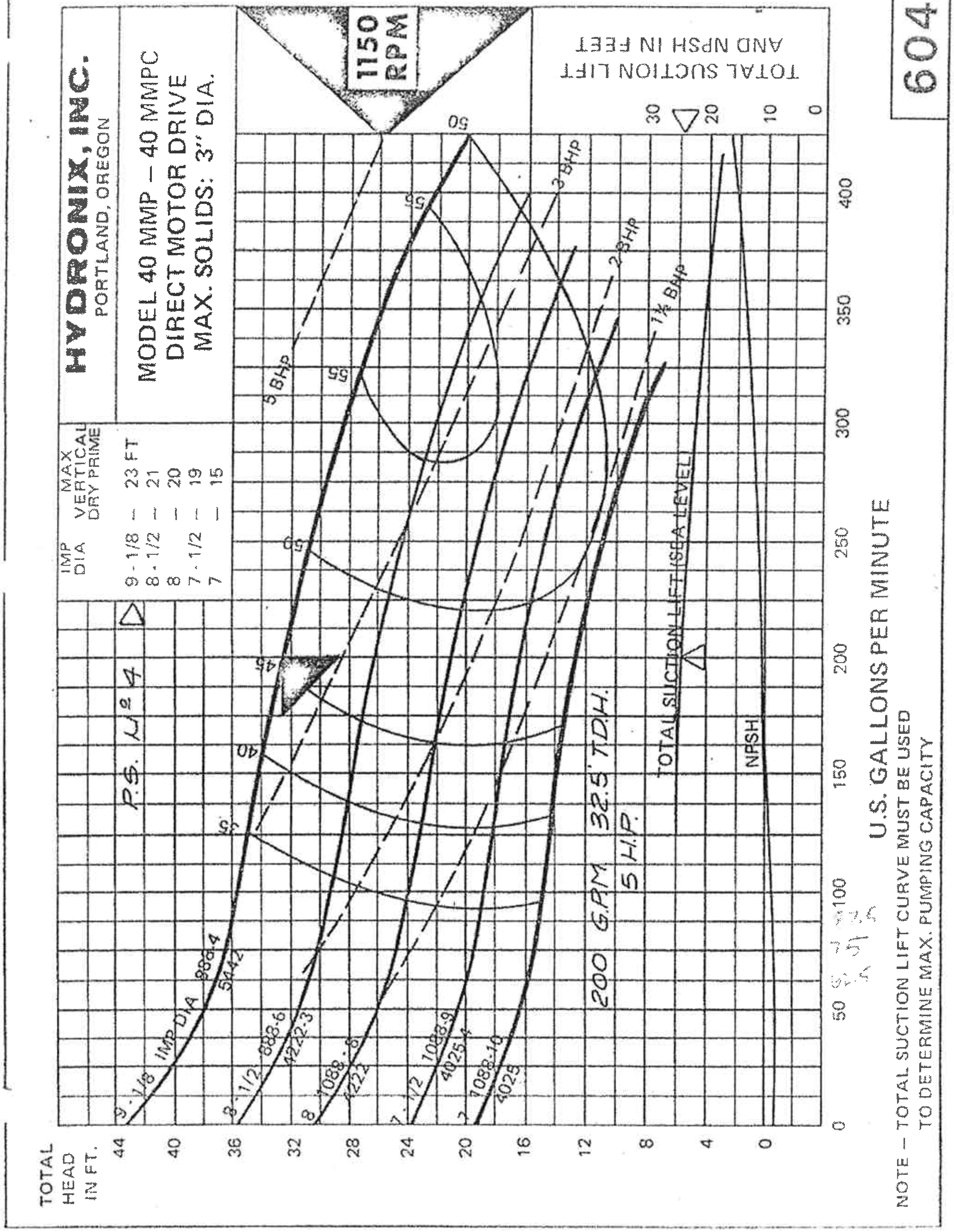
Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

Date of spreadsheet calcs: Jan. 9, 2002
This is also near Putnam Prolube
STATION: **SE MARLIN/101 PS** (orig. EWI #4)
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

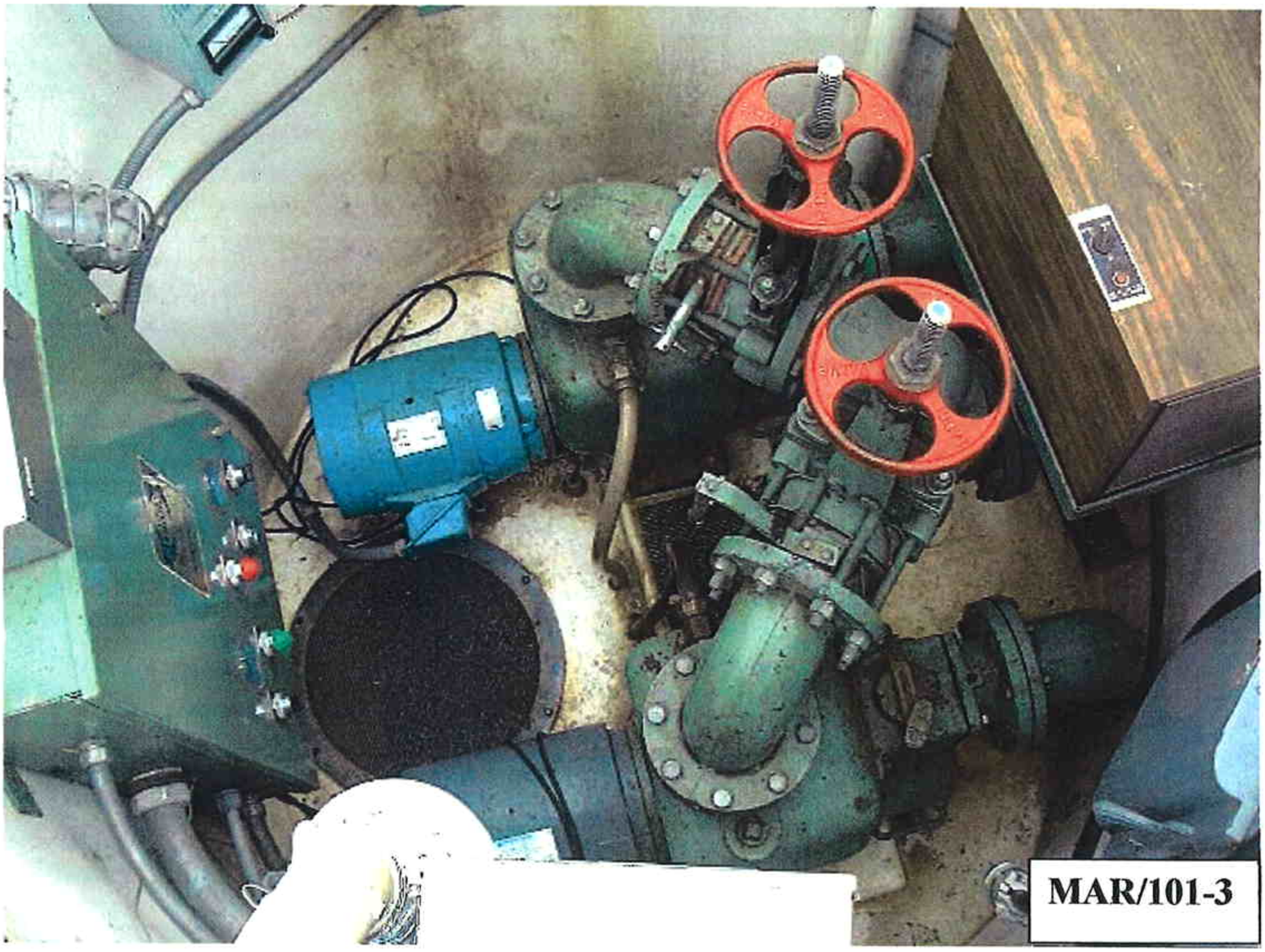
Design Head: 32.5 TDH
Impeller: 9-1/8"
5 HP

SE MARLIN & 101 (Orig. EWI #4)



MAR/101-1

MAR/101-2



MAR/101-3

MAR/101-4

SE 12th / Clatsop Airport Pump Station

(Originally East Warrenton Interceptor P/S #5)

PUMP STATION REPORT

<u>SE 12^{TH} / CLATSOP AIRPORT</u>
(Originally East Warrenton Interceptor P/S #5)

DESCRIPTION:

This pump station transfers the flows from east Warrenton area west, by force main under the Skipanon River, then south to a downtown discharge manhole. This is the fifth (of 5) pump stations in the East Warrenton Interceptor, with approximate construction during 1975. A station location diagram is included with each of the five (5) reports on the East Warrenton Interceptor. This diagram also shows system flow.

This pump station is a HYDRONIX fiberglass unit station mounted over a concrete wet well. This station has a split, locking fiberglass cover. See photo AIR-1. It is a duplex station with a 5.0 hp direct coupled, #40MMP, double suction, self-priming pumps. Both pumps have a swinging check valve installed in front of the discharge gate valve/force main header assembly. Both pumps and check valves were found to be operational. See photo AIR-2. Please note recommendations section for this station.

The discharge gate valves/force main header assembly did not have the required gauges. See photo AIR-2. Gauge port plugs on the assembly were removed, and gauges added for the testing procedure required in the DEQ Flow Rate Check Sheet guidelines. Testing and measurements were conducted in accord with these guidelines. It should be noted that this station was tested two (2) times, once with draw down testing on June 14, 2000, then tested according to the DEQ Flow rate testing procedure on December 12, 2001.

The controls were tested through operational cycling during flow rate testing. The control panel inside the station appears to be a NEMA 4, coated panel, with no corrosion evident, and with the proper sealing and panel latch.

Alternate power sources included a manual transfer switch and a receptacle for a portable plug-in generator, mounted in the equipment shelter and visible in the upper right of the photo AIR-2.

The alarm system is mounted on a separate pole, which is shown on photo AIR-3. The alarm is mounted on a pole just east of the station, and appeared to function properly. The alarm is clearly visible from SE 12^{th} Place. The station alarm system is also tied into a central alarm console, which is located in the City of Warrenton Public Works Shop.

No odor control equipment or air compressor are used at this pump station.

Note that since the original five pump stations were constructed in 1975, ***two (2) additional*** pump stations have been added in the East Warrenton Interceptor area. They are the Young's Bay Plaza station and the Shilo station. The sewage flows from these two (2) stations ***increase the loading*** on the East Warrenton Interceptor.

The East Warrenton Interceptor Construction drawings and pump station O&M manuals for the five (5) original stations were available at the City of Warrenton Public Works building.

A specific equipment inventory for this pump station is contained in the spreadsheet, "PUMP STATION INVENTORY.XLS" found at the beginning of the east Warrenton section. The format of this spreadsheet is taken from the current DEQ Guidelines. The pump curve, photos, and a location map of the pump station are attached. A DEQ Guidelines based flow rate spreadsheet with explanatory notes was developed and is also part of and attached to this report.

PUMP FLOWRATE/EFFICIENCIES:

It was possible to apply the original pump curve to the DEQ Flow rate spreadsheet. See attached pump curve, obtained from the O&M manual. From the O&M manual, the station should have 5.0 hp motors with 9-1/8" impellers.

Based upon a design maximum flow rate of 200 gpm, the design TDH is 33.0 feet for a new pump. Since the pumps were operating on this curve, it was possible to use the original curve. The attached DEQ flow rate spreadsheet is included for its shutoff head information, and also future testing and measurements. Measured pump flows at this station were as follows:

Pump	Measured Flow	% of New Pump Capacity	Wear In Pump chamber
#1	150 gpm	75 %	25 %
#2	150 gpm	75 %	25 %

Explanation of the columns: Measured flow is typically from a DEQ flowrate test, see attached spreadsheet. Percentage of new pump capacity is: New pump flow divided by measured flow x 100. Wear in pump chamber is 100% minus % of New Pump Capacity x 100. Note that the last column is especially important to review during annual testing.

FORCE MAIN:

Total length of the force main is approximately 4,367 feet. This force main is constructed of 6"ϕ PVC. Two (2) vent and cleanout assemblies exist near the intersection of Airport Road (12th Place) and Alternate 101 to Miles Crossing. The force main discharges into a shallow manhole.

HYDROGEN SULFIDE:

The discharge manhole appeared in good condition. No hydrogen sulfide damage was evident. The force main was in operation when this manhole was observed. No exposed aggregate or concrete cracking was observed. No ground water infiltration was observed coming in through the base, individual manhole sections, manhole cone or the pipe collars. The steel steps going into the manhole were in good condition. No photo exists of this discharge manhole.

OVERFLOWS/BYPASS:

By default, the actual ground elevation at the pump station is the overflow elevation, should the pump station overflow. If the station wet-well was surcharged, the overflow would come out the top of the pump station wet well, flowing over and into the sandy ground surface. This condition is not anticipated though, due the alarm system and availability of a portable generator set.

RECOMMENDATIONS:

This station is in poor condition.

- □ Regular maintenance, cleaning. Repair of the station humidifier.

- □ A regularly scheduled check of the vents on the force main.

- □ I/I is damaging this station through excessive electrical use, excessive pump wear, and excessive station maintenance. Since this is the last station on the East Warrenton Interceptor, all I/I flows also contribute to the degradation of all five (5) stations.

- □ As soon as possible, through coordination with the City's pump supplier, the 5.0 hp motors should be tested and the results should indicate whether or not a change should be made. Both impellers should be matched. This is indicated by the lower pumping rates and wear in the pump chambers. The hour meters indicate that these pumps are running excessive amounts and during some cycles, even together, when they should be alternating.

- □ Through electrical current draw testing, by pump supplier, wire-to-water efficiency and pumping rates can be developed. A new pump curve should be developed. Both pumps/impellers should then be tested at this time and in accord with the DEQ flow rate test method, and the spreadsheet should have the information recorded. This will establish new flow baseline measurements for this critical station, and make it possible to use the DEQ flow rate methodology for future testing.

- □ An annual test of this station should be made, using the methodology developed for this report. Pump capacities should be recorded and compared. This will assist long-term planning and maintenance.

END OF REPORT

AIRPORT (Orig. EWI #5) LOCATION MAP

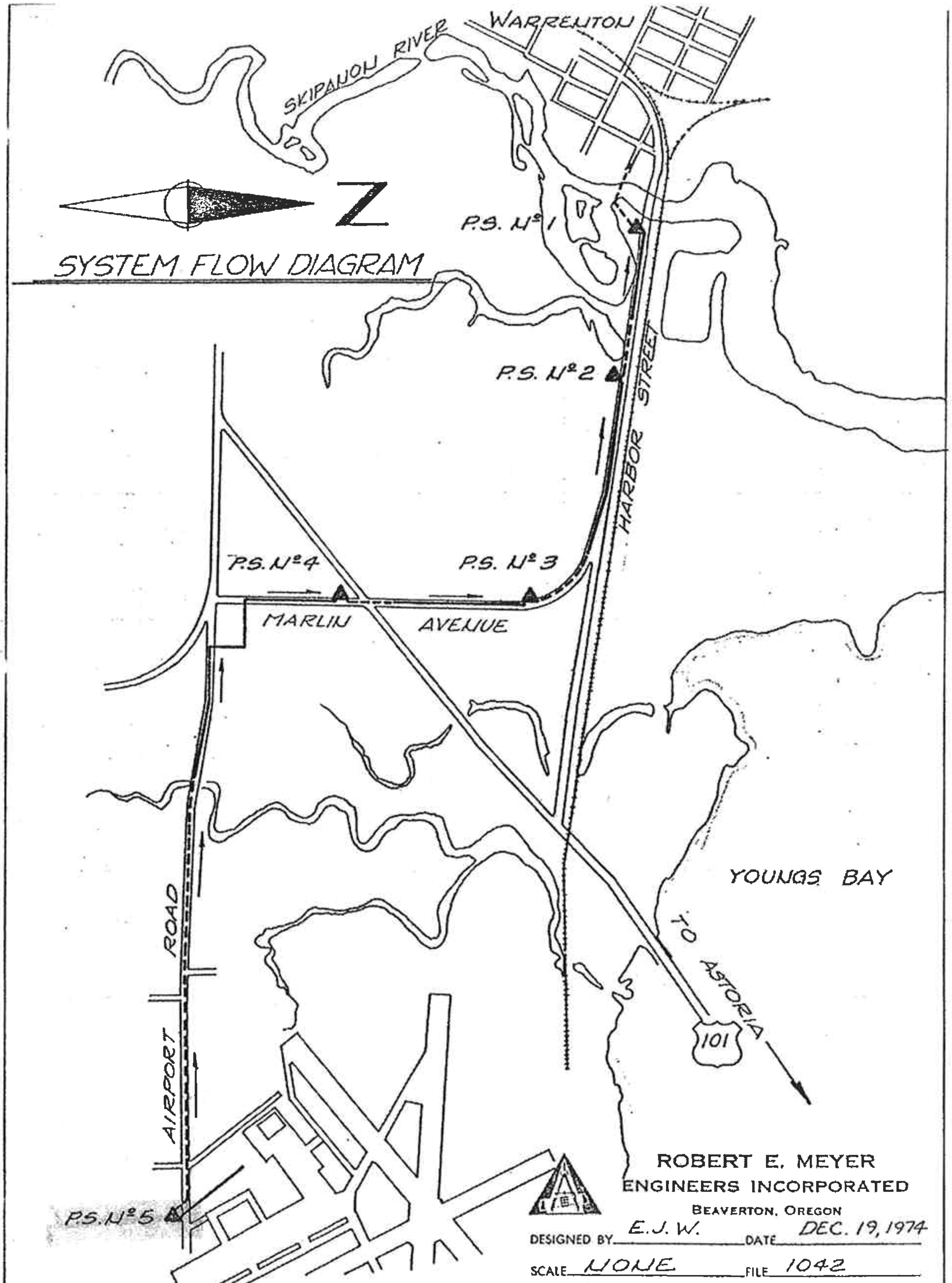


FIGURE 2

DEQ - FLOW RATE CHECK FOR SUCTION PUMPS

FIELD DATA

USER INPUTS IN COLORED BOXES ONLY!

Depth of wetwell to datum	160	inches	(Datum, top of wetwell, pump mounts)
Suction pipe to pump eye	163	inches	(Datum, top of wetwell, pump mounts)
Impeller eye elevation above datum	9	inches	(May be same as pump eye to datum)
Offset of pressure guage to pump eye	27	inches	
Depth of fluid to pump eye (suction lift to start)	124	inches	**START**
Depth of fluid to pump eye (suction lift to stop)	139	inches	**STOP**

PRESSURE DATA

	Pump #1	*Pump #2*	
Shutoff head, direct guage reading,	9 psig	11 psig	MAX CAPACITY
Shutoff head, translated to eye of pump+mid-pool	34.00 FT	38.62 FT	psig*2.31 + guage offset from eye + suction lift@start + mid-pool. **(TRACE SHUTOFF HEAD INTO CURVE)**
Discharge head			
Guage reading @ pump start, psig	6 psig	7 psig	
Reading adj. to impeller eye (add guage off.+start)	26.44 FT	28.75 FT	psig*2.31+guage offset + start
Guage reading @ pump stop	6 psig	7 psig	
Reading adj. to impeller eye (add guage off.+stop)	27.69 FT	30.00 FT	psig*2.31 + guage offset + stop

TOTAL DYNAMIC HEAD

TDH @ pump start (at midpool)	27.07 FT	29.38 FT	taken at mid-pool, with water column moving
TDH @ pump stop	27.69 FT	30.00 FT	**(TAKE THESE NUMBERS INTO CURVE)**

FLOWRATE DATA @ Pump RPM of: 1150 RPM

Flowrate @ pump start (curve interpolation)	150 *GPM*	150 *GPM*	
Flowrate @ pump stop (curve interpolation)	150 *GPM*	150 *GPM*	
Average Flow, gpm	**150** *GPM*	**150** *GPM*	Mean
Design GPM	200 *GPM*	200 *GPM*	
% of new capacity	75%	75%	

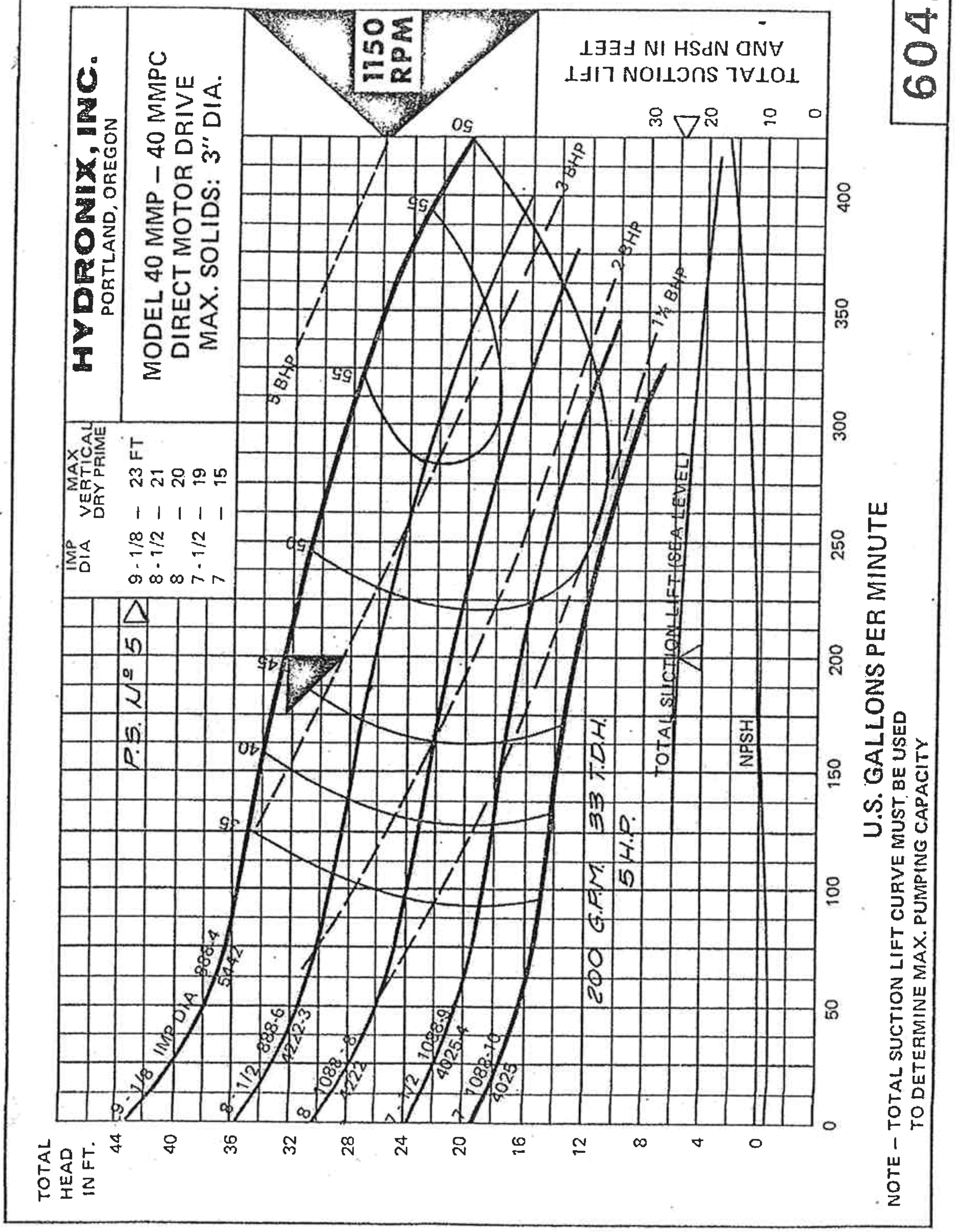
Note: The above box is added to assist report writer.
Note: No suction gauges on City of Warrenton Pump Stations.

Date of spreadsheet calcs: Jan. 9, 2002
This is also near Putnam Prolube
STATION: **AIRPORT PS** (orig. EWI #5)
CURVE Yes - attached
DATE OF FIELD TESTING: Dec. 11, 2001
FIELD PERSON: GGL CHECKED BY:

Note:
This spreadsheet and the notes that follow off of the spreadsheet in this column are based on the DEQ Guidelines, "O&M NOTES FOR GAUGES ON SEWAGE PUMPS"

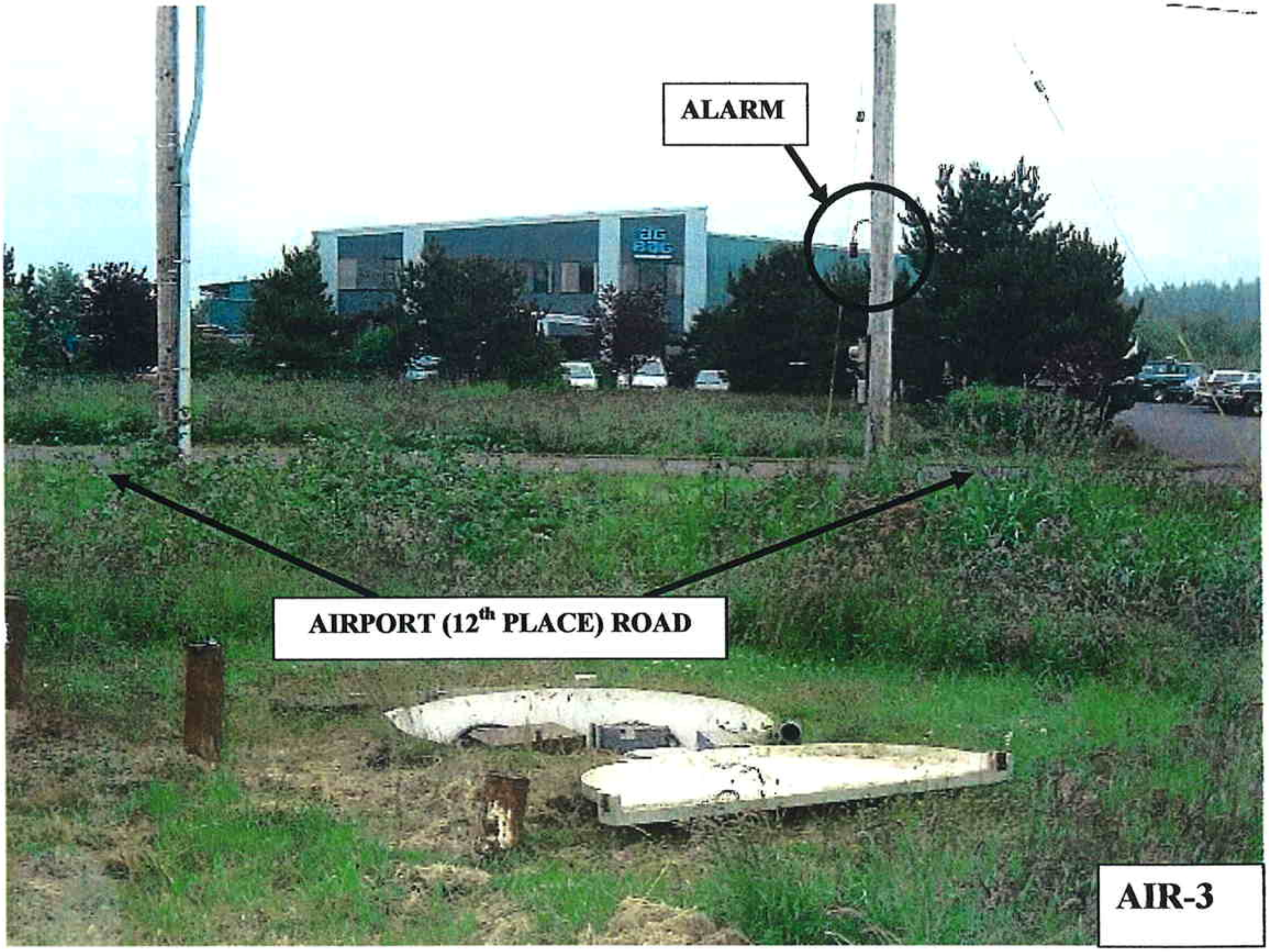
Design Head: 33 TDH
Impeller: 9-1/8"
5 HP

AIRPORT (Orig. EWI #5)



AIR-1

AIR-2


ALARM
AIRPORT (12th PLACE) ROAD
AIR-3

APPENDIX – M
(Wastewater Treatment Plant Monitoring Report – DMR's for 2000 & 2001)

Discharge Monitoring Report - Oregon Department of Environmental Quality

lity Name	Warrenton	Phone Number	503-861-2233	Month/Year	Jan 2000
Permit No.	100874	DEQ File No./Facility ID	93769	EPA Reference No.	OR-002087-7
Type	Two Cell Lagoon	County	Clatsop	Population Served	4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager
Authorized Signature Date

Terry M. Ager
Name (Print)

Operator Certification

ection Sys. Class	II	Principal Operator Name (print)	Terry Ager	Certification No. & Grade	7159/II
atment Sys. Class	I	Principal Operator Name (print)	Terry Ager	Certification No. & Grade	7514/II

INFLUENT / **EFFLUENT** (identify outfall number -- e.g. 001, 002, 003):

Date	Infl. Temperature °F/°C	Infl. pH S.U.	Infl. Flow MGD	Infl. BOD Concentration (Grab) mg/L	Infl. BOD Loading (Comp.) lbs.	Infl. CBOD mg/L	Infl. TSS Concentration (Grab) mg/L	Infl. TSS Loading (Comp.) lbs.	Effl. Temperature °F/°C	Effl. pH S.U.	Effl. Flow MGD	Effl. DO mg/L	Effl. BOD Concentration (Grab) mg/L	Effl. BOD Removal %	Effl. BOD Loading (Comp.) lbs.	Effl. CBOD Concentration (Grab) mg/L	Effl. CBOD Removal %	Effl. CBOD Loading (Comp.) lbs.	Effl. TSS Concentration (Grab) mg/L	Effl. TSS Removal %	Effl. TSS Loading (Comp.) lbs.
1		6.4	1.00								0										
2		6.6	1.02								0										
3		6.7	1.04								0										
4		6.4	1.14	130	1236		140	1331			0										
5		6.4	1.23	160	1641		160	1641			0										
6		6.7	1.25	400	4170		130	1355			0										
7		6.5	1.22							7.6	0.04										
8		6.4	1.27							7.6	0.26										
9		6.5	1.33							7.5	0.54										
10		6.5	1.31							7.2	0.96										
11		[illegible].7	0.90	210	1576		98	736		7.3	1.79										
12		6.4	0.50	130	542		110	459		7.2	1.43										
13		6.6	0.33	96	264		95	261		7.0	1.62		4	96	54				12	87	162
14		6.2	0.69							7.3	1.66										
15		6.6	0.81							7.6	1.69										
16		6.4	0.84							7.3	1.73										
17		6.5	0.92							7.4	1.77										
18		6.5	0.90	210	1576		1260	9458		7.4	1.76										
19		6.7	0.50	90	375		82	342		7.7	1.67										
20		6.4	0.90	60	450		75	563		7.9	1.51		10	83	126				22	71	277
21		6.6	0.50							7.6	1.46										
22		6.5	0.33							7.8	1.42										
23		6.8	0.50							7.7	0.91										
24		6.5	0.33							7.5	0.20										
25		6.7	0.33	240	661		140	385		7.6	0.08										
26		6.4	0.33	100	275		116	319			0										
27		6.6	0.90	12	90		78	585			0										
28		6.5	0.59								0										
29		6.8	0.69								0										
30		6.6	0.76								0										
31		6.4	0.81								0										
TOTAL			25.17	1838	12856		2484	17435			22.42		14		180				34		439
DAILY MINIMUM			0.33	12	90		78	261		7.0	0.04		4		54				12		162
DAILY MAXIMUM			1.33	400	4170		1260	9458		7.9	1.79		10		126				22		277
WEEKLY AVG. MAX.																					
MONTHLY AVG.			0.81	153	1071		207	1452			1.18		7	90	90				17	79	220
DAILY LIMITS															225						375
WEEKLY LIMITS															167						300
MONTHLY LIMITS										6/9			30	85	112				50	65	188

Date	Total Phosphorus (Grab) mg/L	Total Kjeldahl Nitrogen mg/L	Ammonia Nitrogen (Composite) mg/L	Nitrate Nitrogen mg/L	Chlorine Used lbs.	Chlorine Total Residual mg/L	UV Trans-mittance %		Turbidity N.T.U	E.coli CFU/100 ml	Fecal CFU/100 ml	Total CFU/100 ml	Ammonia	Dilution	Stream Flow CFS	Temperature °F/°C	pH S.U.	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					0													
2					0													
3					0													
4					0													
5					0													
6					0													On Cl_2 4 lbs
7					4	4.3												
8					4	3.5												
9					4	2.7												
10					4	2.0												New Inf. on/No record
11					4	0.5												* Inf. Flow/Instant-
12					4	0.7												aneous (No totalizer)
13					4	0.6					0							
14					4	0.6												
15					4	0.5												
16					4	0.6												
17					4	0.4												
18					4	0.5												
19					4	0.6												
20					4	0.5					0							Up Cl_2
21					10	0.9												
22					10	1.6												
23					10	1.9												
24					10	2.5												
25					0													
26					0													
27					0													
28					0													
29					0													
30					0													
31					0													*
TOTAL					96						0							TOTAL
DAILY MINIMUM					0	0.4					0							DAILY MINIMUM
DAILY MAXIMUM					10	4.3					0							DAILY MAXIMUM
WEEKLY AVERAGE MAX.																		WEEKLY AVERAGE MAX.
MONTHLY AVERAGE					5.35	1.38					0							MONTHLY AVERAGE
DAILY LIMITS																		DAILY LIMITS
WEEKLY LIMITS											400							WEEKLY LIMITS
MONTHLY LIMITS											200							MONTHLY LIMITS

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name	Warrenton	Phone Number	503-861-0914	Month/Year	Mar-00
DEQ Permit No.	100874	DEQ File No./Facility ID	93769	EPA Reference No.	OR-002087-7
Plant Type	Two Cell Lagoon	County	Clatsop	Population Served	4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager 4-15
Authorized Signature Date

Terry Ager
Name (Print)

Operator Certification

Collection Sys. Class II Principal Operator Name (print) Terry Ager Certification No. & Grade 7159/II
Treatment Sys. Class I Principal Operator Name (print) Terry Ager Certification No. & Grade 7512/II

INFLUENT / EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Influent Temperature °F/°C	Influent pH (S.U.)	Influent Flow (MGD)	Influent BOD Concentration (mg/L)	Influent BOD Loading (lbs.)	Influent CBOD (mg/L)	Influent TSS Concentration (mg/L)	Influent TSS Loading (lbs.)	Effluent Temperature °F/°C	Effluent pH (S.U.)	Effluent Flow (MGD)	DO (mg/L)	Effluent BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	Effluent TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)
1	12°	6.8	0.59	190	935		96	472	9°	7.5	1.13										
2	12°	6.6	0.64	190	1014		93	496	9°	7.3	1.18		36	81	354				20	78	300
3	12°	6.7	0.57						9°	7.5	.615										
4	12°	6.7	0.54						9°	7.5	.615										
5	12°	6.9	0.92						10°	7.7	.615										
6	12°	7.4	0.71						11°	7.9	.615										
7	12°	6.9	0.75	190	1186		170	1063	10°	7.6	.615										
8	12°	6.7	0.66						10°	7.5	.330										
9	12°	7.3	0.65	150	813		150	813	11°	7.7	.347		20	87	58				9	94	26
10	12°	6.9	0.65						11°	7.4	.347										
11	12°	6.8	0.66						11°	7.6	.363										
12	13°	6.7	0.67						11°	7.5	.363										
13	13°	6.9	0.67						11°	7.9	.363										
14	13°	6.7	0.85	160	1134		160	1134	11°	7.9	.379										
15	12°	6.9	0.69	160	921		88	506	10°	7.5	.385										
16	12°	6.9	0.75	140	876		113	707	11°	7.6	.400		13	91	43				7	94	23
17	12°	7.1	0.77						11°	7.7	.395										
18	13°	6.8	0.78						11°	7.4	.428										
19	12°	6.7	0.78						11°	7.4	.428										
20	12°	6.9	0.78						11°	7.4	.428										
21	13°	6.9	0.78	180	1171		250	1626	11°	7.6	.435		8	96	29				13	95	47
22	13°	7.0	0.78	150	976		110	716	10°	7.3	.415										
23	13°	6.9	0.66	110	605		91	501	11°	7.2	.365		10	91	30				4	95	12
24	13°	7.2	0.66						11°	7.4	.445										
25	13°	6.7	0.75						11°	7.5	.481										
26	13°	6.9	0.75						11°	7.5	.481										
27	12°	7.1	0.75						11°	7.5	.481										
28	13°	7.1	0.67	170	950		130	726	10°	7.3	.461										
29	13°	7.0	0.66	140	771		220	1211	11°	7.7	.460										
30	13°	7.1	0.62						12°	7.5	.461										
31	13°	7.3	0.62						12°	7.6	.461										
TOTAL			21.74	1930	11354		1671	9241			15.43		87		514				53		408
DAILY MINIMUM			0.59	110	605		88	472			.330		8		29				4		12
DAILY MAXIMUM			0.92	190	1188		250	1626			1.18		36		354				20		300
WKLY. AVG. MAX.																					
MONTHLY AVG.			0.70	161	946		139	770			.498		17.4	89	103				10.6	91	81.6
DAILY LIMITS																					
WEEKLY LIMITS																					
MONTHLY LIMITS										6/9			30	85	112				50	65	118

NUTRIENTS / DISINFECTION / COLIFORM / RECEIVING STREAM / DAILY LOG

Date	Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	E.coli (CFU/100 ml)	Fecal (CFU/100 ml)	Total (CFU/100 ml)	Ammonia	Dilution	Stream Flow (CFS)	Temperature	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					6	0.7												
2					6	0.8					4							+ Decrease Effluent
3					5	0.6												Drop Cl2 to 5#
4					5	0.7												
5					5	0.6												
6					4	0.6												
7					5	0.5												Decrease Efflu[illegible]
8					4	0.8												
9					5	0.9					0							Drop Cl2 to 3#
10					3	0.7												
11					3	0.7												
12					3	0.7												
13					3	0.6												
14					3	0.6												
15					3	0.7												
16	-				3	0.6					0							-
17					3	0.6												
18					3	0.5												
19					3	0.7												
20					4	0.7												
21					2	0.6												
22					3	0.7												
23					3	0.6					0							
24					3	0.7												
25					2	0.5												
26					3	0.7												
27					3	0.6												
28					3	0.7												
29					3	0.7												
30					3	0.6												
31					4	0.7												
TOTAL					111	20.4					4							TOTAL
DAILY MINIMUM					2	0.5					0							DAILY MINIMUM
DAILY MAXIMUM					6	0.9					4							DAILY MAXIMUM
WEEKLY AVERAGE MAX.																		WEEKLY AVERAGE MAX.
MONTHLY AVERAGE					3.58	0.65					2							MONTHLY AVERAGE
DAILY LIMITS																		DAILY LIMITS
WEEKLY LIMITS											400							WEEKLY LIMITS
MONTHLY LIMITS											200							MONTHLY LIMITS

DMR PG1.XLS

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name	Warrenton	Phone Number	503 861-0914	Month/Year	Feb 00
DEQ Permit No.	100374	DEQ File No./Facility ID	93167	EPA Reference No.	OR-0020371-7
Type	Two Cell-Lagoon	County	Clatsop	Population Served	4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — 3-6-00 Date

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class	II	Principal Operator Name (print)	Terry Ager	Certification No. & Grade	7159/II
Treatment Sys. Class	I	Principal Operator Name (print)	Terry Ager	Certification No. & Grade	7512/II

INFLUENT / **EFFLUENT** (identify outfall number -- e.g. 001, 002, 003):

Date	Influent Temperature (°F/°C)	Influent pH (S.U.)	Influent Flow (MGD)	Influent BOD Concentration (mg/L)	Influent BOD Loading (lbs.)	Influent CBOD (mg/L)	Influent TSS Concentration (mg/L)	Influent TSS Loading (lbs.)	Effluent Temperature (°F/°C)	Effluent pH (S.U.)	Effluent Flow (MGD)	Effluent DO (mg/L)	Effluent BOD Concentration (mg/L)	Effluent BOD Removal (%)	Effluent BOD Loading (lbs.)	Effluent CBOD Concentration (mg/L)	Effluent CBOD Removal (%)	Effluent CBOD Loading (lbs.)	Effluent TSS Concentration (mg/L)	Effluent TSS Removal (%)	Effluent TSS Loading (lbs.)
1		7.0	0.92	190	1458		83	637			0										
2		6.7	1.04	140	1214		130	1128		7.3	0.19										
3		6.7	0.54	96	432		70	315		7.2	0.23		6	94	11.5				16	77	30.6
4		6.6	0.41							7.5	0.27			ok	F						
5		6.3	0.67							7.4	0.38										
6		6.8	0.90							7.2	0.38										
7		6.7	1.18							7.2	0.51										
8		6.7	0.41	170	581		152	520		7.3	0.51										
9		6.7	0.56	250	1168		220	1027		7.3	0.46										
10		6.6	0.64	96	512		85	454		7.1	0.51		8	92	34				16	81	68
11		7.0	1.04							7.4	0.51			ok	F						
12		6.9	0.92							7.5	0.57										
13		6.8	0.79							7.4	0.55										
14		7.5	0.69							7.7	0.57										
15	13°	6.8	0.90	220	1651		120	901	8°	7.3	0.59										
16		6.8	0.92	120	921		92	706		7.5	0.62										
17	13°	6.8	1.21	100	1009		86	868	9°	7.7	0.60		13	87	65				20	77	100
18	13°	6.8	0.52						8°	7.8	0.48			ok	F						
19		6.9	0.50							7.8	0.55										
20		6.6	0.61							7.7	0.55										
21		6.7	0.50							7.7	0.55										
22	12°	6.9	0.59	100	492		83	408	9°	7.7	0.55										
23	12°	6.8	0.45	170	638		100	375	9°	7.8	0.64										
24	12°	6.7	0.66	140	771		110	605	9°	7.9	0.66		20	86	110				16	85	80
25	12°	6.8	0.95						8°	7.6	0.63			ok	F						
26	12°	6.7	0.64						8°	7.8	0.69										
27	13°	6.7	0.71						9°	7.6	0.75										
28	13°	6.9	0.76						9°	7.7	0.72			PERMIT						PERMIT	
29	12°	6.7	0.37						9°	7.7	1.20										
30																					
31																					
TOTAL			21.00	1792	10847		1331	7944			15.42		47	85%	2205		6		68	65%	278.6
DAILY MINIMUM			0.37	96	432		70	315		7.1	0.19		6		11.5				16		30.6
MAXIMUM			1.21	250	1458		220	1128		7.9	1.20		20		110				20		100
WKLY. AVG. MAX.															ok F						
MONTHLY AVG.			0.72	149	904		111	662			0.55		7	90	55 < 112				17	80	70 < 188
DAILY LIMITS															225 DRY W. FLOW						375 DRY W. FLOW
WEEKLY LIMITS															169						300
MONTHLY LIMITS										6/9			30	85	112				50	65	188

Date	Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	E.coli (CFU/100 ml)	Fecal (CFU/100 ml)	Total (CFU/100 ml)	Receiving Stream Ammonia	Dilution	Stream Flow (CFS)	Temperature	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.	Date
1					0	0													1
2					4	2.4													2
3					4	1.6					0								3
4					4	1.2													4
5					3	0.9													5
6					4	0.3												Up CL - 5 LBS	6
7					5	0.6													7
8					5	0.7													8
9					5	0.5													9
10					4	0.6					0								10
11					5	0.7													11
12					5	0.6													12
13					5	0.5													13
14					5	0.7													14
15					5	0.8													15
16					6														16
17					5	0.6					0								17
18					5	0.9													18
19					5	0.7													19
20					5	0.7													20
21					4	0.8													21
22					5	0.8													22
23					5	0.7													23
24					5	0.7					80								24
25					4	0.7													25
26					5	0.6													26
27					5	0.5													27
28					5	0.6													28
29					6	0.5													29
30																			30
31																			31
					133						80							TOTAL	
					3	0.3					0							DAILY MINIMUM	
					6	2.4					80							DAILY MAXIMUM	
																		WEEKLY AVERAGE MAX.	
					4.75	0.7					3							MONTHLY AVERAGE	
																		DAILY LIMITS	
											400							WEEKLY LIMITS	
											200							MONTHLY LIMITS	

7/30/97 ALAN PUT A HOLD ON AERATION WORK UNTIL FURTHER NOTICE. 3-8-00

DMR_PG1.XLS

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton | Phone Number: 503-861-0914 | Month/Year: Apr. 1 - 00
DEQ Permit No.: 100874 | DEQ File No./Facility ID: 93769 | EPA Reference No.: OR-0020877
Plant Type: Two Cell Lagoon | County: Clatsop | Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — Date: 5-17-00

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II
Treatment Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7511/II

INFLUENT / EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Influent Temperature (°F/°C)	Influent pH (S.U.)	Influent Flow (MGD)	BOD Concentration (mg/L)	BOD Loading (lbs.)	CBOD (mg/L)	TSS Concentration (mg/L)	TSS Loading (lbs.)	Effluent Temperature (°F/°C)	Effluent pH (S.U.)	Effluent Flow (MGD)	DO (mg/L)	BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)
1		6.9	0.60							7.5	.459										
2		7.0	0.60							7.4	.459										
3		7.3	0.60							7.4	.459										
4		7.4	0.62	120	620		156	807		[redacted]											
5		7.1	0.59	96	472		120	590		7.5	.450										
6		7.3	0.63	150	788		160	841		7.5	.475		4	97	15.8				11	93	43.5
7		7.3	0.65							7.5	.698										
8		7.3	0.65							7.5	.698										
9		7.4	0.65							7.5	.698										
10		7.3	0.65							7.5	.698										
11		7.3	0.65	180	976		170	922		7.5	.698										
12		7.3	0.55	210	963		190	872		7.5	1.62										
13		7.1	0.48	160	641		100	400		7.4	1.25										
14		6.8	0.90							7.7	1.94										
15		7.0	0.68							7.5	1.36										
16		6.9	0.68							7.5	1.36										
17		7.3	0.68							7.5	1.36										
18		7.1	0.61	120	610		78	397		7.4	1.74										
19		7.2	0.61	160	814		160	814			0										
20		7.0	0.62	120	620		98	507			0										
21		7.3	0.57								0										
22		7.3	0.63								0										
23		7.3	0.63								0										
24		7.3	0.63								0										
25		7.1	0.66	140	771		91	501			0										
26		6.8	0.69	130	748		110	633			0										
27		7.0	0.62	130	672		80	414			0										
28		6.9	0.76								0										
29		6.9	0.68								0										
30		7.2	0.68								0										
31																					
TOTAL			19.25	1716	8695		1513	7698			16.9		4		15.8				11		43.5
DAILY MINIMUM			0.48	96	472		78	397		7.4	0										
DAILY MAXIMUM			0.90	210	976		190	922		7.7	1.74										
WKLY. AVG. MAX.																					
MONTHLY AVG.			0.64	143	725		126	257			.939		4	97	15.8				11	93	43.5
DAILY LIMITS																					
WEEKLY LIMITS																					
MONTHLY LIMITS										6/9			30	85	112				50	65	118

Date	Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	E.coli (CFU/100 ml)	Fecal (CFU/100 ml)	Total (CFU/100 ml)	Receiving Stream Ammonia	Dilution	Stream Flow (CFS)	Temperature	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					3	0.7												
2					3	0.6												
3					4	0.6												
4					[redacted]													
5					3	0.7												
6					3	0.5					0							Up Effluent +
7					6	0.9												up Cl2 to 6 lbs
8					6	0.8												
9					5	0.9												
10					6	0.9												
11					6	0.7												Up Effluent +
12					8	0.5												up Cl2 to 8 lbs
13					7	0.6					300							
14					8	0.6												
15					8	0.7												
16					8	0.9												
17					8	0.6												Up Effluent
18					8	0.7												Stop Effluent +
19					0	-												Stop Cl2 flow
20					0	-												
21					0	-												
22					0	-												
23					0	-												
24					0	-												
25					0	-												
26					0	-												
27					0	-												
28					0	-												
29					0	-												
30					0	-												
31																		
TOTAL					103						300							
DAILY MINIMUM					3						0							
DAILY MAXIMUM					8						300							
WEEKLY AVERAGE MAX.																		
MONTHLY AVERAGE					5.7						150							
DAILY LIMITS																		
WEEKLY LIMITS											400							
MONTHLY LIMITS											200							

7/30/97

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
DEQ Permit No.: 100874
Plant Type: Two Cell Lagoon
Phone Number: 503-861-0914
DEQ File No./Facility ID: 93769
County: Clatsop
Month/Year: May - 00
EPA Reference No.: OR-002087-7
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — 6-8- — Date

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II

Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7512/II

EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

INFLUENT

Date	Temperature °F/°C	pH (S.U.)	Flow (MGD)	BOD Concentration (mg/L)	BOD Loading (lbs.)	CBOD (mg/L)	TSS Concentration (mg/L)	TSS Loading (lbs.)
1		7.0	0.68					
2		7.0	0.57	180	856		150	713
3		7.0	0.65	170	922		140	759
4		6.9	0.51	110	468		120	510
5		7.1	0.68					
6		7.0	0.63					
7		6.8	0.63					
8		6.8	0.63					
9		6.9	0.60	210	1051		150	751
10		6.7	0.70	330	1927		130	759
11		6.9	0.59	110	541		76	374
12		7.1	0.70					
13		7.0	0.70					
14		7.1	0.70					
15		7.1	0.70					
16		7.0	0.63	200	1051		270	1419
17		6.8	0.54	520	2341		190	856
18		6.8	0.54	90	405		46	207
19		6.9	0.67					
20		7.0	0.67					
21		6.7	0.67					
22		6.7	0.67					
23		6.9	0.61	170	865		170	865
24		7.0	0.62	150	776		200	1034
25		6.7	0.60	100	500		200	1001
26		6.9	0.60					
27		7.0	0.62					
28		6.7	0.70					
29		6.7	0.68					
30		6.8	0.64					
31		6.6	0.59	190	935		210	1033
TOTAL			19.92	2530	12,638		2052	10,281
DAILY MINIMUM			0.57	90			46	207
DAILY MAXIMUM			0.70	520			270	1419
WKLY. AVG. MAX.								
MONTHLY AVG.			0.64	195	972		158	791
DAILY LIMITS								
WEEKLY LIMITS								

EFFLUENT

Date	Temperature °F/°C	pH (S.U.)	Flow (MGD)	DO (mg/L)	BOD Grab/Comp. Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)
1			⊖										
2			⊖										
3			⊖										
4			⊖										
5		7.4	0.30										
6		7.0	0.25										
7		7.3	0.25										
8		7.3	0.25										
9		7.3	0.25										
10		7.4	0.25										
11		7.2	0.23		⊖	100	⊖				3	96	6
12		7.4	0.28										
13		7.4	0.28										
14		7.2	0.28										
15		7.2	0.28										
16		7.3	0.28										
17		7.4	0.26										
18		7.7	0.26		12	87	26				18	61	39
19		7.7	0.30										
20		7.4	0.30										
21		7.4	0.30										
22		7.4	0.30										
23		7.4	0.51										
24		7.7	0.51										
25		7.5	0.50		4	96	17				6	97	25
26		7.4	0.50										
27		7.6	0.51										
28		7.6	0.50										
29		7.7	0.50										
30		7.4	0.50										
31		7.4	0.50										
TOTAL			9.43		16		33				27		70
DAILY MINIMUM		7.0	⊖		⊖		⊖				3		6
DAILY MAXIMUM		7.7	0.51		12		26				18		39
WKLY. AVG. MAX.													
MONTHLY AVG.			0.34		5	94	14				9	85	23
DAILY LIMITS													
WEEKLY LIMITS													

Date	Nutrients Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrate Nitrogen	Disinfection Chlorine Used (lbs.)	Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	Coliform E.coli (CFU/100 ml)	Fecal	Total	Receiving Stream Ammonia	Dilution	Stream Flow (CFS)	Temperature °F/°C	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1																		
2																		
3																		
4																		* Start Discharge
5					3	0.7												Cl2 at 3 LBS
6					3	0.8												
7					3	0.7												
8					4	0.7												
9					3	0.6												
10					3	0.8												
11					4	0.8					⊖							
12					3	0.5												
13					3	0.7												
14					3	0.7												
15					4	0.7												
16					4	0.6												
17					3	0.8												
18					3	0.8					⊖							
19					3	0.7												
20					3	0.7												
21					4	0.7												
22					3	0.6												* Up Cl2 to 4 LBS
23					4	0.5												Up Effluent
24					4	0.4												
25					4	0.5					⊖							
26					4	0.5												
27					5	0.4												
28					4	0.6												
29					4	0.5												
30					4	0.5												
31					4	0.4												
TOTAL					96						⊖							TOTAL
DAILY MINIMUM					3	0.4					⊖							DAILY MINIMUM
DAILY MAXIMUM					5	0.8					⊖							DAILY MAXIMUM
WKLY. AVG. MAX.																		WEEKLY AVERAGE MAX.
MONTHLY AVG.					3.55	0.6					⊖							MONTHLY AVERAGE
DAILY LIMITS																		DAILY LIMITS
WEEKLY LIMITS											400							WEEKLY LIMITS

MONTHLY LIMITS

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton | Phone Number: 503-861-0914 | Month/Year: June-00
DEQ Permit No.: 100874 | DEQ File No./Facility ID: 93769 | EPA Reference No.: OR-002087-7
Plant Type: Two Cell Lagoon | County: Clatsop | Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

X Terry M. Ager — Authorized Signature — Date: 7-6-

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II | Principal Operator Name (print): Terry Ager | Certification No. & Grade: 7159/II
Treatment Sys. Class: I | Principal Operator Name (print): Terry Ager | Certification No. & Grade: 7511/II

0K98

INFLUENT / EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Infl. Temperature (°F/°C)	Infl. pH (S.U.)	Infl. Flow (MGD)	Infl. BOD Concentration (mg/L)	Infl. BOD Loading (lbs.)	Infl. CBOD (mg/L)	Infl. TSS Concentration (mg/L)	Infl. TSS Loading (lbs.)	Eff. Temperature (°F/°C)	Eff. pH (S.U.)	Eff. Flow (MGD)	DO (mg/L)	Eff. BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)	Total Phosphorus (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	E.coli (CFU/100 ml)	Fecal (CFU/100 ml)	Total (CFU/100 ml)	Ammonia	Dilution	Stream Flow (CFS)	Temperature (°F/°C)	pH (S.U.)	DAILY LOG Regarding breakdowns bypassing, odors, complaints, etc.
1		6.9	0.56	110	514		106	495		7.6	0.50		5	95	21				0	100	0					4	0.6					0							
2		6.8	0.57							7.4	0.50															4	0.4												
3		7.1	0.59							7.3	0.50															4	0.6												
4		6.9	0.60							7.3	0.50															5	0.5												
5		6.9	0.59							7.5	0.50															4	0.5												
6		6.7	0.60	190	951		170	851		7.4	0.50															3	0.6												
7		6.7	0.60	200	1001		200	1001		7.6	0.49															4	0.5												
8		6.7	0.60	170	851		230	1151		7.4	0.49		4	98	16				0	100	0					4	0.6					4							
9		6.9	0.60							7.4	0.50															4	0.5												
10		6.6	0.64							7.6	0.52															4	0.5												
11		6.5	0.78							7.5	0.54															4	0.4												
12		6.6	1.09							7.7	0.71															5	0.6												Up Eff / Up Cl
13		6.9	0.93							7.6	1.20															7	0.5												Up Eff / Up Cl
14		6.7	0.87							7.7	1.24															7	0.6												
15		6.6	0.75	110	688		94	588		7.9	1.19		32	71	316				8	91	79					6	0.7					0							
16		6.6	0.72							7.4	1.10															7	0.8												
17		6.5	0.65							7.6	0.94															7	0.6												
18		6.7	0.67							7.6	0.92															7	0.8												Drop Cl to 6
19		6.9	0.64							7.7	0.80															6	0.7												
20		6.9	0.62	130	672		116	600		7.5	0.82															6	0.9												
21		6.9	0.62							7.5	0.87															7	0.7												
22		6.9	0.63	78	410		87	457		7.4	0.86		10	87	72				13	85	93					6	0.6					4							
23		6.7	0.62							7.6	0.87															6	0.7												
24		6.7	0.62							7.6	0.87															5	0.6												
25		6.4	0.63							7.6	0.86															6	0.7												
26		6.5	0.62							7.7	0.86															6	0.7												
27		6.5	0.68							7.6	0.90															6	0.6												
28		6.7	0.52							7.5	0.76															6	0.7												
29		6.7	0.51							7.7	0.75															6	0.8												
30		6.7	0.62							7.7	0.87															6	0.8												
31																																							
TOTAL			19.74	988	5089		1003	5143			22.93		51		425				21		172					162						8							TOTAL
DAILY MINIMUM			0.56	78	410		87	457		7.3	0.49		4		16				0		0					3	0.4					0							DAILY MINIMUM
DAILY MAXIMUM			1.09	200	1001		230	1151		7.9	1.24		32		316				13		93					7	0.8					4							DAILY MAXIMUM
WKLY. AVG. MAX.																																							WEEKLY AVERAGE MAX
MONTHLY AVG.			0.65	141	727		143	735			0.76		13	88	106				5	94	43					5.4	0.6					4							MONTHLY AVERAGE
DAILY LIMITS																																							DAILY LIMITS
WEEKLY LIMITS																																							WEEKLY LIMITS
MONTHLY LIMITS										[illegible]			[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]																		

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
DEQ Permit No.: 100874
Plant Type: Two Cell Lagoon

Phone Number: 503-861-0914
DEQ File No./Facility ID: 93769
County: Clatsop

Month/Year: July-00
EPA Reference No.: OR-002087-7
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

X Terry Ager — Authorized Signature — Date: 8-4-0

Terry Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II

Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7512/II

INFLUENT / EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Influent Temperature (°F/°C)	Influent pH (S.U.)	Influent Flow (MGD)	Influent BOD Concentration (mg/L)	Influent BOD Loading (lbs.)	Influent CBOD (mg/L)	Influent TSS Concentration (mg/L)	Influent TSS Loading (lbs.)	Effluent Temperature (°F/°C)	Effluent pH (S.U.)	Effluent Flow (MGD)	DO (mg/L)	BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)	Total Phosphorus (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)	Turbidity (N.T.U)	Coliform E.coli (CFU/100 ml)	Coliform Fecal (CFU/100 ml)	Coliform Total (CFU/100 ml)	Receiving Stream Ammonia	Dilution	Stream Flow (CFS)	Temperature (°F/°C)	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1		6.9	0.59							7.5	0.76															6	0.8											
2		6.7	0.58							7.7	0.76															6	0.8											
3		7.0	0.58							7.5	0.76															6	0.9											
4		6.9	0.63							7.4	0.27															4	1.3											Close Eff/Cl2 o
5		6.9	0.62	250	1293		340	1758			0															0												
6		6.8	0.59	220	1083		270	1329			0															0												
7		6.9	0.59								0															0												
8		6.7	0.59								0															0												
9		6.7	0.60								0															0												
10		6.7	0.59								0															0												
11		6.9	0.49	240	981		280	1144			0															0												
12		6.6	0.56	220	1027		340	1588			0															0												
13		6.8	0.55	230	1055		520	2385			0															0												
14		6.8	0.55								0															0												
15		6.9	0.56								0															0												
16		6.7	0.57								0															0												
17		6.7	0.57								0															0												
18		6.9	0.55	260	1193		600	2752			0															4												Open Eff/Cl2 at
19		6.6	0.54							7.4	0.28															4	0.6											
20		6.8	0.65	220	1193		250	1355		7.5	0.29		12	95	29				39	84	94					5	0.4				110							
21		6.7	0.52							7.4	0.30															6	0.4											
22		6.9	0.57							7.7	0.51															8	0.6											
23		6.7	0.57							7.5	0.51															8	0.7											
24		6.8	0.57							7.4	0.51															8	0.5											
25		6.8	0.62	220	1138		280	1448		7.4	0.52															7	0.5											
26		6.6	0.51	240	1021		400	1701		7.5	0.48															8	0.6											
27		6.7	0.52	310	1344		830	3600		7.4	0.50		40	87	167				68	92	284					8	0.5				50							
28		6.9	0.55							7.4	0.50															8	0.6											
29		6.6	0.56							7.6	0.49															8	0.6											
30		6.8	0.56							7.5	0.50															7	0.5											
31		6.8	0.57							7.5	0.49															8	0.5											
TOTAL			17.67	2410	11328		4110	19060			7.92		52		196				107		378					119					160							TOTAL
DAILY MINIMUM			0.49	220	981		250	1144		7.4	~~0.27~~		12		29				39		94					0	0											DAILY MINIMUM
DAILY MAXIMUM			0.65	310	1344		830	3600		7.7	0.76		40		167				68		284					8	1.3											DAILY MAXIMUM
WKLY. AVG. MAX.																																						WEEKLY AVERAGE MAX.
MONTHLY AVG.			0.57	241	1133		411	1906			~~0.45~~ .46		26	91	98				53.5	88	189					3.83	0.63				80							MONTHLY AVERAGE
DAILY LIMITS																																						DAILY LIMITS
WEEKLY LIMITS																																						WEEKLY LIMITS
MONTHLY LIMITS										6/9			30	85	112				50	65	188										200							MONTHLY LIMITS

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
DEQ Permit No.: 100874
Plant Type: Two Cell Lagoon
Phone Number: 503-861-0914
DEQ File No./Facility ID: 93769
County: Clatsop
Month/Year: August-00
EPA Reference No.: OR-0020877
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager
Authorized Signature
9-8-[illegible]
Date
Terry M. Ager
Name (Print)

Operator Certification

Collection Sys. Class: II Principal Operator Name (print): Terry Ager Certification No. & Grade: 7159/II
Treatment Sys. Class: I Principal Operator Name (print): Terry Ager Certification No. & Grade: 7512/II

INFLUENT

Date	Temperature °F/°C	pH (S.U.)	Flow (MGD)	BOD Concentration (mg/L)	BOD Loading (lbs.)	CBOD (mg/L)	TSS Concentration (mg/L)	TSS Loading (lbs.)
1		6.7	0.57					
2		6.7	0.58					
3		6.8	0.54	290	1306		470	2117
4		6.9	0.51					
5		6.6	0.57					
6		6.7	0.54					
7		6.7	0.55					
8		6.9	0.54					
9		6.7	0.56	250	1168		310	1448
10		6.6	0.55	250	1147		340	1560
11		6.3	0.54					
12		6.7	0.57					
13		6.5	0.59					
14		6.7	0.58					
15		6.5	0.51	350	1489		408	1735
16		6.8	0.56	200	934		156	729
17		6.8	0.55	210	963		174	798
18		6.7	0.56					
19		6.8	0.58					
20		6.9	0.57					
21		6.7	0.58					
22		6.7	0.60	190	950		250	1251
23		6.8	0.56	220	1027		300	1401
24		6.6	0.56	190	950		280	1308
25		6.7	0.57					
26		6.5	0.55					
27		6.7	0.54					
28		6.7	0.54					
29		6.7	0.53	150	663		120	530
30		6.6	0.52	230	997		280	1214
31		6.8	0.52					
TOTAL			17.19	2530	11594		3088	14091
DAILY MINIMUM			0.51	150	934		120	530
DAILY MAXIMUM			0.60	350	1489		470	2117
WKLY. AVG. MAX.								
MONTHLY AVG.			0.55	230	1054		281	1281
DAILY LIMITS								
WEEKLY LIMITS								
MONTHLY LIMITS								

EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Temperature °F/°C	pH (S.U.)	Flow (MGD)	DO (mg/L)	BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)
1		7.5	0.49										
2		7.4	0.49										
3		7.5	0.49		43	85	176				40	91	163
4		7.7	0.48										
5		7.5	0.48										
6		7.4	0.48										
7		7.4	0.49										
8		7.4	0.48										
9		7.3	0.48										
10		7.2	0.50		27	89	113				30	91	125
11		7.5	0.47										
12		7.4	0.48										
13		7.4	0.47										
14		7.3	0.48										
15		7.1	0.30										
16		7.3	0.31										
17		7.2	0.30		27	87	68				46	74	115
18		7.5	0.31										
19		7.5	0.31										
20		7.5	0.30										
21		7.4	0.31										
22		7.2	0.32										
23		7.3	0.31										
24		7.5	0.31		24	87	62				56	80	145
25		7.2	0.32										
26		7.4	0.31										
27		7.4	0.31										
28		7.3	0.31										
29		7.2	0.32										
30		7.4	0.33										
31		7.3	0.33										
TOTAL			12.07		121		419				172		548
DAILY MINIMUM			0.30		24		62				30		115
DAILY MAXIMUM			0.50		43		176				56		163
WKLY. AVG. MAX.													
MONTHLY AVG.			0.389		30	87	105				43	84	137
DAILY LIMITS													
WEEKLY LIMITS													
MONTHLY LIMITS					30	85	112				50	65	188

NUTRIENTS / DISINFECTION / COLIFORM / RECEIVING STREAM

Date	Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	E.coli (CFU/100 ml)	Fecal (CFU/100 ml)	Total (CFU/100 ml)	Ammonia	Dilution	Stream Flow (CFS)	Temperature °F/°C	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					8	0.5												
2					8	0.5												
3					8	0.4					240							
4					9	0.4												
5					10	0.5												Up Cl2 to 10 L[illegible]
6					9	0.3												
7					11	0.5												Up Cl2 to 11 L[illegible]
8					11	0.3												
9					14	0.4												Up Cl2 to 14 L[illegible]
10					14	0.4					70							
11					14	0.6												
12					14	0.5												
13					13	0.5												
14					14	0.6												
15					10	0.4												Drop Effluent a[illegible]
16					10	0.5												
17					9	0.4					30							
18					10	0.4												
19					10	0.5												
20					9	0.5												
21					10	0.6												
22					10	0.4												
23					10	0.4												
24					10	0.5					23							
25					11	0.5												
26					10	0.5												
27					10	0.4												
28					10	0.4												
29					10	0.4												
30					10	0.3												
31					10	0.4												
TOTAL					326						363							
DAILY MINIMUM					8	0.3					23							
DAILY MAXIMUM					14	0.6					240							
WEEKLY AVERAGE MAX.																		
MONTHLY AVERAGE					10.51	0.45					91							
DAILY LIMITS																		
WEEKLY LIMITS											400							
MONTHLY LIMITS											2[illegible]							

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton | Phone Number: 503-861-0914 | Month/Year: Sept. 2000
DEQ Permit No.: 100874 | DEQ File No./Facility ID: 93769 | EPA Reference No.: OR-002087-7
Plant Type: Two Cell Lagoon | County: Clatsop | Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — Date: 10-13

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II
Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7513/II

INFLUENT

Date	Temperature °F/°C	pH (S.U.)	Flow (MGD)	BOD Concentration (mg/L)	BOD Loading (lbs.)	CBOD (mg/L)	TSS Concentration (mg/L)	TSS Loading (lbs.)
1		6.7	0.58					
2		6.7	0.56					
3		6.8	0.55					
4		6.5	0.56					
5		6.8	0.56					
6		6.7	0.52					
7		6.7	0.45	300	1126		812	3047
8		6.5	0.51					
9		6.6	0.53					
10		6.6	0.52					
11		6.4	0.53					
12		6.7	0.50	260	1084		323	1347
13		6.7	0.48	230	921		247	989
14		6.5	0.51	220	936		300	1276
15		6.6	0.50					
16		6.6	0.51					
17		6.8	0.50					
18		6.5	0.50					
19		6.7	0.48	230	921		290	1161
20		6.4	0.50	250	1043		320	1334
21		6.6	0.49	280	1144		340	1389
22		6.5	0.49					
23		6.9	0.49					
24		7.1	0.48					
25		6.7	0.49					
26		6.7	0.48	370	1450		360	1441
27		6.7	0.48	180	721		260	1041
28		6.5	0.47	160	627		220	862
29		6.6	0.50					
30		6.6	0.60					
31								
TOTAL			15.32	2480	9973		3472	13887
DAILY MINIMUM			0.45	160	627		220	862
DAILY MAXIMUM			0.60	370	1450		812	3047
WKLY. AVG. MAX.								
MONTHLY AVG.			0.51	248	997		347	1389
DAILY LIMITS								
WEEKLY LIMITS								

EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Temperature °F/°C	pH (S.U.)	Flow (MGD)	DO (mg/L)	BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)
1		7.4	0.36										
2		7.5	0.49										
3		7.3	0.50										
4		7.4	0.49										
5		7.4	0.49										
6		7.6	0.51										
7		7.4	0.46		26	91	100				24	97	92
8		7.4	0.50										
9		7.4	0.50										
10		7.3	0.51										
11		7.5	0.50										
12		7.5	0.49										
13		7.6	0.49										
14		7.5	0.50		37	83	154				33	89	138
15		7.7	0.49										
16		7.6	0.49										
17		7.4	0.48										
18		7.4	0.49										
19		7.6	0.47										
20		7.3	0.49										
21		7.3	0.49		12	96	49				44	87	180
22		7.6	0.48										
23		7.2	0.47										
24		7.2	0.47										
25		7.3	0.47										
26		7.4	0.47										
27		7.3	0.47										
28		7.2	0.47		30	81	118				38	83	150
29		7.3	0.48										
30		7.5	0.48										
31													
TOTAL			14.45		105		421				139		560
DAILY MINIMUM		7.2	0.36		12		49				24		92
DAILY MAXIMUM		7.7	0.51		37		154				44		180
WKLY. AVG. MAX.													
MONTHLY AVG.			0.48		26	88	105				38	89	140
DAILY LIMITS													
WEEKLY LIMITS													

Date	Nutrients: Total Phosphorus (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Disinfection: Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Transmittance (%)		Turbidity (N.T.U)	Coliform E.coli (CFU/100 ml)	Fecal (CFU/100 ml)	Total (CFU/100 ml)	Receiving Stream: Ammonia	Dilution	Stream Flow (CFS)	Temperature °F/°C	pH (S.U.)	DAILY LOG Regarding breakdowns bypassing, odors, complaints, etc.
1					10	0.2												
2					13	0.6												Up Cl2 + Efflu
3					14	0.7												
4					14	0.6												
5					13	0.5												
6					14	0.6												
7					14	0.7					4							
8					13	0.7												
9					14	0.5												
10					14	0.6												
11					14	0.5												
12					13	0.5												
13					14	0.6												
14					14	0.6					130							
15					14	0.5												
16					15	0.6												
17					14	0.6												
18					14	0.7												
19					13	0.7												Drop Cl2 to 12
20					12	0.6												
21					12	0.5					2							
22					12	0.6												
23					12	0.5												
24					13	0.5												
25					12	0.6												
26					12	0.5												
27					12	0.6												
28					12	0.6					50							
29					12	0.7												
30					12	0.6												
31																		
TOTAL					391	17.3												TOTAL
DAILY MINIMUM					10	0.2												DAILY MINIMUM
DAILY MAXIMUM					15	0.7												DAILY MAXIMUM
WKLY. AVG. MAX.																		WEEKLY AVERAGE MA
MONTHLY AVG.					13.03	0.57												MONTHLY AVERAGE
DAILY LIMITS																		DAILY LIMITS
WEEKLY LIMITS																		WEEKLY LIMITS

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
DEQ Permit No.: 100874
Plant Type: Two Cell Lagoon
Phone Number: 503-861-0914
DEQ File No./Facility ID: 93769
County: Clatsop
Month/Year: Oct-2000
EPA Reference No.: OR-002087-7
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — Date: 11-3-00

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II
Treatment Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7513/II

INFLUENT / EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Influent Temperature °F/°C	Influent pH S.U.	Influent Flow MGD	Influent BOD (Grab / Comp. ✓) Concentration mg/L	Influent BOD Loading lbs.	Influent CBOD mg/L	Influent TSS (Grab / Comp. ✓) Concentration mg/L	Influent TSS Loading lbs.	Effluent Temperature °F/°C	Effluent pH S.U.	Effluent Flow MGD	DO mg/L	Effluent BOD (Grab / Comp.) Concentration mg/L	BOD Removal %	BOD Loading lbs.	Effluent CBOD (Grab / Comp.) Concentration mg/L	CBOD Removal %	CBOD Loading lbs.	Effluent TSS (Grab / Comp.) Concentration mg/L	TSS Removal %	TSS Loading lbs.
1		6.7	0.69							7.5	0.48										
2		6.6	0.64							7.3	0.48										
3		6.4	0.57	210	998		28	133		7.2	0.50										
4		6.8	0.52	160	694		280	1214		7.3	0.48										
5		6.4	0.50	190	792		240	1001		7.3	0.48		20	89	80				35	85	140
6		6.9	0.50							7.5	0.49										
7		6.7	0.52							7.3	0.48										
8		6.7	0.53							7.3	0.48										
9		6.5	0.53							7.3	0.48										
10		6.6	0.52	150	651		230	997		7.4	0.48										
11		6.4	0.52	170	737		260	1128		7.4	0.50										
12		6.7	0.51	160	681		230	978		7.5	0.49		46	71	188				38	83	155
13		6.6	0.58							7.4	0.47										
14		6.5	0.57							7.4	0.49										
15		6.5	0.56							7.5	0.49										
16		6.6	0.57							7.4	0.49										
17		6.7	0.60	160	801		190	951		7.5	0.50										
18		6.5	0.64	170	907		250	1334		7.5	0.49										
19		6.6	0.68	160	907		230	1304		7.5	0.50		21	87	88				20	91	83
20		6.7	0.68							7.3	0.50										
21		6.6	0.65							7.4	0.52										
22		6.6	0.62							7.5	0.54										
23		6.6	0.59							7.5	0.54										
24		6.4	0.63	180	946		210	1103		7.4	0.97										
25		6.5	0.61	210	1068		230	1170		7.2	0.95										
26		6.4	0.58	210	1016		280	1354		7.5	0.52		9	96	39				14	95	61
27		6.5	0.58							7.4	0.50										
28		6.7	0.64							7.4	0.52										
29		6.5	0.69							7.4	0.53										
30		6.5	0.74							7.6	0.53										
31		6.6	0.62							7.5	0.51										
TOTAL			18.39	2130	10,198		2658	12667			16.38		96		395				107		439
DAILY MINIMUM			0.50	150	651		28	133		7.2	0.47		9		39				14		61
DAILY MAXIMUM			0.74	210	1068		280	1354		7.6	0.97		46		188				38		155
WKLY. AVG. MAX.																					
MONTHLY AVG.			0.59	178	850		222	1056			0.52		24	86	99				27	89	110
DAILY LIMITS																					
WEEKLY LIMITS																					
MONTHLY LIMITS										[illegible]			[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]

Date	Nutrients: Total Phosphorus (Grab) mg/L	Total Kjeldahl Nitrogen (Composite) mg/L	Ammonia Nitrogen mg/L	Nitrate Nitrogen mg/L	Disinfection: Chlorine Used lbs.	Chlorine Total Residual mg/L	UV Trans-mittance %		Turbidity N.T.U	Coliform (MPN/MF) E.coli CFU/100 ml	Fecal CFU/100 ml	Total CFU/100 ml	Receiving Stream: Ammonia	Dilution	Stream Flow CFS	Temperature °F/°C	pH S.U.	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					12	0.5												
2					13	0.7												
3					12	0.5												
4					12	0.7												
5					12	0.7					0							
6					12	0.7												
7					13	0.6												
8					12	0.6												
9					12	0.7												
10					12	0.6												
11					13	0.5												
12					12	0.7					50							
13					12	0.7												
14					12	0.6												
15					12	0.5												
16					13	0.7												
17					12	0.6												
18					12	0.6												
19					12	0.7					2							
20					12	0.5												
21					12	0.7												
22					12	0.6												
23					13	0.6												Up Effluent 4Cl
24					15	0.5												
25					15	0.5												Drop Eff 4 Cl2
26					12	0.8					80							Drop Cl2
27					10	0.5												
28					10	0.5												
29					10	0.6												
30					11	0.5												
31					10	0.4												Up Eff 4 Cl2
TOTAL					352						132							
DAILY MINIMUM					10	0.4					0							
DAILY MAXIMUM					15	0.8					80							
WEEKLY AVERAGE MAX.																		
MONTHLY AVERAGE					11.35	0.6					6							
DAILY LIMITS																		
WEEKLY LIMITS																		
MONTHLY LIMITS											[illegible]							

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
DEQ Permit No.: 100874
Plant Type: Two cell Lagoon
Phone Number: 503-861-0914
DEQ File No./Facility ID: 93769
County: Clatsop
Month/Year: Nov-2000
EPA Reference No.: OR-002087-7
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — Date: 12-4-0

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II
Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7513/II

INFLUENT / EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Influent Temperature (°F/°C)	Influent pH (S.U.)	Influent Flow (MGD)	Influent BOD Concentration (mg/L)	Influent BOD Loading (lbs.)	Influent CBOD (mg/L)	Influent TSS Concentration (mg/L)	Influent TSS Loading (lbs.)	Effluent Temperature (°F/°C)	Effluent pH (S.U.)	Effluent Flow (MGD)	DO (mg/L)	BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)
1		6.6	0.62	130	672		180	931		7.5	0.92										
2		6.5	0.62	150	776		200	1034		7.5	0.91		16	89	121				22	89	167
3		6.6	0.61							7.4	0.91										
4		6.6	0.68							7.4	0.91										
5		6.7	0.66							7.4	0.90										
6		6.6	0.68							7.3	0.90										
7		6.6	0.67	170	950		260	1887		7.6	0.92										
8		6.7	0.62	140	724		190	982		7.6	0.82										
9		6.4	0.62	140	724		190	982		7.4	0.87		9	94	65				16	92	116
10		6.5	0.65							7.7	0.86										
11		6.5	0.64							7.5	0.86										
12		6.9	0.64							7.5	0.85										
13		6.7	0.64							7.4	0.85										
14		6.5	0.50	150	626		190	792		7.5	0.84										
15		6.7	0.59	170	837		210	1033		7.5	0.84										
16		6.7	0.59	160	787		210	1033		7.5	0.48		18	89	72				26	88	104
17		6.6	0.55							7.7	0.45										
18		6.5	0.59							7.6	0.45										
19		6.7	0.59							7.5	0.45										
20		6.7	0.58							7.5	0.45										
21		6.6	0.60	150	751		230	1151		7.4	0.49										
22		6.7	0.57	96	456		200	951		7.5	0.46		11	89	42				16	92	61
23		6.8	0.59							7.4	0.48										
24		6.5	0.61							7.6	0.51										
25		6.7	0.64							7.5	0.50										
26		6.7	0.67							7.5	0.51										
27		6.7	0.67							7.5	0.49										
28		6.6	0.65	160	867		190	1023		7.4	0.47										
29		6.7	0.66	150	826		220	1211		7.5	0.47										
30		6.5	0.65							7.6	0.46										
31																					
TOTAL			18.65	1766	8996		2470	13010			20.28		54		300				80		448
DAILY MINIMUM			0.50	96	950		180	792		7.3	0.45		9		42				16		61
DAILY MAXIMUM			0.68	170	456		260	1887		7.7	0.92		18		121				26		167
WKLY AVG MAX																					
MONTHLY AVG.			0.62	147	750		206	1084			0.67		13.5	90	75				20	90	112
DAILY LIMITS																					
WEEKLY LIMITS																					
MONTHLY LIMITS										6-9			30	85	112				50	65	188

Date	NUTRIENTS Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	DISINFECTION CHLORINE Used (lbs.)	Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	COLIFORM E.coli (CFU/100 ml)	Fecal (CFU/100 ml)	Total (CFU/100 ml)	RECEIVING STREAM Ammonia	Dilution	Stream Flow (CFS)	Temperature (°F/°C)	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					14	1.2												
2					12	1.1					8							
3					8	0.7												
4					8	0.7												
5					8	0.6												
6					9	0.7												
7					8	0.6												
8					8	0.5												
9					8	0.6					50							
10					8	0.6												
11					7	0.4												
12					8	0.6												
13					8	0.5												
14					8	0.7												
15					8	0.7												Drop EN 4 N12
16					6	0.8					0							
17					6	0.6												
18					6	0.7												
19					6	0.6												
20					5	0.7												
21					6	0.7												
22					6	0.8					0							
23					6	0.7												
24					6	0.7												
25					6	0.6												
26					6	0.6												
27					6	0.6												
28					6	0.5												
29					6	0.7												
30					6	0.6												
31																		
TOTAL					219						58							TOTAL
DAILY MINIMUM					5	0.5					0							DAILY MINIMUM
DAILY MAXIMUM					14	1.2					50							DAILY MAXIMUM
WEEKLY AVERAGE MAX.																		WEEKLY AVERAGE MAX.
MONTHLY AVERAGE					7.3	0.67					15							MONTHLY AVERAGE
DAILY LIMITS																		DAILY LIMITS
WEEKLY LIMITS											400							WEEKLY LIMITS
MONTHLY LIMITS											200							MONTHLY LIMITS

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
Phone Number: 503-861-0914
Month/Year: Dec. 2000
DEQ Permit No.: 100874
DEQ File No./Facility ID: 93769
EPA Reference No.: OR-002087-7
Plant Type: Two Cell Lagoon
County: Clatsop
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — 1-9-01 Date

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II

Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7315/II

INFLUENT

Date	Temperature (°F/°C)	pH (S.U.)	Flow (MGD)	BOD (Grab/Comp.) Concentration (mg/L)	BOD Loading (lbs.)	CBOD (mg/L)	TSS (Grab/Comp.) Concentration (mg/L)	TSS Loading (lbs.)
1		6.9	0.70					
2		6.7	0.70					
3		6.7	0.70					
4		6.5	0.71					
5		6.6	0.67	160	894		210	1173
6		6.7	0.64	180	961		230	1228
7		6.6	0.60	150	751		220	1101
8		6.4	0.63					
9		6.4	0.61					
10		6.7	0.60					
11		6.5	0.61					
12		6.5	0.60	160	801		220	1101
13		6.5	0.61	140	712		260	1323
14		6.6	0.63	180	946		270	1419
15		6.7	0.64					
16		6.4	0.73					
17		6.5	0.74					
18		6.6	0.70					
19		6.6	0.69	200	1151		390	2244
20		6.8	0.71	150	888		300	1776
21		6.6	0.78	180	1171		270	1756
22		6.8	0.82					
23		6.6	0.82					
24		6.7	0.83					
25		6.7	0.82					
26		6.8	0.80	170	1134		220	1468
27		6.8	0.71	—	—		260	1540
28		6.5	0.67	170	950		230	1285
29		6.6	0.70					
30		6.7	0.72					
31		6.5	0.72					
TOTAL			21.61	1840	10359		3080	17378
DAILY MINIMUM			0.60	140	1171		210	1101
DAILY MAXIMUM			0.83	200	751		390	2244
WKLY. AVG. MAX.								
MONTHLY AVG.			0.69	167	863		257	1448
DAILY LIMITS								
WEEKLY LIMITS								
MONTHLY LIMITS								

EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Temperature (°F/°C)	pH (S.U.)	Flow (MGD)	DO (mg/L)	BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)
1		7.5	0.51										
2		7.5	0.50										
3		7.4	0.50										
4		7.5	0.50										
5		7.6	0.57										
6		7.4	0.46										
7		7.5	0.52		12	92	52				26	88	113
8		7.5	0.53										
9		7.4	0.50										
10		7.4	0.50										
11		7.4	0.50										
12		7.5	0.52										
13		7.5	0.51										
14		7.6	0.53		8	96	35				14	95	62
15		7.5	1.15										
16		7.3	1.13										
17		7.5	1.14										
18		7.5	1.15										
19		7.4	1.06										
20		7.7	0.51										
21		7.6	0.54		8	96	36				18	93	81
22		7.5	0.48										
23		7.5	1.00										
24		7.4	0.99										
25		7.6	0.99										
26		7.4	0.99										
27		7.5	0.93										
28		7.4	0.91		0	100	0				12	95	91
29		7.4	0.90										
30		7.5	0.91										
31		7.4	0.90										
TOTAL			22.83		28		123				70		347
DAILY MINIMUM		7.4	0.46		0		0				12		62
DAILY MAXIMUM		7.7	1.15		12		52				26		113
WKLY. AVG. MAX.													
MONTHLY AVG.			0.73		7	96	31				18	93	87
DAILY LIMITS													
WEEKLY LIMITS													
MONTHLY LIMITS		6-9			30	85	112				50	65	188

Date	Total Phosphorus (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)	Turbidity (N.T.U)	Coliform E.coli (CFU/100 ml)	Coliform Fecal (CFU/100 ml)	Coliform Total (CFU/100 ml)	Ammonia	Dilution	Receiving Stream Flow (CFS)	Receiving Stream Temperature	Receiving Stream pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					6	0.6											
2					6	0.7											
3					6	0.6											
4					6	0.6											
5					6	0.6											
6					6	0.6											
7					6	0.6				2							
8					6	0.5											
9					6	0.6											
10					6	0.6											
11					6	0.7											
12					6	0.5											
13					6	0.6											Up Eff. & Cl2
14					6	0.5				2							
15					10	0.7											
16					10	0.7											
17					10	0.6											
18					10	0.6											
19					10	0.7											Drop Eff & Cl2
20					6	0.6											
21					6	0.5				4							
22					6	0.7											Up Eff & Cl2
23					10	0.8											
24					10	0.7											
25					9	0.7											
26					10	0.6											
27					10	0.7											
28					10	0.6				0							
29					9	0.7											
30					10	0.8											
31					10	0.7											
TOTAL					240					8							
DAILY MINIMUM					6	0.5				0							
DAILY MAXIMUM					10	0.8				4							
WEEKLY AVERAGE MAX.																	
MONTHLY AVERAGE					7.74	0.65				2							
DAILY LIMITS																	
WEEKLY LIMITS																	
MONTHLY LIMITS										200							

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton | Phone Number: 503-861-0914 | Month/Year: Jan-2001
DEQ Permit No.: 100874 | DEQ File No./Facility ID: 93769 | EPA Reference No.: OR-0020877-7
ant Type: Two Cell Lagoon | County: Clatsop | Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — 2-1-01 Date

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II | Principal Operator Name (print): Terry Ager | Certification No. & Grade: 7159/II
Treatment Sys. Class: I | Principal Operator Name (print): Terry Ager | Certification No. & Grade: 7315/II

INFLUENT

Date	Temperature °F/°C	pH (S.U.)	Flow (MGD)	BOD Concentration (mg/L)	BOD Loading (lbs.)	CBOD (mg/L)	TSS Concentration (mg/L)	TSS Loading (lbs.)
1		6.7	0.72					
2		6.5	0.71	160	947		250	1480
3		6.6	0.63	180	946		230	1208
4		6.7	0.75	130	813		140	876
5		6.9	0.78					
6		6.6	0.74					
7		6.6	0.72					
8		6.7	0.73					
9		6.9	0.75	180	1126		290	1814
10		6.9	0.75	200	1251		340	2127
11		6.7	0.72	220	1321		500	3002
12		6.8	0.71					
13		6.9	0.72					
14		6.7	0.70					
15		6.7	0.71					
16		6.8	0.71	200	1184		280	1658
17		6.6	0.68	200	1134		330	1871
18		6.9	0.63	190	998		530	2785
19		6.7	0.67					
20		6.9	0.74					
21		6.6	0.84					
22		6.7	0.79					
23		6.7	0.81	63	426		82	554
24		6.6	0.69	130	748		200	1151
25		6.9	0.74	120	741		240	1481
26		6.6	0.73					
27		6.8	0.72					
28		6.8	0.73					
29		6.7	0.73					
30		6.7	0.72					
31		6.6	0.73					
TOTAL			22.5	1973	11635		3412	20007
DAILY MINIMUM			0.63	63	426		82	554
DAILY MAXIMUM			0.84	220	1321		530	3002
WKLY. AVG. MAX.								
MONTHLY AVG.			0.72	164	970		284	1667
DAILY LIMITS								
WEEKLY LIMITS								
MONTHLY LIMITS								

EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Temperature °F/°C	pH (S.U.)	Flow (MGD)	DO (mg/L)	BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)
1		7.4	0.90										
2		7.5	0.90										
3		7.7	0.80										
4		7.4	0.87		4	97	29				0	100	0
5		7.5	0.83										
6		7.4	0.90										
7		7.4	0.88										
8		7.6	0.89										
9		7.3	0.87										
10		7.4	0.86										
11		7.5	0.86		6	97	43				14	97	100
12		7.5	0.86										
13		7.4	0.87										
14		7.5	0.86										
15		7.5	0.86										
16		7.4	0.86										
17		7.4	0.49										
18		7.4	0.47		7	96	27				14	97	55
19		7.5	0.48										
20		7.5	0.49										
21		7.7	0.50										
22		7.4	0.50										
23		7.5	0.53										
24		7.5	0.47										
25		7.4	0.51		8	93	34				14	94	60
26		7.4	0.51										
27		7.6	0.94										
28		7.5	0.90										
29		7.5	0.88										
30		7.4	0.90										
31		7.4	0.90										
TOTAL			23.34		25		133				42		215
DAILY MINIMUM		7.3	0.47		4		27				0		0
DAILY MAXIMUM		7.7	0.90		8		43				14		100
WKLY. AVG. MAX.													
MONTHLY AVG.			0.75		6	96	33				11	97	54
DAILY LIMITS													
WEEKLY LIMITS					45		169				80		300
MONTHLY LIMITS		6/9			30	85	112				50	65	188

NUTRIENTS / DISINFECTION / COLIFORM / RECEIVING STREAM / DAILY LOG

Date	Total Phosphorus	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrate Nitrogen	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	E.coli (CFU/100 ml)	Fecal (CFU/100 ml)	Total (CFU/100 ml)	Ammonia	Dilution	Stream Flow (CFS)	Temperature °F/°C	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					10	0.7												
2					9	0.7												
3					10	0.8												
4					10	0.9					0							Drop Cl2
5					8	0.6												
6					8	0.6												
7					8	0.7												
8					8	0.6												
9					7	0.6												
10					8	0.8												
11					8	0.7					0							
12					8	0.7												
13					7	0.8												
14					8	0.6												
15					8	0.7												
16					8	0.7												Drop Cl2 + Eff
17					6	0.8												
18					6	0.8					0							
19					6	0.7												
20					6	0.8												
21					6	0.7												
22					6	0.6												(Marin Ave.
23					5	0.8												Line Flushing)
24					6	0.6												
25					6	0.7					2							
26					6	0.7												Up Eff + Cl2
27					10	0.8												
28					10	0.6												
29					9	0.7												
30					10	0.6												
31					10	0.7												
TOTAL					241						2							TOTAL
DAILY MINIMUM					5	0.6					0							DAILY MINIMUM
DAILY MAXIMUM					10	0.9					2							DAILY MAXIMUM
WEEKLY AVERAGE MAX.																		WEEKLY AVERAGE MAX.
MONTHLY AVERAGE					7.77	0.75					2							MONTHLY AVERAGE
DAILY LIMITS																		DAILY LIMITS
WEEKLY LIMITS											400							WEEKLY LIMITS
MONTHLY LIMITS											200							MONTHLY LIMITS

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
DEQ Permit No.: 100874
Plant Type: Two Cell Lagoon

Phone Number: 503-861-0914
DEQ File No./Facility ID: 93769
County: Clatsop

Month/Year: Feb-01
EPA Reference No.: OR-0020877
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — Date: 3-8-
Terry Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II
Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7315/II

INFLUENT

Date	Temperature °F/°C	pH (S.U.)	Flow (MGD)	BOD Concentration (mg/L)	BOD Loading (lbs.)	CBOD (mg/L)	TSS Concentration (mg/L)	TSS Loading (lbs.)
1		6.7	0.73	150	913		150	913
2		6.9	0.76					
3		6.6	0.84					
4		6.6	0.80					
5		6.8	0.81					
6		6.5	0.73	110	670		160	974
7		6.7	0.71	140	830		210	1243
8		6.7	0.58	110	532		200	968
9		6.7	0.77					
10		6.6	0.74					
11		6.6	0.75					
12		6.8	0.62					
13		6.9	0.57	440	2092		460	2187
14		6.7	0.73	500	3044		380	2314
15		6.5	0.66	560	3082		570	3138
16		6.8	0.80					
17		6.6	0.79					
18		6.6	0.77					
19		6.8	0.75					
20		6.6	0.71	360	2132		500	2961
21		6.9	0.68	320	1815		640	3630
22		6.7	0.71	400	2369		870	5152
23		6.6	0.70					
24		6.7	0.67					
25		6.7	0.65					
26		6.6	0.65					
27		6.9	0.72	280	1681		440	2642
28		6.7	0.65	180	976		470	2548
29								
30								
31								
TOTAL			20.05	3550	20136		5050	28670
DAILY MINIMUM			0.57	110	532		150	913
DAILY MAXIMUM			0.84	560	3082		870	5152
WKLY. AVG. MAX.								
MONTHLY AVG.			0.72	296	1678		421	2389
DAILY LIMITS								
WEEKLY LIMITS								
MONTHLY LIMITS								

EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Temperature °F/°C	pH (S.U.)	Flow (MGD)	DO (mg/L)	BOD Grab Concentration (mg/L)	BOD Removal (%)	BOD Comp. Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)
1		7.4	0.90		5	97	38				10	93	75
2		7.6	1.61										
3		7.5	1.56										
4		7.5	1.53										
5		7.5	1.47										
6		7.4	1.41										
7		7.5	0.94										
8		7.5	0.67		20	82	112				32	84	179
9		7.4	0.65										
10		7.5	0.65										
11		7.5	0.65										
12		7.7	0.64										
13			Ø										
14			Ø										
15			Ø										
16			Ø										
17			Ø										
18			Ø										
19			Ø										
20		7.6	0.64										
21		7.4	0.52										
22		7.4	0.55		9	98	41				16	98	73
23		7.5	0.54										
24		7.5	0.53										
25		7.4	0.53										
26		7.4	0.53										
27		7.5	0.58										
28		7.4	0.55										
29													
30													
31													
TOTAL			17.65		34		191				58		327
DAILY MINIMUM		7.4	Ø		5		38				10		73
DAILY MAXIMUM		7.7	1.61		20		112				32		179
WKLY. AVG. MAX.													
MONTHLY AVG.			0.84		11	92	64				19	92	109
DAILY LIMITS													
WEEKLY LIMITS					45		169				80		300
MONTHLY LIMITS		6/9			30	85	112				50	65	188

EFFLUENT (continued): Nutrients, Disinfection, Coliform, Receiving Stream

Date	Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U.)	E.coli (CFU/100 ml)	Fecal (CFU/100 ml)	Total (CFU/100 ml)	Receiving Stream Ammonia	Dilution	Stream Flow (CFS)	Temperature °F/°C	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1																		
2					10	0.7					Ø							Up Eff & Cl2
3					14	0.8												
4					14	0.6												
5					14	0.5												
6					13	0.7												
7					14	0.7												Drop Eff & Cl2
8					10	0.8												Drop Cl2
9					7	0.7					300							Drop Cl2
10					6	0.8												
11					7	0.6												
12					7	0.6												
13					7	0.5												Hold Eff Cl2
14					Ø													
15					Ø													
16					Ø													
17					Ø													
18					Ø													
19					Ø													
20					Ø													
21					6	0.7												Adj Eff & Cl2
22					6	0.7												
23					6	0.6					Ø							
24					6	0.6												
25					6	0.6												
26					6	0.7												
27					6	0.6												
28					7	0.7												
29					6	0.6												
30																		
31																		
TOTAL					178						300							TOTAL
DAILY MINIMUM					Ø	0.5					Ø							DAILY MINIMUM
DAILY MAXIMUM					14	0.8					300							DAILY MAXIMUM
WEEKLY AVERAGE MAX.																		WEEKLY AVERAGE MAX.
MONTHLY AVERAGE					8.47	0.65					100							MONTHLY AVERAGE
DAILY LIMITS																		DAILY LIMITS
WEEKLY LIMITS											400							WEEKLY LIMITS
MONTHLY LIMITS											200							MONTHLY LIMITS

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
Phone Number: 503-861-0914
Month/Year: March-01
DEQ Permit No.: 100874
DEQ File No./Facility ID: 93769
EPA Reference No.: OR-002087-7
Plant Type: Two Cell Lagoon
County: Clatsop
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — Date: 4-6-

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II
Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7315/II

INFLUENT | EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Influent Temperature °F/°C	Influent pH (S.U.)	Influent Flow (MGD)	Influent BOD Concentration (mg/L)	Influent BOD Loading (lbs.)	Influent CBOD (mg/L)	Influent TSS Concentration (mg/L)	Influent TSS Loading (lbs.)	Effluent Temperature °F/°C	Effluent pH (S.U.)	Effluent Flow (MGD)	DO (mg/L)	Effluent BOD Concentration (mg/L)	Effluent BOD Removal (%)	Effluent BOD Loading (lbs.)	Effluent CBOD Concentration (mg/L)	Effluent CBOD Removal (%)	Effluent CBOD Loading (lbs.)	Effluent TSS Concentration (mg/L)	Effluent TSS Removal (%)	Effluent TSS Loading (lbs.)
1		6.7	0.63	280	1471		470	2469		7.3	0.55		12	96	55				28	94	128
2		6.7	0.78							7.4	0.60										
3		6.5	0.76							7.5	0.97										
4		6.8	0.70							7.4	0.95										
5		6.8	0.64							7.3	0.92										
6		6.8	0.67	300	1676		359	2006		7.4	0.91										
7		6.6	0.66	250	1376		420	2319		7.3	0.91										
8		6.7	0.67	260	1453		336	1876		7.3	0.90		14	95	105				16	95	120
9		6.5	0.70							7.5	0.84										
10		6.6	0.68							7.5	0.53										
11		6.5	0.66							7.5	0.53										
12		6.7	0.64							7.4	0.51										
13		6.6	0.77	220	1413		360	2312		7.4	0.52										
14		6.6	0.67	230	1285		470	2626		7.3	0.53										
15		6.8	0.66	300	1651		470	2587		7.4	0.52		11	96	48				16	97	69
16		6.6	0.70							7.4	0.53										
17		6.5	0.75							7.4	0.54										
18		6.7	0.79							7.5	0.55										
19		6.7	0.82							7.3	0.56										
20		6.4	0.77	210	1349		440	2826		7.5	0.96										
21		6.6	0.72	190	1141		340	2042		7.4	0.94										
22		6.5	0.68	170	964		300	1701		7.3	0.51		6	96	26				12	96	51
23		6.6	0.70							7.5	0.53										
24		6.6	0.71							7.4	0.53										
25		6.8	0.72							7.5	0.53										
26		7.0	0.71							7.6	0.53										
27		6.7	0.67	190	1062		310	1732		7.4	0.50										
28		6.7	0.93	170	1319		340	2637		7.4	0.59										
29		6.7	0.70							7.3	0.56										
30		6.6	0.79							7.5	0.59										
31		6.8	0.76							7.5	0.62										
TOTAL			22.21	2770	16160		4615	27133			20.26		43		243				72		364
DAILY MINIMUM			0.63	170	964		300	1701		7.3	0.50		6		26				12		51
DAILY MAXIMUM			0.93	300	1676		470	2826		7.6	0.97		14		105				28		128
WKLY. AVG. MAX.																					
MONTHLY AVG.			0.71	230	1347		385	2261			0.65		10.7	96	58.5				18	96	92
DAILY LIMITS																					
WEEKLY LIMITS													45		169				80		300

Date	Nutrients: Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Disinfection Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	Coliform E.coli (CFU/100 ml)	Coliform Fecal (CFU/100 ml)	Coliform Total (CFU/100 ml)	Receiving Stream Ammonia	Dilution	Stream Flow (CFS)	Temperature °F/°C	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					6	0.7					2							
2					6	0.6												Increase Eff&Cl
3					9	0.8												
4					8	0.7												
5					8	0.7												Drop Eff & Cl2
6					8	0.7												
7					8	0.8												
8					8	0.6					-0-							Drop Eff + Cl2
9					6	0.4												
10					6	0.7												
11					6	0.7												
12					6	0.7												
13					6	0.6												
14					6	0.7												
15					6	0.6					-0-							
16					6	0.7												
17					7	0.5												
18					6	0.6												
19					6	0.6												Up Eff & Cl2
20					9	0.4												
21					9	0.5												Drop Eff & Cl2
22					6	0.7					-0-							
23					6	0.6												
24					6	0.6												
25					6	0.5												
26					6	0.6												
27					6	0.6												
28					7	0.7												
29					6	0.5												
30					6	0.6												
31					6	0.6												
TOTAL					207						2							
DAILY MINIMUM					6	0.4					-0-							
DAILY MAXIMUM					9	0.8					2							
WEEKLY AVERAGE MAX																		
MONTHLY AVERAGE					6.67	0.6					2							
DAILY LIMITS																		
WEEKLY LIMITS											400							

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
DEQ Permit No.: 100874
Plant Type: Two Cell Lagoon
Phone Number: 503-861-0914
DEQ File No./Facility ID: 93769
County: Clatsop
Month/Year: Apr. 1-01
EPA Reference No.: OR-002087-7
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — Date: 5-3-

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II
Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7315/II

INFLUENT

Date	Temperature (°F / °C)	pH (S.U.)	Flow (MGD)	BOD Grab/Comp. Concentration (mg/L)	BOD Loading (lbs.)	CBOD (mg/L)	TSS Grab/Comp. Concentration (mg/L)	TSS Loading (lbs.)
1		6.9	0.75					
2		6.6	0.74					
3		6.7	0.72	170	1029		320	1922
4		6.7	0.70	160	934		270	1576
5		6.9	0.71	190	1125		360	2132
6		6.8	0.79					
7		6.9	0.79					
8		7.0	0.79					
9		6.8	0.79					
10		6.6	0.78	290	1887		570	3708
11		6.9	0.86	220	1578		310	2223
12		6.7	0.78	190	1236		370	2407
13		6.6	0.74					
14		6.6	0.72					
15		6.8	0.71					
16		6.6	0.70					
17		6.9	0.73	280	1705		350	2131
18		6.8	0.75	170	1063		260	1626
19		6.9	0.73	300	1826		410	2496
20		6.9	0.67					
21		7.0	0.69					
22		6.8	0.70					
23		6.8	0.69					
24		6.9	0.68	310	1758		1090	6182
25		6.7	0.68	260	1475		400	2268
26		6.7	0.63	300	1574		410	2154
27		6.9	0.68					
28		6.6	0.71					
29		6.8	0.78					
30		6.7	0.85					
31								
TOTAL			22.04	2840	17192		5120	30825
DAILY MINIMUM			0.63	160	934		260	1576
DAILY MAXIMUM			0.86	310	1887		1090	6182
WKLY. AVG. MAX.								
MONTHLY AVG.			0.73	237	1433		427	2569
DAILY LIMITS								
WEEKLY LIMITS								
MONTHLY LIMITS								

EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Temperature (°F / °C)	pH (S.U.)	Flow (MGD)	DO (mg/L)	BOD Grab/Comp. Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Grab/Comp. Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Grab/Comp. Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)
1		7.5	0.65										
2		7.4	0.65										
3		7.4	1.04										
4		7.6	0.98										
5		7.3	0.94		0	100	0				13	96	110
6		7.4	0.94										
7		7.4	0.92										
8		7.4	0.90										
9		7.5	0.91										
10		7.3	0.92										
11		7.6	0.92										
12		7.2	0.93		7	96	54				12	97	93
13		7.3	0.91										
14		7.5	0.91										
15		7.5	0.90										
16		7.5	0.90										
17		7.3	0.88										
18		7.4	0.88										
19		7.2	0.89		5	98	37				20	95	148
20		7.3	0.87										
21		7.4	0.88										
22		7.4	0.88										
23		7.2	0.87										
24		7.2	0.82										
25		7.4	0.50										
26		7.3	0.46		4	99	15				19	95	73
27		7.5	0.49										
28		7.3	0.48										
29		7.3	0.47										
30		7.4	0.48										
31													
TOTAL			24.17		16		106				64		424
DAILY MINIMUM			0.46		0		0				12		73
DAILY MAXIMUM			1.04		7		54				20		148
WKLY. AVG. MAX.													
MONTHLY AVG.			0.80		4	98	27				16	96	106
DAILY LIMITS													
WEEKLY LIMITS					45		169				80		300
MONTHLY LIMITS		6/9			30	85	112				50	65	188

NUTRIENTS / DISINFECTION / COLIFORM / RECEIVING STREAM

Date	Total Phosphorus (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	E.coli (CFU/100 ml)	Fecal (CFU/100 ml)	Total (CFU/100 ml)	Ammonia	Dilution	Stream Flow (CFS)	Temperature (°F / °C)	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					6	0.6												
2					6	0.5												Up Eff & Cl2
3					10	0.6												
4					10	0.7												
5					10	0.7					13							
6					9	0.5												
7					9	0.5												
8					9	0.4												
9					9	0.5												
10					9	0.5												
11					9	0.6												
12					9	0.4					50							
13					9	0.5												
14					10	0.6												
15					9	0.5												
16					9	0.6												
17					9	0.6												
18					9	0.6												
19					9	0.5					0							
20					9	0.6												
21					9	0.6												
22					9	0.5												
23					9	0.6												
24					9	0.7												Decp Eff & Cl
25					6	0.8												
26					6	0.7					0							
27					6	0.7												
28					6	0.7												
29					6	0.6												
30					6	0.7												
31																		
TOTAL					250						63							
DAILY MINIMUM					6	0.4					0							
DAILY MAXIMUM					10	0.8					50							
WEEKLY AVERAGE MAX.																		
MONTHLY AVERAGE					8.3	0.6					16							
DAILY LIMITS																		
WEEKLY LIMITS											400							
MONTHLY LIMITS											200							

DMR PG1

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
DEQ Permit No.: 100847
t Type: Two Cell Lagoon
Phone Number: 503-861-0914
DEQ File No./Facility ID: 93769
County: Clatsop
Month/Year: May-2001
EPA Reference No.: OR-0020087-7
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature
6-1-01 — Date

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II
Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7315/II

INFLUENT

Date	Temperature (°F / °C)	pH (S.U.)	Flow (MGD)	BOD Concentration (mg/L)	BOD Loading (lbs.)	CBOD (mg/L)	TSS Concentration (mg/L)	TSS Loading (lbs.)
1		6.7	0.84	170	1191		240	1681
2		6.9	0.80	180	1201		330	2202
3		6.9	0.65	250	1355		360	1952
4		6.8	0.70					
5		6.9	0.69					
6		7.0	0.69					
7		6.8	0.68					
8		6.7	0.66	100	550		76	418
9		6.7	0.66	140	771		140	771
		6.6	0.65	350	1897		1480	8023
		6.8	0.65					
12		6.7	0.62					
13		6.7	0.61					
14		6.7	0.61					
15		6.9	0.97	260	2103		510	4126
16		6.8	0.91	200	1518		510	3871
17		6.7	0.51	150	638		250	1063
18		6.6	0.88					
19		6.8	0.70					
20		6.8	0.69					
21		6.8	0.70					
22		6.9	0.64	150	801		330	1761
23		6.7	0.60	220	1101		410	2052
24		6.7	0.63	200	1051		410	2154
25		6.8	0.62					
26		6.9	0.69					
27		6.9	0.68					
28		7.1	0.68					
29		6.8	0.69					
30		6.7	0.60					
31		6.7	0.61					
TOTAL			21.31	2370	14,178		5046	30074
DAILY MINIMUM			0.51	100	550		76	418
MAXIMUM			0.97	350	2103		1480	8023
W... AVG. MAX.								
MONTHLY AVG.			0.68	198	1181		421	2506
DAILY LIMITS								
WEEKLY LIMITS								
MONTHLY LIMITS								

EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Temperature (°F / °C)	pH (S.U.)	Flow (MGD)	DO (mg/L)	BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)	Nutrients: Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Disinfection: Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Transmittance (%)	Turbidity (N.T.U)
1		7.4	0.50															6	0.7		
2		7.5	0.51															6	0.6		
3		7.4	0.49		10	96	41				17	95	69					6	0.6		
4		7.4	0.50															6	0.6		
5		7.6	0.51															6	0.6		
6		7.5	0.50															6	0.7		
7		7.5	0.51															7	0.6		
8		7.3	0.52															6	0.6		
9		7.3	0.53															6	0.5		
10		7.5	0.57		13	96	55				32	98	136					6	0.3		
11		7.4	0.53															6	0.6		
12		7.4	0.50															6	0.5		
13		7.4	0.48															6	0.5		
14		7.3	0.49															7	0.4		
15		7.5	0.64															6	0.5		
16		7.7	0.70															6	0.5		
17		7.7	0.51		46	69	196				38	85	162					6	0.4		
18		7.4	0.82															6	0.5		
19		7.6	0.64															6	0.5		
20		7.5	0.63															6	0.4		
21		7.5	0.63															6	0.5		
22		7.4	0.58															6	0.5		
23		7.4	0.54															6	0.4		
24		7.3	0.58		26	87	126				24	94	116					6	0.5		
25		7.3	0.99															8	0.3		
26		7.4	0.94															9	0.5		
27		7.4	0.91															9	0.4		
28		7.5	0.89															9	0.5		
29		7.3	0.88															10	0.7		
30		7.3	0.91															9	0.6		
31		7.5	0.93															9	0.6		
TOTAL			19.80		95		418				111		483					209			
DAILY MINIMUM			0.48		10		41				17		69					6	0.3		
MAXIMUM			0.99		46		196				38		162					10	0.7		
W... AVG. MAX.																					
MONTHLY AVG.			0.63		24	87	105				28	93	121					6.74	0.5		
DAILY LIMITS																					
WEEKLY LIMITS					45		169				80		300								
MONTHLY LIMITS					30	85	112				50	65	188								

COLIFORM / RECEIVING STREAM / DAILY LOG

Date	Coliform E.coli (CFU/100 ml)	Coliform Fecal (CFU/100 ml)	Coliform Total (CFU/100 ml)	Receiving Stream Ammonia	Dilution	Stream Flow (CFS)	Temperature (°F / °C)	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1									
2									
3		⊖							
4									
5									
6									
7									
8									
9									
10		⊖							
11									
12									
13									
14									
15									
16									
17		80							
18									
19									
20									
21									
22									
23									
24		30							Up Eff & Cl2
25									Up Cl2
26									
27									
28									
29									
30									
31									
TOTAL		110							
DAILY MINIMUM									
DAILY MAXIMUM									
WEEKLY AVERAGE MAX.									
MONTHLY AVERAGE		28							
DAILY LIMITS									
WEEKLY LIMITS		400							
MONTHLY LIMITS		200							

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
Phone Number: 503-861-0914
Month/Year: June 2001
DEQ Permit No.: 100847
DEQ File No./Facility ID: 93769
EPA Reference No.: OR-002087-7
Plant Type: Two Cell Lagoon
County: Clatsop
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

X Terry M. Ager
Authorized Signature
Date

Terry M. Ager
Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II
Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7315/II

INFLUENT / EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Influent Temperature °F/°C	Influent pH (S.U.)	Influent Flow (MGD)	Influent BOD Concentration (mg/L)	Influent BOD Loading (lbs.)	Influent CBOD (mg/L)	Influent TSS Concentration (mg/L)	Influent TSS Loading (lbs.)	Effluent Temperature °F/°C	Effluent pH (S.U.)	Effluent Flow (MGD)	Effluent DO (mg/L)	Effluent BOD Concentration (mg/L)	Effluent BOD Removal (%)	Effluent BOD Loading (lbs.)	Effluent CBOD Concentration (mg/L)	Effluent CBOD Removal (%)	Effluent CBOD Loading (lbs.)	Effluent TSS Concentration (mg/L)	Effluent TSS Removal (%)	Effluent TSS Loading (lbs.)
1		6.7	0.59							7.3	0.87										
2		6.9	0.63							7.5	0.86										
3		6.8	0.68							7.3	0.86										
4		6.8	0.65							7.4	0.85										
5		6.7	0.64	180	961		350	1868		7.4	0.52										
6		6.9	0.62	200	1034		350	1810		7.4	0.50										
7		6.8	0.65	170	907		300	1626		7.2	0.52		30	82.3	130				20	93	87
8		6.8	0.62							7.2	0.51										
9		7.0	0.60							7.4	0.50										
10		6.9	0.59							7.6	0.50										
11		6.9	0.59							7.4	0.50										
12		6.7	0.66	190	1046		300	1651		7.3	0.51										
13		6.8	0.62	280	1448		310	1603		7.1	0.51										
14		6.8	0.62	220	1138		300	1551		7.3	0.50		24	89	100				19	94	79
15		6.8	0.62							7.3	0.51										
16		6.8	0.61							7.4	0.50										
17		6.6	0.61							7.4	0.50										
18		6.7	0.61							7.3	0.50										
19		6.9	0.58	200	967		260	1258		7.4	0.50										
20		6.7	0.56	190	887		300	1401		7.4	0.27										
21		6.7	0.55	260	1193		310	1422		7.3	0.28		13	95	30				18	94	42
22		6.8	0.58							7.5	0.28										
23		6.7	0.60							7.3	0.29										
24		6.7	0.64							7.4	0.29										
25		6.6	0.61							7.4	0.28										
26		6.8	0.61	190	967		340	1730		7.6	0.29										
27		6.7	0.61	180	916		270	2252		7.5	0.28										
28		6.7	0.69	170	978		290	1669		7.5	0.30		8	9	20				20	93	50
29		6.6	0.59							7.3	0.29										
30		6.8	0.60							7.4	0.29										
31																					
TOTAL			17.84	2430	12442		3680	19841			14.16		75		280				77		258
DAILY MINIMUM			0.55	170	887		260	1401			0.27		8		20				18		42
DAILY MAXIMUM			0.69	280	1448		350	2252			0.87		30		130				20		87
WKLY. AVG. MAX.																					
MONTHLY AVG.			0.595	203	1037		307	1653			0.47		19	90	70				19	94	65
DAILY LIMITS																					
WEEKLY LIMITS													45		169				80		300

Date	Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	Coliform E.coli (CFU/100 ml)	Coliform Fecal (CFU/100 ml)	Coliform Total (CFU/100 ml)	Receiving Stream Ammonia	Dilution	Stream Flow (CFS)	Temperature °F/°C	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					9	0.7												
2					9	0.8												
3					9	0.7												
4					9	0.7												Drop Eff & Cl₂
5					6	0.6												
6					6	0.7												
7					6	0.6					300							
8					6	0.5												
9					6	0.6												
10					6	0.6												
11					6	0.7												
12					6	0.5												
13					7	0.5												
14					7	0.6					900							
15					7	0.5												
16					8	0.7												
17					8	0.6												
18					8	0.7												
19					8	0.8												Drop Eff
20					8	0.7												
21					8	0.5					4							
22					8	0.4												
23					10	0.7												Up Cl₂
24					10	0.6												
25					9	0.8												
26					10	0.6												
27					10	0.7												
28					10	0.5					11							Up Cl₂
29					11	0.7												
30					11	0.6												
31																		
TOTAL					242						[illegible]							
DAILY MINIMUM					6	.5					4							
DAILY MAXIMUM					11	.8					[illegible]							
WEEKLY AVERAGE MAX.																		
MONTHLY AVERAGE					8	0.5					34							
DAILY LIMITS																		
WEEKLY LIMITS											400							
MONTHLY LIMITS											[illegible]							

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
DEQ Permit No.: 100847
Plant Type: Two Cell Lagoon
Phone Number: 503-861-0914
DEQ File No./Facility ID: 93769
County: Clatsop
Month/Year: July-2001
EPA Reference No.: 012-002087-7
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — Date: 8-3-01

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II

Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7315/II

INFLUENT / EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Influent Temperature (°F/°C)	Influent pH (S.U.)	Influent Flow (MGD)	Influent BOD Concentration (mg/L)	Influent BOD Loading (lbs.)	Influent CBOD (mg/L)	Influent TSS Concentration (mg/L)	Influent TSS Loading (lbs.)	Effluent Temperature (°F/°C)	Effluent pH (S.U.)	Effluent Flow (MGD)	DO (mg/L)	BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)
1		6.8	0.60							7.4	0.30										
2		7.1	0.60							7.3	0.30										
3		6.9	0.58	190	919		330	1596		7.4	0.29										
4		6.7	0.58	200	967		290	1403		7.2	0.29										
5		6.7	0.58	190	919		290	1403		7.1	0.30		27	86	68				16	94	40
6		6.9	0.62							7.4	0.30										
7		6.6	0.62							7.5	0.50										
8		6.7	0.62							7.3	0.51										
9		6.7	0.62							7.6	0.50										
		6.9	0.62	230	1189		420	2172		7.6	0.51										
		6.8	0.57	180	856		310	1474		7.5	0.48										
12		6.7	0.63	140	736		350	1839		7.4	0.47		21	85	82				36	90	141
13		6.8	0.62							7.4	0.46										
14		6.8	0.62							7.3	0.46										
15		6.6	0.62							7.5	0.46										
16		6.9	0.62							7.4	0.46										
17		6.7	0.60	220	1101		340	1701		7.4	0.52										
18		6.7	0.60	240	1201		420	2102		7.3	0.45										
19		6.7	0.58	240	1161		350	1693		7.2	0.45		25	90	94				27	92	101
20		6.7	0.63							7.4	0.46										
21		6.9	0.62							7.5	0.45										
22		6.6	0.62							7.5	0.45										
23		6.7	0.62							7.4	0.46										
24		6.8	0.62	180	931		380	1965		7.5	0.46										
25		6.6	0.59	250	1230		370	1821		7.3	0.45										
26		6.7	0.57	180	856		430	2044		7.4	0.45		21	88	79				24	94	90
27		6.5	0.61							7.5	0.46										
28		6.7	0.64							7.5	0.45										
29		6.9	0.69							7.3	0.46										
30		6.9	0.62							7.4	0.46										
31		6.6	0.63							7.5	0.46										
TOTAL			18.90	2440	12066		4280	21213			13.48		94		323				103		372
DAILY MINIMUM			0.57	140	736		290	1409			0.29		21		68				16		40
DAILY MAXIMUM			0.69	250	1230		430	2172			0.51		27		94				36		141
WKLY. AVG. MAX.																					
MONTHLY AVG.			0.61	203	1006		207	1768			0.43		24	87	81				26	93	93
DAILY LIMITS																					
WEEKLY LIMITS													45		169				80		300
MONTHLY LIMITS										6/9			30	85	112				50	65	188

Date	Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	Coliform E.coli (CFU/100 ml)	Coliform Fecal (CFU/100 ml)	Coliform Total (CFU/100 ml)	Receiving Stream Ammonia	Dilution	Stream Flow (CFS)	Temperature (°F/°C)	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					11	0.6												
2					10	0.7												
3					11	0.5												
4					11	0.5												
5					11	0.4					2							
6					11	0.5												Up Eff + Cl
7					16	0.6												
8					15	0.7												
9					16	0.7												
10					16	0.6												
11					16	0.7												
12					16	0.5					11							
13					15	0.7												
14					16	0.6												
15					16	0.6												
16					16	0.7												
17					16	0.6												
18					15	0.6												
19					16	0.7					13							
20					16	0.7												
21					16	0.8												
22					16	0.7												
23					16	0.8												
24					16	0.8												
25					15	0.7												
26					16	0.5					4							
27					15	0.5												
28					16	0.5												
29					16	0.6												
30					16	0.5												
31					16	0.5												
TOTAL					460						30							
DAILY MINIMUM					10	0.5					2							
DAILY MAXIMUM					16	0.8					13							
WEEKLY AVERAGE MAX.																		
MONTHLY AVERAGE					14.83	0.62					8							
DAILY LIMITS																		
WEEKLY LIMITS											400							
MONTHLY LIMITS											200							

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
DEQ Permit No.: 100847
t Type: Two Cell Lagoon
Phone Number: 503-861-0914
DEQ File No./Facility ID: 93769
County: Clatsop
Month/Year: August-01
EPA Reference No.: OR-002087-7
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M Ager — Authorized Signature — 9-8-01 Date

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II

Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7315/II

EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	INFLUENT Temperature °F/°C	pH S.U.	Flow MGD	BOD Concentration mg/L	BOD Loading lbs.	CBOD mg/L	TSS Concentration mg/L	TSS Loading lbs.	EFFLUENT Temperature °F/°C	pH S.U.	Flow MGD	DO mg/L	BOD Concentration mg/L	BOD Removal %	BOD Loading lbs.	CBOD Concentration mg/L	CBOD Removal %	CBOD Loading lbs.	TSS Concentration mg/L	TSS Removal %	TSS Loading lbs.
1		6.9	0.62	190	982		270	1396		7.2	0.47										
2		6.7	0.62	150	775		320	1655		7.2	0.46		12	92	46				22	93	84
3		6.7	0.64							7.5	0.94										
4		6.8	0.64							7.4	0.92										
5		6.6	0.64							7.3	0.90										
6		6.6	0.64							7.2	0.89										
7		6.4	0.71	230	1362		300	1776		7.4	0.45										
8		6.7	0.60	190	951		310	1551		7.5	0.41										
9		6.7	0.63	290	1524		370	1944		7.5	0.42		16	94	56				26	93	91
10		6.9	0.63							7.4	0.43										
11		6.8	0.64							7.5	0.43										
12		6.9	0.64							7.4	0.42										
13		6.9	0.64							7.4	0.43										
14		7.0	0.65	340	1843		470	2548		7.3	0.43										
15		6.7	0.59	270	1329		320	1575		7.5	0.41										
16		6.7	0.63	330	1734		360	1892		7.4	0.42		20	94	70				24	93	84
17		6.5	0.63							7.4	0.43										
18		6.8	0.63							7.5	0.43										
19		6.8	0.63							7.7	0.42										
20		6.7	0.63							7.4	0.43										
21		6.9	0.62	350	1810		590	3051		7.2	0.42										
22		6.6	0.80	210	1401		330	2202		7.2	0.47										
23		6.5	0.97	220	1780		290	2346		7.1	0.71		13	94	77				27	91	160
24		6.6	0.80							7.2	0.73										
25		6.8	0.81							7.3	0.75										
26		6.8	0.80							7.5	0.73										
27		6.6	0.80							7.4	0.75										
28		6.7	0.70	290	1693		450	2627		7.5	0.74										
29		6.5	0.70							7.3	0.46										
30		6.8	0.73							7.6	0.48										
31		6.6	0.64							7.4	0.44										
TOTAL			21.05	3060	17,184		4,380	24,563			17.22		61		249				99		419
DAILY MINIMUM			0.59	350	775		270	1,396		7.1	0.41		12		46				22		84
DAILY MAXIMUM			0.97	150	1,843		590	3,051		7.7	0.94		20		77				27		160
WKLY. AVG. MAX.																					
MONTHLY AVG.			0.679	255	1,432		365	2046			0.555		15	94	62				25	93	105
DAILY LIMITS																					
WEEKLY LIMITS													45		169				80		300
MONTHLY LIMITS										6/9			30	85	112				50	65	188

Date	NUTRIENTS Total Phosphorous (Grab) mg/L	Total Kjeldahl Nitrogen mg/L	Ammonia Nitrogen mg/L	Nitrate Nitrogen mg/L	DISINFECTION CHLORINE Used lbs.	Total Residual mg/L	UV Trans-mittance %	Turbidity N.T.U.	COLIFORM E.coli CFU/100 ml	Fecal CFU/100 ml	Total CFU/100 ml	RECEIVING STREAM Ammonia	Dilution	Stream Flow CFS	Temperature °F/°C	pH S.U.	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					16	0.6											
2					16	0.7				Ø							Up Eff. + Cl_2
3					22	0.5											
4					22	0.4											
5					21	0.5											
6					22	0.5											Drop Eff & Cl_2
7					16	0.8											
8					16	0.9											
9					16	0.9				Ø							Drop Cl_2
10					14	0.6											
11					14	0.7											
12					13	0.6											
13					14	0.6											
14					14	0.7											
15					14	0.6											
16					15	0.7				Ø							
17					14	0.6											
18					14	0.8											
19					13	0.6											Drop Cl_2
20					13	0.6											
21					13	0.7											
22					13	0.5											Up Cl_2
23					18	0.5				Ø							
24					18	0.4											
25					18	0.5											
26					17	0.4											
27					18	0.4											
28					18	0.6											Drop Cl_2
29					12	0.4											
30					12	0.5											
31					12	0.6											
TOTAL					488					Ø							
DAILY MINIMUM					12	0.4				Ø							
DAILY MAXIMUM					22	0.9				Ø							
WEEKLY AVERAGE MAX.																	
MONTHLY AVERAGE					15.74	0.65				Ø							
DAILY LIMITS																	
WEEKLY LIMITS										400							
MONTHLY LIMITS										200							

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name	Warrenton	Phone Number	503-861-0914	Month/Year	Sept. 01
DEQ Permit No.	100847	DEQ File No./Facility ID	93769	EPA Reference No.	OR-002087-7
Plant Type	Two Cell Lagoon	County	Clatsop	Population Served	4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry Ager — Authorized Signature — 10-5-0[illegible] Date

Terry Ager — Name (Print)

Operator Certification

Collection Sys. Class	II	Principal Operator Name (print)	Terry Ager	Certification No. & Grade	7159/II
Treatment Sys. Class	I	Principal Operator Name (print)	Terry Ager	Certification No. & Grade	7315/II

INFLUENT / EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Influent Temperature °F/°C	Influent pH (S.U.)	Influent Flow (MGD)	Influent BOD Concentration (mg/L)	Influent BOD Loading (lbs.)	Influent CBOD (mg/L)	Influent TSS Concentration (mg/L)	Influent TSS Loading (lbs.)	Effluent Temperature °F/°C	Effluent pH (S.U.)	Effluent Flow (MGD)	Effluent DO (mg/L)	Effluent BOD Concentration (mg/L)	Effluent BOD Removal (%)	Effluent BOD Loading (lbs.)	Effluent CBOD Concentration (mg/L)	Effluent CBOD Removal (%)	Effluent CBOD Loading (lbs.)	Effluent TSS Concentration (mg/L)	Effluent TSS Removal (%)	Effluent TSS Loading (lbs.)
1		6.6	0.68							7.3	0.47										
2		6.8	0.73							7.5	0.79										
3		6.7	0.76							7.5	0.78										
4		6.7	0.70	250	1460		450	2627		7.7	0.79										
5		6.7	0.64	210	1121		370	1975		7.4	0.47										
6		6.5	0.64	200	1068		290	1548		7.5	0.43		10	95	36				21	93	75
7		6.8	0.69							7.3	0.47										
8		6.6	0.65							7.6	0.43										
9		6.7	0.61							7.6	0.43										
10		6.7	0.62							7.7	0.42										
11		6.9	0.62	230	1189		360	1861		7.3	0.46										
12		6.5	0.62	170	879		250	1293		7.5	0.45										
13		6.6	0.60	300	1501		500	2502		7.4	0.50		9	97	38				25	95	104
14		6.6	0.65							7.4	0.47										
15		6.7	0.63							7.4	0.43										
16		6.7	0.61							7.5	0.43										
17		6.8	0.58							7.4	0.42										
18		6.6	0.56							7.4	0.42										
19		6.7	0.58							7.6	0.45										
20		6.5	0.58	270	1306		330	1596		7.3	0.43		18	93	65				21	94	75
21		6.8	0.52							7.4	0.42										
22		6.6	0.56							7.4	0.43										
23		6.6	0.57							7.3	0.44										
24		6.7	0.57							7.5	0.43										
25		6.6	0.58							7.4	0.44										
26		6.4	0.57							7.6	0.44										
27		6.5	0.52	260	1128		340	1475		7.3	0.42		13	95	46				23	93	81
28		6.7	0.58							7.5	0.46										
29		6.7	0.56							7.5	0.43										
30		6.9	0.55							7.5	0.43										
31																					
TOTAL			18.33	1890	9652		2890	14877			14.28		50		185				90		335
DAILY MINIMUM			0.52	170	879		250	1293			0.42		9		36				21		75
DAILY MAXIMUM			0.76	300	1501		500	2502			0.79		18		65				25		104
WKLY. AVG. MAX.																					
MONTHLY AVG.			0.61	236	1207		316	1860			0.47		13	95	46				23	94	84
DAILY LIMITS																					
WEEKLY LIMITS													45		169				80		300
MONTHLY LIMITS										[illegible]			30	85	[illegible]				[illegible]		[illegible]

Date	Nutrients Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Disinfection Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	Coliform E.coli (CFU/100 ml)	Coliform Fecal (CFU/100 ml)	Coliform Total (CFU/100 ml)	Receiving Stream Ammonia	Dilution	Stream Flow (CFS)	Temperature °F/°C	pH (S.U)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					12	0.7												Up Eff & Cl2
2					19	0.5												
3					20	0.4												
4					19	0.5												Drop Eff & Cl2
5					12	0.6												Drop Cl2
6					10	0.7					∅							
7					10	0.6												
8					10	0.7												
9					9	0.8												
10					10	0.6												
11					11	0.7												
12					10	0.7												
13					10	0.7					∅							
14					10	0.6												
15					10	0.8												
16					9	0.8												
17					10	0.7												
18					10	0.7												
19					10	0.6												
20					10	0.8					∅							
21					10	0.7												
22					9	0.7												
23					10	0.6												
24					10	0.8												
25					10	0.7												
26					10	0.7												
27					11	0.8					∅							
28					10	0.6												
29					10	0.7												
30					10	0.7												
31																		
TOTAL					331						0							TOTAL
DAILY MINIMUM					9	0.4					0							DAILY MINIMUM
DAILY MAXIMUM					20	0.8					0							DAILY MAXIMUM
WEEKLY AVERAGE MAX.																		WEEKLY AVERAGE MAX.
MONTHLY AVERAGE					11	0.6					∅							MONTHLY AVERAGE
DAILY LIMITS																		DAILY LIMITS
WEEKLY LIMITS											400							WEEKLY LIMITS

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton | Phone Number: 503-861-0914 | Month/Year: Oct. 2001
DEQ Permit No.: 100847 | DEQ File No./Facility ID: 93769 | EPA Reference No.: OR-002087-7
…t Type: Two Cell Lagoon | County: Clatsop | Population Served: 4000

Operator Certification

Collection Sys. Class: II | Principal Operator Name (print): Terry Ager | Certification No. & Grade: 7159/II
Treatment Sys. Class: I | Principal Operator Name (print): Terry Ager | Certification No. & Grade: 7315/II

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry Ager — Authorized Signature | 11-6-01 — Date

Terry Ager — Name (Print)

INFLUENT / EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Influent Temperature (°F/°C)	Influent pH (S.U.)	Influent Flow (MGD)	Influent BOD Concentration (mg/L)	Influent BOD Loading (lbs.)	Influent CBOD (mg/L)	Influent TSS Concentration (mg/L)	Influent TSS Loading (lbs.)	Effluent Temperature (°F/°C)	Effluent pH (S.U.)	Effluent Flow (MGD)	DO (mg/L)
1		6.8	0.55							7.4	0.42	
2		6.7	0.55							7.5	0.43	
3		6.9	0.53							7.3	0.44	
4		6.7	0.55	190	872		440	2018		7.2	0.43	
5		6.8	0.51							7.4	0.41	
6		6.8	0.54							7.4	0.40	
7		6.6	0.57							7.5	0.40	
8		6.6	0.58							7.3	0.39	
9		6.7	0.57							7.5	0.57	
		6.9	0.57							7.4	0.56	
		6.8	0.65	260	1409		440	2385		7.3	0.63	
		7.0	0.64							7.2	0.83	
13		6.8	0.63							7.4	0.82	
14		6.7	0.63							7.4	0.82	
15		6.9	0.63							7.4	0.82	
16		6.6	0.64							7.4	0.82	
17		6.7	0.63							7.5	0.80	
18		6.7	0.62	350	1810		470	2430		7.2	0.80	
19		6.6	0.56							7.3	0.75	
20		6.6	0.63							7.3	0.79	
21		6.8	0.67							7.6	0.78	
22		6.7	0.65							7.4	0.78	
23		6.9	0.73							7.4	0.75	
24		6.7	0.69							7.2	0.74	
25		6.6	0.72	330	1982		340	2836		7.1	0.74	
26		6.6	0.69							7.3	0.76	
27		6.9	0.70							7.3	0.75	
28		6.5	0.71							7.5	0.75	
29		6.7	0.70							7.4	0.75	
30		6.6	0.65							7.4	0.75	
31		6.5	0.77							7.2	0.75	
TOTAL			19.46	1,130	6,073		1,690	9,669			20.63	
DAILY MINIMUM			0.51	190	872		340	2018		7.1	0.39	
… MAXIMUM			0.77	350	1982		470	2836		7.6	0.83	
… AVG. MAX.												
…THLY AVG.			0.62	283	380		423	2417			0.66	
DAILY LIMITS												
WEEKLY LIMITS												
MONTHLY LIMITS										6/9		

Date	BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)	Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrate Nitrogen	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	E.coli (CFU/100 ml)	Fecal	Total	Ammonia	Dilution	Stream Flow (CFS)	Temperature	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.	Date
1														10	0.6													1
2														10	0.7													2
3														9	0.7													3
4	18	91	65				42	90	151					10	0.6					Ø								4
5														10	0.6													5
6														9	0.7													6
7														9	0.7													7
8														10	0.8												Up Eff & Cl2	8
9														12	0.5													9
														12	0.6													10
	8	97	42				18	96	95					12	0.6					Ø							Up Eff & Cl2	11
														14	0.5													12
13														14	0.7													13
14														13	0.5													14
15														14	0.5													15
16														14	0.6													16
17														14	0.7													17
18	11	97	73				22	95	147					15	0.7					Ø								18
19														14	0.6													19
20														14	0.8													20
21														14	0.5													21
22														13	0.6													22
23														14	0.6													23
24														14	0.7													24
25	15	95	125				16	95	99					15	0.7					Ø								25
26														14	0.6													26
27														14	0.7													27
28														14	0.7													28
29														14	0.7													29
30														13	0.6													30
31														14	0.6													31
TOTAL	52		365				98		492					392						[illegible]								
DAILY MINIMUM	8		42				16		95					9	0.5					[illegible]								
DAILY MAXIMUM	18		125				42		151					15	0.8					[illegible]								
WEEKLY AVERAGE MAX.																												
MONTHLY AVERAGE	13	95	76				25	94	123					12.6	0.65					[illegible]								
DAILY LIMITS																												
WEEKLY LIMITS	45		169				80		300											400								
MONTHLY LIMITS	30	85	112				50	65	188											200								

7/30/97

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name	Warrenton	Phone Number	503-861-0914	Month/Year	Nov. 2001
DEQ Permit No.	100847	DEQ File No./Facility ID	93769	EPA Reference No.	OR-002087-7
Type	Two Cell Lagoon	County	Clatsop	Population Served	4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — 12-3-01 Date

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class II	Principal Operator Name (print) Terry Ager	Certification No. & Grade	7159/II
Treatment Sys. Class I	Principal Operator Name (print) Terry Ager	Certification No. & Grade	7315/II

INFLUENT / EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Influent pH (S.U.)	Influent Flow (MGD)	Influent BOD Concentration (mg/L)	Influent BOD Loading (lbs.)	Influent CBOD (mg/L)	Influent TSS Concentration (mg/L)	Influent TSS Loading (lbs.)	Effluent pH (S.U.)	Effluent Flow (MGD)	Effluent DO (mg/L)	Effluent BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	Effluent TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	Fecal Coliform (CFU/100 ml)	Daily Log Regarding breakdowns, bypassing, odors, complaints, etc.	Date
1	6.7	0.73	250	1522		360	2192	7.3	0.72		7	97	42	13	96	78	14	0.7	Ø		1
2	6.8	0.71						7.4	0.70								14	0.8		Drop Cl2	2
3	6.5	0.70						7.4	0.69								12	0.5			3
4	6.7	0.71						7.4	0.64								12	0.6			4
5	6.8	0.72						7.2	0.65								11	0.5			5
6	6.8	0.71						7.5	0.67								12	0.5			6
7	6.9	0.71						7.3	0.66								12	0.6			7
8	6.7	0.69	190	1093		260	1496	7.3	0.63		11	94	58	19	93	100	12	0.7	Ø	Drop Cl2	8
9	6.7	0.66						7.2	0.60								10	0.7			9
	6.8	0.66						7.3	0.60								10	0.8			10
	6.6	0.67						7.2	0.60								10	0.6			11
12	6.7	0.68						7.4	0.60								9	0.7			12
13	6.7	0.69						7.3	0.61								10	0.7			13
14	6.7	1.27						7.2	0.72								10	0.6		Up Cl2	14
15	6.5	1.35	45	507		170	1914	7.3	0.83		9	80	62	11	94	76	16	0.9	Ø		15
16	6.8	1.12						7.3	0.89								16	0.9		Up Cl2	16
17	6.8	0.93						7.2	1.23								20	0.6			17
18	6.6	0.91						7.2	1.22								20	0.7			18
19	6.8	0.83						7.4	1.22								20	0.6		Drop Cl2	19
20	6.5	1.00						7.4	1.05								18	0.8			20
21	6.6	0.97	120	971		130	1052	7.3	0.98		4	97	33	10	92	82	18	0.8	Ø		21
22	6.7	1.23						7.5	1.11								18	0.6			22
23	6.7	1.38						7.4	1.17								17	0.6			23
24	6.6	0.92						7.4	1.18								18	0.7			24
25	6.5	0.88						7.2	1.14								18	0.5			25
26	6.7	0.83						7.3	1.16								18	0.7			26
27	6.6	0.88						7.4	1.10								18	0.5			27
28	6.4	1.12						7.4	1.08								18	0.6			28
29	6.4	1.23						7.2	1.24								19	0.5			29
30	6.7	1.05						7.3	1.22								18	0.7			30
31																					31
TOTAL		26.94	605	4093		920	6654		26.91		31		195	53		336	443		Ø	TOTAL	
DAILY MINIMUM		0.66	45	507		130	1052	7.2	0.60		4		33	10		76	9	0.5	Ø	DAILY MINIMUM	
DAILY MAXIMUM		1.35	250	1522		360	2192	7.5	1.24		11		62	19		100	20	[illegible]	Ø	DAILY MAXIMUM	
WKLY. AVG. MAX.																				WEEKLY AVERAGE MAX.	
MONTHLY AVG.		0.89	151	1023		230	1664		0.89		8	92	49	13	94	84	[illegible]	0.7	Ø	MONTHLY AVERAGE	
DAILY LIMITS																				DAILY LIMITS	
WEEKLY LIMITS											45		169	80		370			400	WEEKLY LIMITS	
MONTHLY LIMITS								6/9			30	85	112	50	65	188			200	MONTHLY LIMITS	

7/30/97

Discharge Monitoring Report - Oregon Department of Environmental Quality

Facility Name: Warrenton
DEQ Permit No.: MAO(WQM-NWR-01-24)
Plant Type: Two Cell Lagoon
Phone Number: 503-861-0914
DEQ File No./Facility ID: 93769
County: Clatsop
Month/Year: Dec-2001
EPA Reference No.: OR-002087-2
Population Served: 4000

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

x Terry M. Ager — Authorized Signature — Date: 1-8-02

Terry M. Ager — Name (Print)

Operator Certification

Collection Sys. Class: II — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7159/II
Treatment Sys. Class: I — Principal Operator Name (print): Terry Ager — Certification No. & Grade: 7315/II

INFLUENT

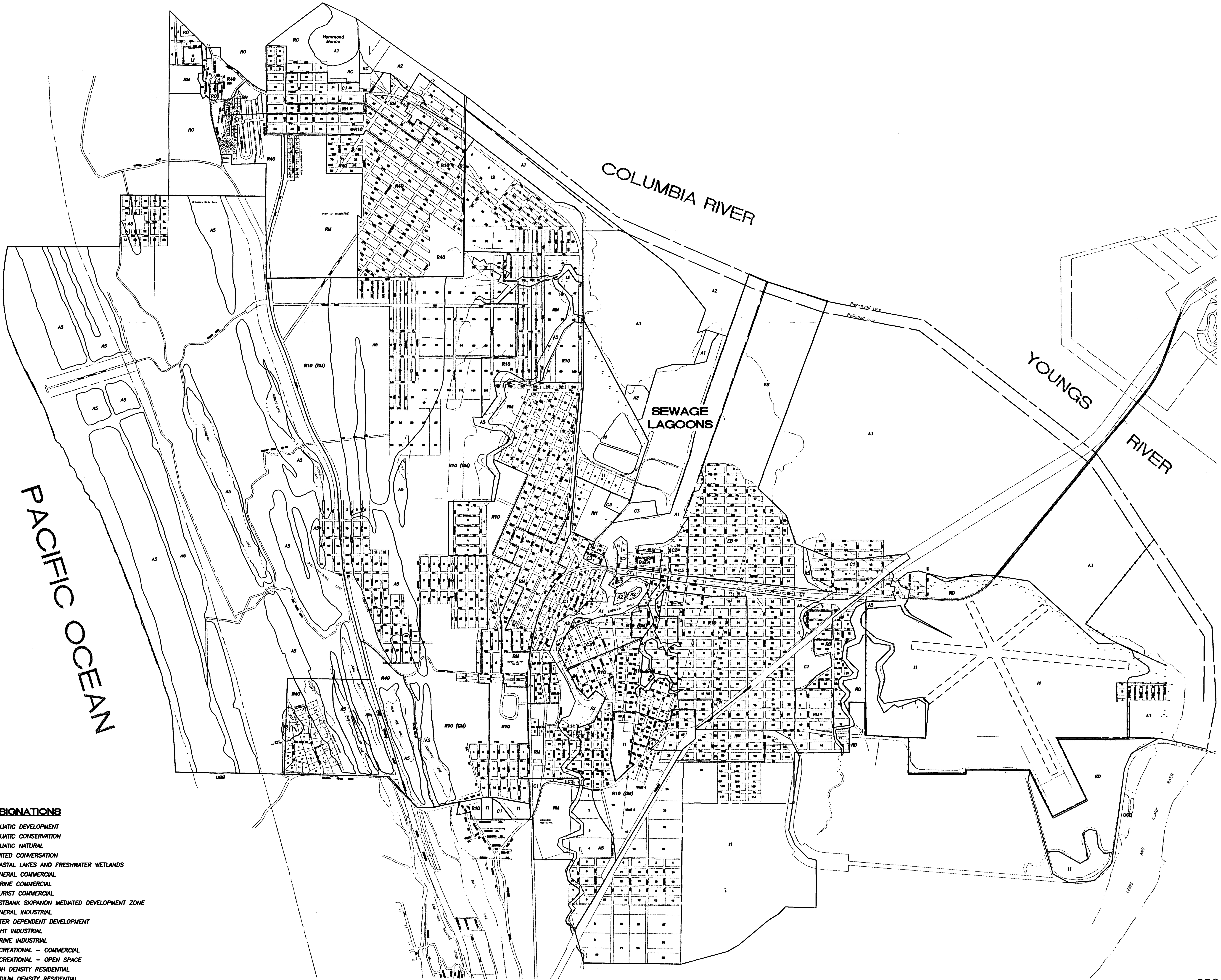
Date	Temperature (°F/°C)	pH (S.U.)	Flow (MGD)	BOD Concentration (mg/L)	BOD Loading (lbs.)	CBOD (mg/L)	TSS Concentration (mg/L)	TSS Loading (lbs.)
1		6.6	1.27					
2		6.7	1.21					
3		6.5	1.13					
4		6.9	1.02					
5		6.7	0.99					
6		6.7	0.90	200	1501		250	1877
7		6.6	0.94					
8		6.8	0.91					
9		6.8	0.89					
10		6.7	0.90					
11		6.4	1.28					
12		6.7	0.60					
13		6.7	1.14	160	1521		250	2377
14		6.5	1.40					
15		6.6	1.17					
16		6.7	0.94					
17		6.7	0.99					
18		6.6	1.19					
19		6.8	1.40					
20		6.6	1.13	120	1131		140	1319
21		6.6	0.99					
22		6.9	0.91					
23		6.7	0.83					
24		6.7	0.77					
25		6.7	0.80					
26		6.5	0.79					
27		6.8	0.63	600	3153		540	2837
28		6.7	0.91					
29		6.7	0.82					
30		6.6	0.73					
31		6.7	0.68					
TOTAL			30.86	1080	7603		1180	8410
DAILY MINIMUM			0.60	120	1131		140	1319
DAILY MAXIMUM			1.40	600	3153		540	2837
WKLY. AVG. MAX.								
MONTHLY AVG.			0.99	270	1827		295	2103
DAILY LIMITS								
WEEKLY LIMITS								
MONTHLY LIMITS								

EFFLUENT (identify outfall number -- e.g. 001, 002, 003):

Date	Temperature (°F/°C)	pH (S.U.)	Flow (MGD)	DO (mg/L)	BOD Concentration (mg/L)	BOD Removal (%)	BOD Loading (lbs.)	CBOD Concentration (mg/L)	CBOD Removal (%)	CBOD Loading (lbs.)	TSS Concentration (mg/L)	TSS Removal (%)	TSS Loading (lbs.)
1		7.4	1.20										
2		7.5	0.70										
3		7.5	0.72										
4		7.3	0.69										
5		7.7	0.74										
6		7.7	0.71		Ø	100	Ø				8	97	47
7		7.4	0.72										
8		7.2	0.90										
9		7.4	0.90										
10		7.3	0.89										
11		7.6	0.92										
12		7.4	0.91										
13		7.4	0.84		7	96	49				16	94	112
14		7.3	1.25										
15		7.2	1.20										
16		7.5	0.97										
17		7.4	0.99										
18		7.4	1.14										
19		7.2	1.73										
20		7.3	1.64		5	96	68				11	92	150
21		7.1	1.50										
22		7.2	1.42										
23		7.0	1.38										
24		7.3	1.32										
25		7.5	1.20										
26		7.4	1.07										
27		7.4	0.98		20	97	150				15	97	113
28		7.3	1.09										
29		7.4	0.61										
30		7.4	0.61										
31		7.2	0.60										
TOTAL			31.46		32		267				50		422
DAILY MINIMUM		7.0	0.60		Ø		Ø				8		47
DAILY MAXIMUM		7.7	1.73		20		150				16		150
WKLY. AVG. MAX.													
MONTHLY AVG.			1.01		8	97	67				13	95	106
DAILY LIMITS							938						938
WEEKLY LIMITS					100		704				120		704
MONTHLY LIMITS		6-9			75	70	469				75	65	469

NUTRIENTS / DISINFECTION / COLIFORM / RECEIVING STREAM / DAILY LOG

Date	Total Phosphorous (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Chlorine Used (lbs.)	Chlorine Total Residual (mg/L)	UV Trans-mittance (%)		Turbidity (N.T.U)	E.coli (CFU/100 ml)	Fecal (CFU/100 ml)	Total (CFU/100 ml)	Ammonia	Dilution	Stream Flow (CFS)	Temperature	pH (S.U.)	DAILY LOG Regarding breakdowns, bypassing, odors, complaints, etc.
1					18	0.8												Drop Eff & Cl2
2					10	0.7												
3					9	0.8												
4					9	0.6												
5					10	0.6												
6					9	0.7					Ø							
7					9	0.9												Up Eff & Cl2
8					10	0.6												
9					10	0.7												
10					10	0.5												
11					10	0.6												
12					10	0.6												
13					9	0.7					2							Up Eff & Cl2
14					14	0.5												
15					14	0.7												
16					12	0.6												
17					12	0.6												
18					14	0.8												Up Eff + Cl2
19					22	1.0												Up Eff + Cl2
20					20	0.7					Ø							Drop Eff + Cl2
21					20	0.8												
22					20	0.7												
23					20	0.8												
24					19	0.7												
25					14	0.4												Drop Eff & Cl2
26					9	0.8												[illegible] Cl2
27					9	0.8					90							
28					9	0.6												Drop Eff + Cl2
29					7	0.8												
30					6	0.8												
31					6	0.9												Drop Eff + Cl2
TOTAL					380						92							
DAILY MINIMUM					6	0.5					Ø							
DAILY MAXIMUM					22	1.0					90							
WEEKLY AVERAGE MAX.																		
MONTHLY AVERAGE					13.25	0.75					23							
DAILY LIMITS																		
WEEKLY LIMITS											400							
MONTHLY LIMITS											200							



ZONE DESIGNATIONS

A1	AQUATIC DEVELOPMENT
A2	AQUATIC CONSERVATION
A3	AQUATIC NATURAL
A4	LIMITED CONVERSATION
A5	COASTAL LAKES AND FRESHWATER WETLANDS
C1	GENERAL COMMERCIAL
C2	MARINE COMMERCIAL
C3	TOURIST COMMERCIAL
EB	EASTBANK SKIPANON MEDIATED DEVELOPMENT ZONE
I1	GENERAL INDUSTRIAL
I2	WATER DEPENDENT DEVELOPMENT
LI	LIGHT INDUSTRIAL
MI	MARINE INDUSTRIAL
RC	RECREATIONAL – COMMERCIAL
RO	RECREATIONAL – OPEN SPACE
RH	HIGH DENSITY RESIDENTIAL
RM	MEDIUM DENSITY RESIDENTIAL
R10	INTERMEDIATE DENSITY RESIDENTIAL
R10 (GM)	INTERMEDIATE DENSITY, GROWTH MANAGEMENT
R40	LOW DENSITY RESIDENTIAL
RD	RURAL DEVELOPMENT
SC	SHORELANDS CONSERVATION

N

SCALE:
1" = 1500'

GRAPHIC SCALE
2500 0 1250 2500 5000
1" = 1500"

CITY OF WARRENTON FACILITY PLAN

ZONE BOUNDARIES FIGURE 3.3

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INCORPORATED
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FAX: (503) 368-5847

CLATSOP COUNTY
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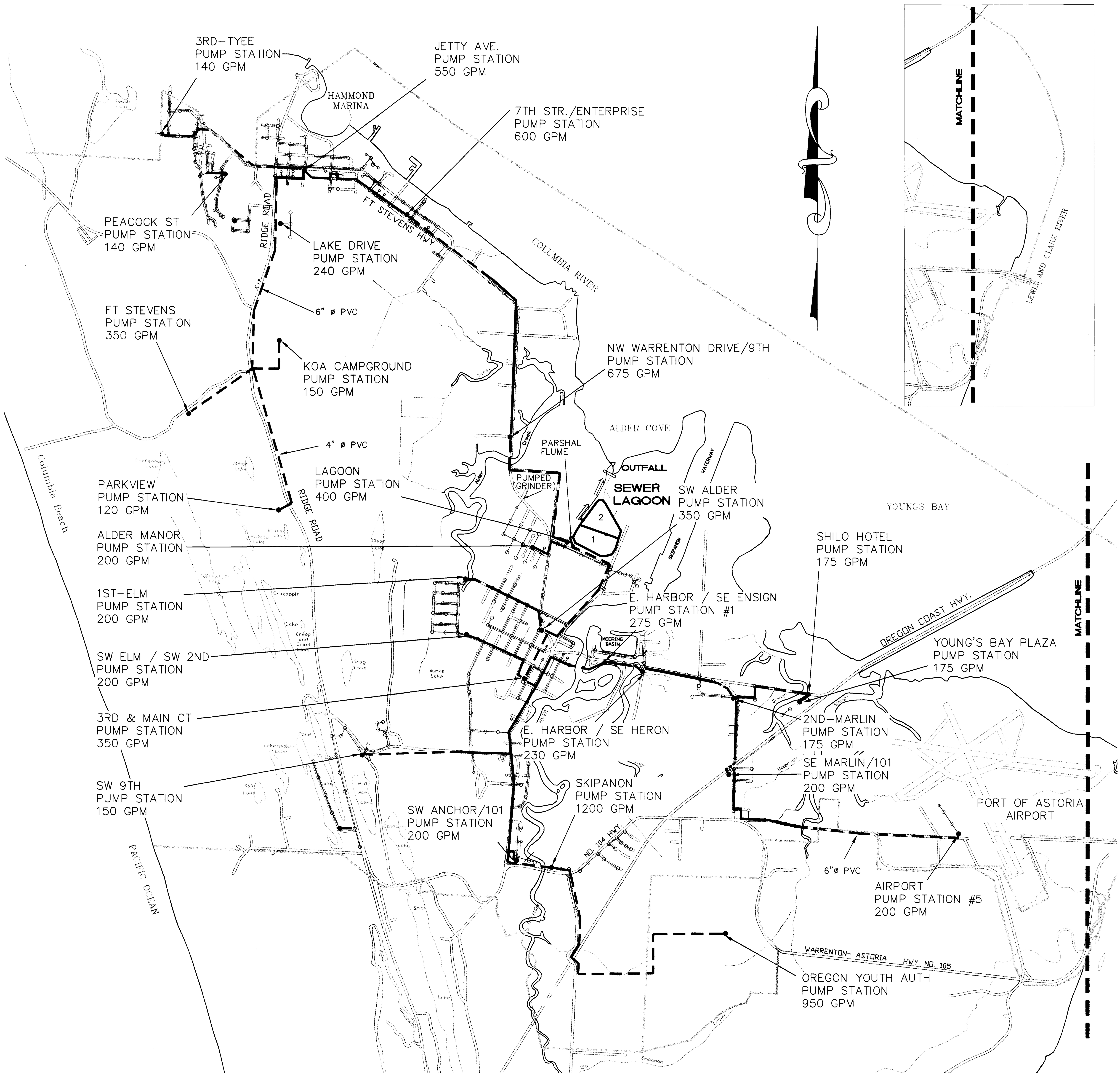
GEARHART, OR 97138
(503) 738-3425
FAX: (503) 738-7455

3487-7300-06-03.DWG



CITY OF WARRENTON
SANITARY SEWER NETWORK (EXISTING SYSTEM)

FIGURE 4.1

LEGEND

URBAN GROWTH
CITY LIMITS
FORCE MAIN
GRAVITY MAIN
PUMP STATION
GRAV. COLL. SYS.

NOTE: THE URBAN GROWTH BOUNDARY IS THE SAME AS THE CITY LIMITS, UNLESS OTHERWISE SHOWN.

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GRAPHIC SCALE
2000 0 1000 2000 4000
1"= 1250'

LIST OF SEWER LIFT STATIONS

CITY OF WARRENTON DESIGNATION	*OLD DESIGNATION - CITY OF WARRENTON*	*DESIGN GPM*
E. HARBOR / SE ENSIGN	EAST WARRENTON INTERCEPTOR P/S #1	275
E. HARBOR / SE HERON	EAST WARRENTON INTERCEPTOR P/S #2	230
2ND-MARLIN	EAST WARRENTON INTERCEPTOR P/S #3	175
SE MARLIN/101	EAST WARRENTON INTERCEPTOR P/S #4	200
AIRPORT	EAST WARRENTON INTERCEPTOR P/S #5	200
NW WARRENTON DRIVE / 9TH	HAMMOND "A"	675
7TH STREET/ENTERPRISE	HAMMOND "B"	600
JETTY AVE.	HAMMOND "C"	550
3RD / TYEE	HAMMOND "D"	140
FT. STEVENS	HAMMOND "E"	350
LAKE DRIVE	KRILL ST.	240
SW ANCHOR /101	L.I.D #1	200
SHILO HOTEL	–	175
KOA CAMPGROUND	–	150
1ST-ELM	NW ELM & NW 1ST STREET STATION	200
OREGON YOUTH AUTHORITY	OREGON YOUTH AUTHORITY, PUMP STATION "C"	950
3RD & MAIN CT.	ORIGINAL #1	350
SW ALDER	ORIGINAL #2	350
LAGOON	ORIGINAL #3	400
PARKVIEW	PARKVIEW APTS	120
SKIPANON	SKIPANON "A"	1200
YOUNGS BAY PLAZA	YOUNG'S BAY PLAZA	175
ALDER MANOR	–	200
SW ELM / SW 2ND	–	200
SW 9TH	–	150
PEACOCK ST.	–	140

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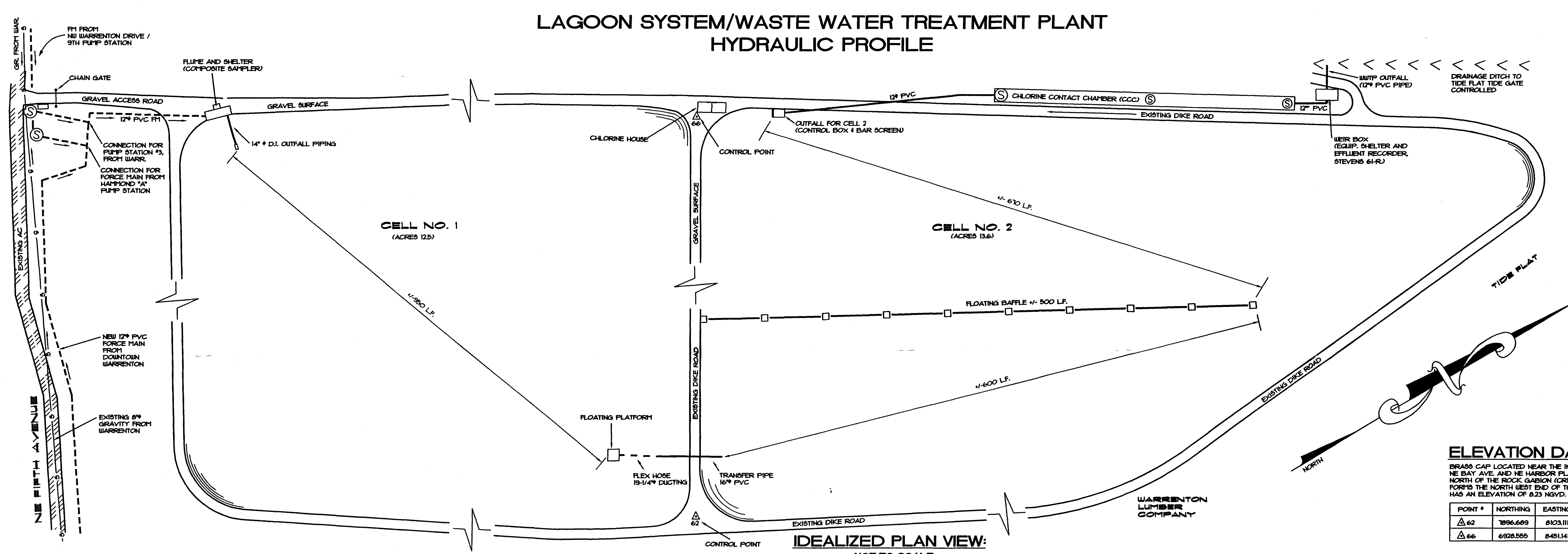
LAGOON SYSTEM/WASTE WATER TREATMENT PLANT
HYDRAULIC PROFILE



IDEALIZED PLAN VIEW:
NOT TO SCALE

ELEVATION DATUM:

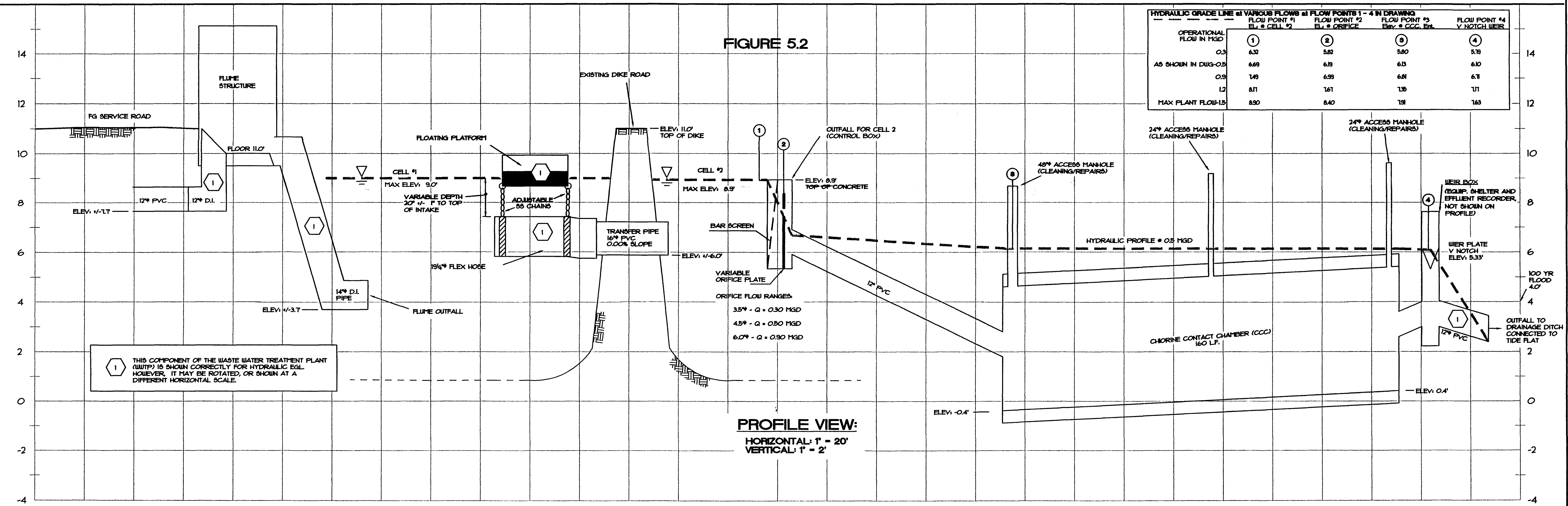
BRASS CAP LOCATED NEAR THE INTERSECTION OF NE BAY AVE. AND NE HARBOR PLACE, JUST NORTH OF THE ROCK GABION (CRIBBING) THAT FORMS THE NORTH WEST END OF THE BRIDGE AND HAS AN ELEVATION OF 8.23 NGVD.

POINT #	NORTHING	EASTING	ELEVATION
△62	7896.689	8103.111	11.11
△66	6928.555	8451.141	11.24

FIGURE 5.2

HYDRAULIC GRADE LINE at VARIOUS FLOWS at FLOW POINTS 1 - 4 IN DRAWING

OPERATIONAL FLOW IN MGD	FLOW POINT #1 EL: @ CELL #2 (1)	FLOW POINT #2 EL: @ ORIFICE (2)	FLOW POINT #3 Elev @ CCC. Ent. (3)	FLOW POINT #4 V NOTCH WEIR (4)
0.3	6.32	5.82	5.80	5.79
AS SHOWN IN DWG-0.5	6.69	6.19	6.13	6.10
0.9	7.49	6.99	6.81	6.71
1.2	8.11	7.61	7.35	7.11
MAX PLANT FLOW-1.5	8.90	8.40	7.91	7.63



PROFILE VIEW:
HORIZONTAL: 1" = 20'
VERTICAL: 1" = 2'

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3467-7300-03-01.DWG

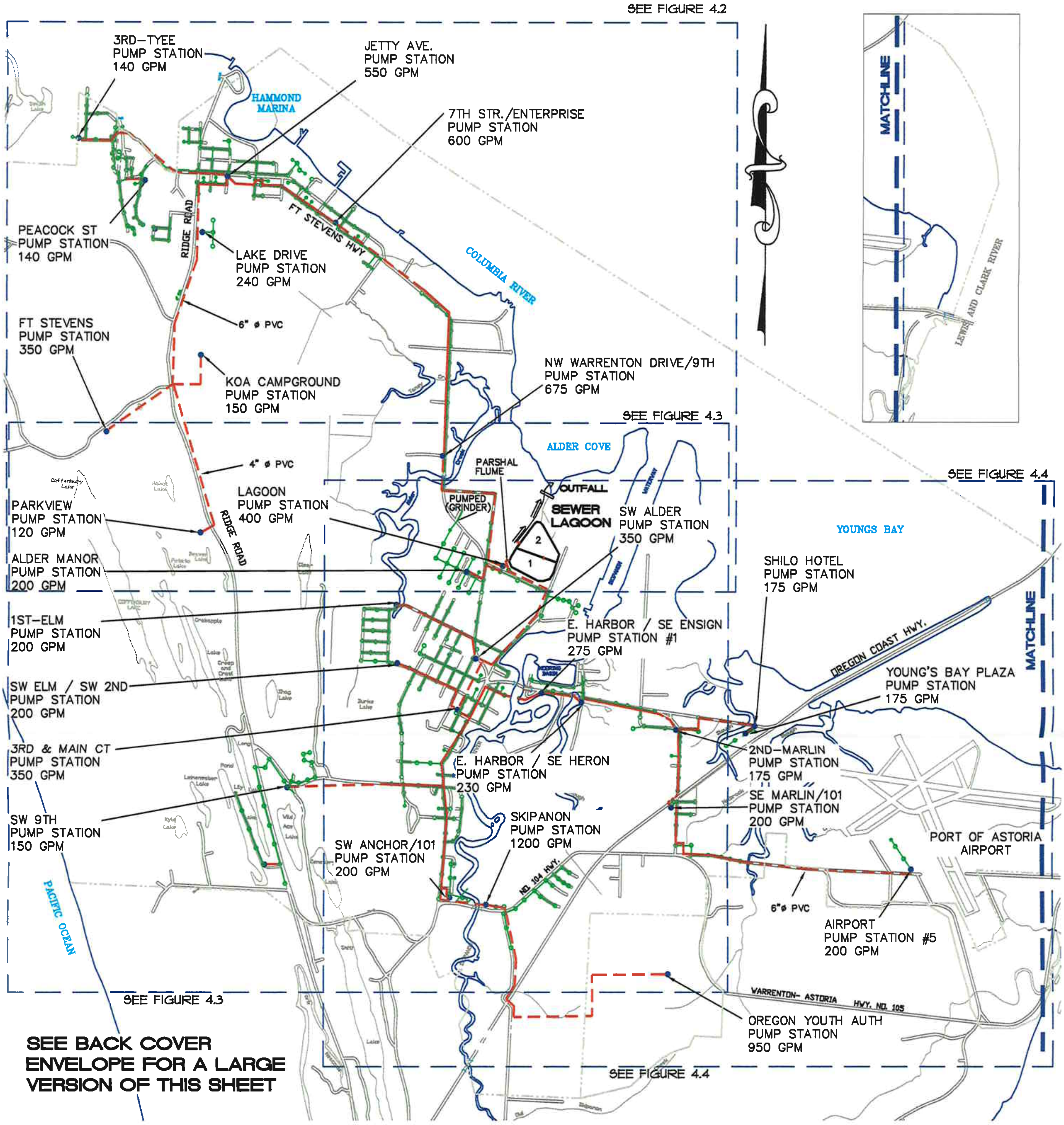
FIGURE 4.5

CITY OF WARRENTON FACILITY PLAN

APPENDIX – N

(Report Maps)

(See also maps in back pocket)



SEE BACK COVER ENVELOPE FOR A LARGE VERSION OF THIS SHEET

CITY OF WARRENTON

SANITARY SEWER NETWORK (EXISTING SYSTEM)

FIGURE 4.1

HLB & ASSOCIATES, INC., SEASIDE, OR.
DRAWING NAME: 3487-1300-06-02.DWG

LEGEND

URBAN GROWTH
CITY LIMITS
FORCE MAIN
GRAVITY MAIN
PUMP STATION
GRAV. COLL. SYS.

NOTE: THE URBAN GROWTH BOUNDARY IS THE SAME AS THE CITY LIMITS, UNLESS OTHERWISE SHOWN.

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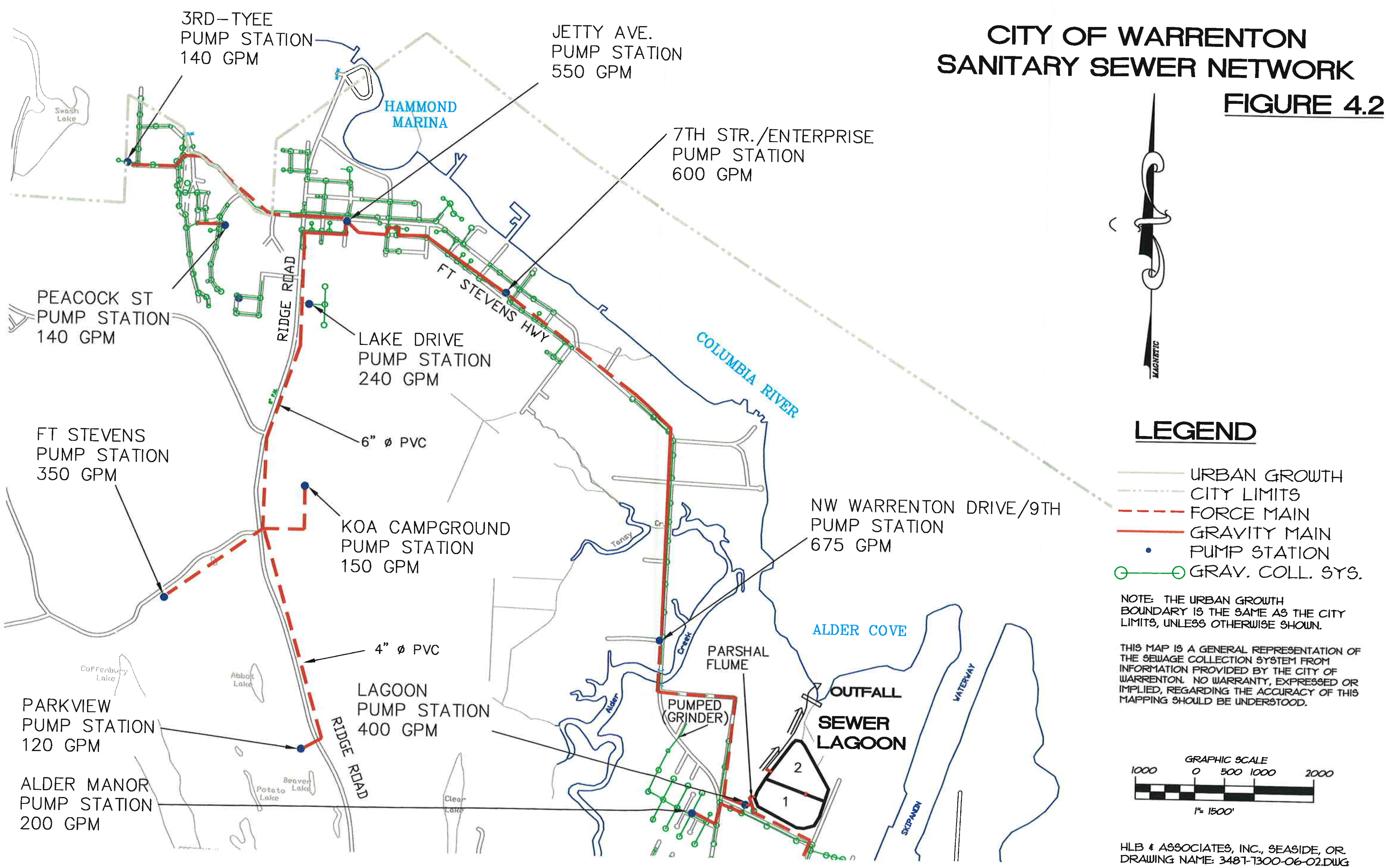
GRAPHIC SCALE
2000 0 1000 2000 4000
1"= 2500'

LIST OF SEWER LIFT STATIONS

CITY OF WARRENTON DESIGNATION	OLD DESIGNATION – CITY OF WARRENTON	DESIGN GPM
E. HARBOR / SE ENSIGN	EAST WARRENTON INTERCEPTOR P/S #1	275
E. HARBOR / SE HERON	EAST WARRENTON INTERCEPTOR P/S #2	230
2ND-MARLIN	EAST WARRENTON INTERCEPTOR P/S #3	175
SE MARLIN/101	EAST WARRENTON INTERCEPTOR P/S #4	200
AIRPORT	EAST WARRENTON INTERCEPTOR P/S #5	200
NW WARRENTON DRIVE / 9TH	HAMMOND "A"	675
7TH STREET/ENTERPRISE	HAMMOND "B"	600
JETTY AVE.	HAMMOND "C"	550
3RD / TYEE	HAMMOND "D"	140
FT. STEVENS	HAMMOND "E"	350
LAKE DRIVE	KRILL ST.	240
SW ANCHOR /101	L.I.D #1	200
SHILO HOTEL	–	175
KOA CAMPGROUND	–	150
1ST-ELM	NW ELM & NW 1ST STREET STATION	200
OREGON YOUTH AUTHORITY	OREGON YOUTH AUTHORITY, PUMP STATION "C"	950
3RD & MAIN CT.	ORIGINAL #1	350
SW ALDER	ORIGINAL #2	350
LAGOON	ORIGINAL #3	400
PARKVIEW	PARKVIEW APTS	120
SKIPANON	SKIPANON "A"	1200
YOUNGS BAY PLAZA	YOUNG'S BAY PLAZA	175
ALDER MANOR	–	200
SW ELM / SW 2ND	–	200
SW 9TH	–	150
PEACOCK ST.	–	140


CITY OF WARRENTON
SANITARY SEWER NETWORK
FIGURE 4.2
3RD-TYEE PUMP STATION 140 GPM
JETTY AVE. PUMP STATION 550 GPM
HAMMOND MARINA
7TH STR./ENTERPRISE PUMP STATION 600 GPM
PEACOCK ST PUMP STATION 140 GPM
RIDGE ROAD
LAKE DRIVE PUMP STATION 240 GPM
FT STEVENS HWY
COLUMBIA RIVER
6" ø PVC
FT STEVENS PUMP STATION 350 GPM
KOA CAMPGROUND PUMP STATION 150 GPM
NW WARRENTON DRIVE/9TH PUMP STATION 675 GPM
4" ø PVC
ALDER COVE
PARSHAL FLUME
LAGOON PUMP STATION 400 GPM
PARKVIEW PUMP STATION 120 GPM
PUMPED (GRINDER)
OUTFALL
SEWER LAGOON
ALDER MANOR PUMP STATION 200 GPM
LEGEND
URBAN GROWTH
CITY LIMITS
FORCE MAIN
GRAVITY MAIN
PUMP STATION
GRAV. COLL. SYS.
NOTE: THE URBAN GROWTH BOUNDARY IS THE SAME AS THE CITY LIMITS, UNLESS OTHERWISE SHOWN.
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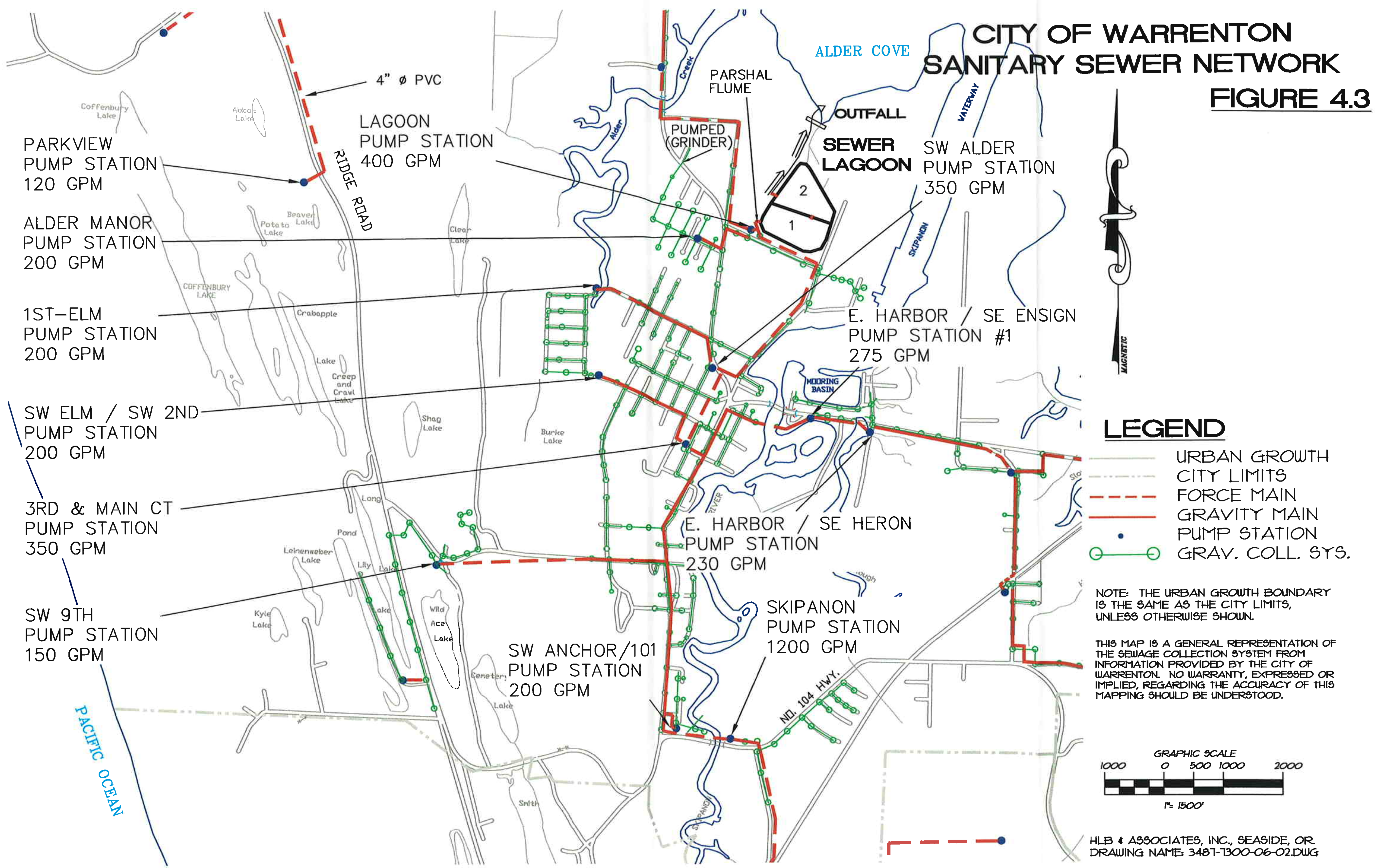
GRAPHIC SCALE
1000 0 500 1000 2000
1"= 1500'
HLB & ASSOCIATES, INC., SEASIDE, OR.
DRAWING NAME: 3487-7300-06-02.DWG



CITY OF WARRENTON
SANITARY SEWER NETWORK
FIGURE 4.3
ALDER COVE
PARSHAL FLUME
OUTFALL
SEWER LAGOON
PUMPED (GRINDER)
4" ø PVC
LAGOON PUMP STATION 400 GPM
PARKVIEW PUMP STATION 120 GPM
ALDER MANOR PUMP STATION 200 GPM
1ST-ELM PUMP STATION 200 GPM
SW ELM / SW 2ND PUMP STATION 200 GPM
3RD & MAIN CT PUMP STATION 350 GPM
SW 9TH PUMP STATION 150 GPM
SW ALDER PUMP STATION 350 GPM
E. HARBOR / SE ENSIGN PUMP STATION #1 275 GPM
E. HARBOR / SE HERON PUMP STATION 230 GPM
SKIPANON PUMP STATION 1200 GPM
SW ANCHOR/101 PUMP STATION 200 GPM
RIDGE ROAD
NO. 104 HWY.
PACIFIC OCEAN
MOORING BASIN
LEGEND
URBAN GROWTH
CITY LIMITS
FORCE MAIN
GRAVITY MAIN
PUMP STATION
GRAV. COLL. SYS.
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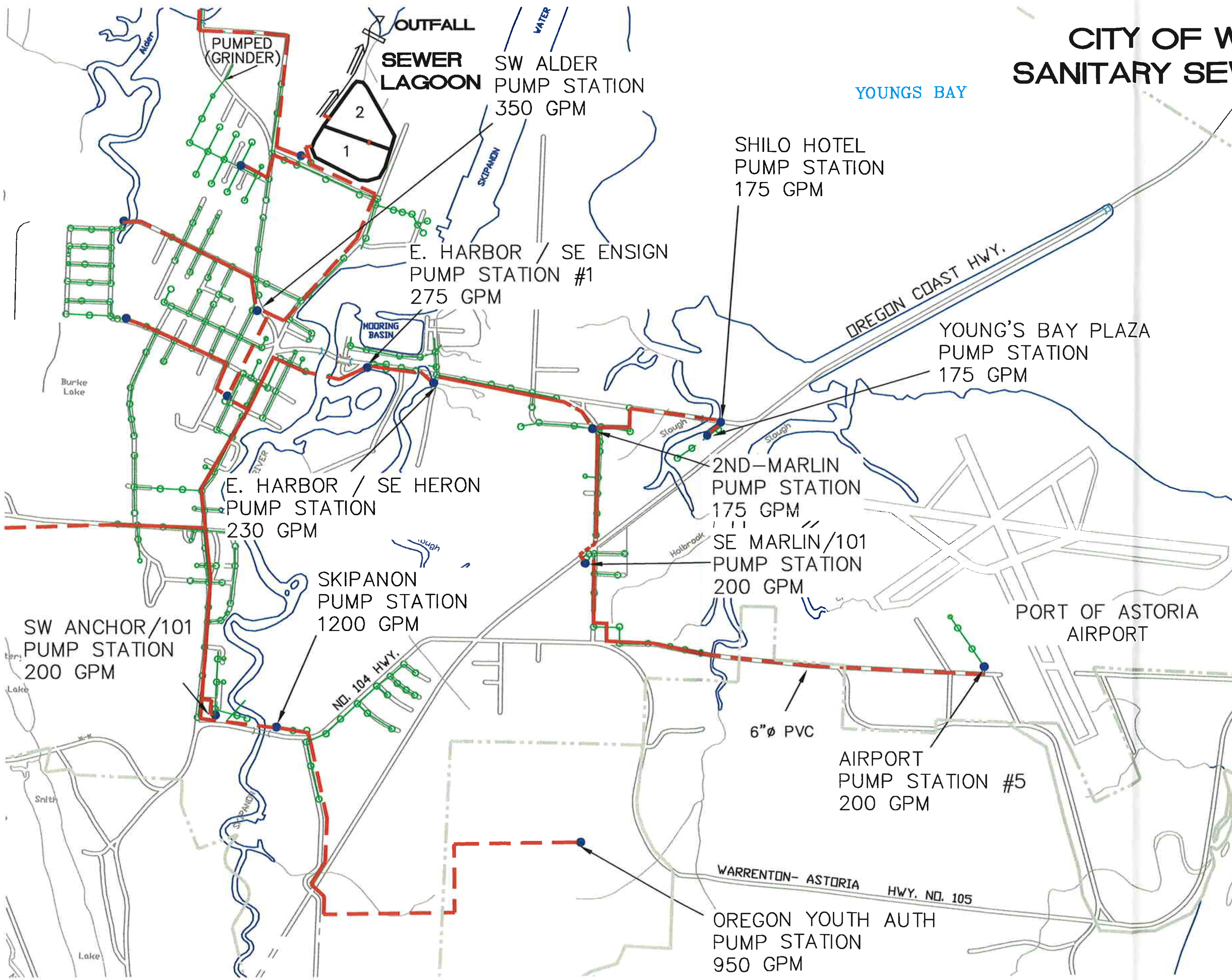
GRAPHIC SCALE
1000 0 500 1000 2000
1"= 1500'
HLB & ASSOCIATES, INC., SEASIDE, OR.
DRAWING NAME: 3487-7300-06-02.DWG

CITY OF WARRENTON SANITARY SEWER NETWORK

FIGURE 4.4



MAGNETIC

LEGEND

- URBAN GROWTH
- CITY LIMITS
- FORCE MAIN
- GRAVITY MAIN
- PUMP STATION
- GRAV. COLL. SYS.

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GRAPHIC SCALE

1000 0 500 1000 2000

1"= 1500'

HLB & ASSOCIATES, INC., SEASIDE, OR.
DRAWING NAME: 3487-7300-06-02.DWG