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STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

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

MEMORANDUM
April 29, 1981

To: John Glynn

From: Sharon Chase

Subject: Lynden Sewage Treatment Plant Class II Inspection

Introduction

On January 13 and 14, 1981 a Class II inspection was conducted at the Lynden Sewage Treatment Plant (STP). Additional samples were collected on January 25 and 26. A receiving water study, conducted from January 12 to 14, 1981 on the Nooksack River, will be discussed in a memorandum by Lynn Singleton and Joseph Joy.

Personnel involved in the inspection and receiving water study included Sharon Chase, Lynn Singleton, and Joseph Joy, all from the Department of Ecology (DOE) Water and Wastewater Monitoring Section. The plant operator, Terry Klimpel, was present during the Class II inspection.

The Lynden STP is a secondary treatment plant with two oxidation ditches, an ABF tower, two secondary clarifiers, and an aerated sludge holding tank (Figure 1). The plant flow is measured by a propeller meter just before the chlorine contact chamber.

The plant's effluent is discharged to the Nooksack River (waterway segment 01-01-04). The National Pollutant Discharge Elimination System (NPDES) waste discharge permit for this plant (number WA-002257-8(m)) places limits on effluent biochemical oxygen demand (BOD), total suspended solids (TSS), pH, fecal coliforms, and flow. DOE laboratory results indicate that the plant was not meeting its permit limitations for BOD. The plant also was in violation of the solid waste disposal section (section S5) of the permit.

Procedure

On January 13, 1981, compositors were placed at the influent and effluent. Grab samples were taken for field measurement of pH, temperature,

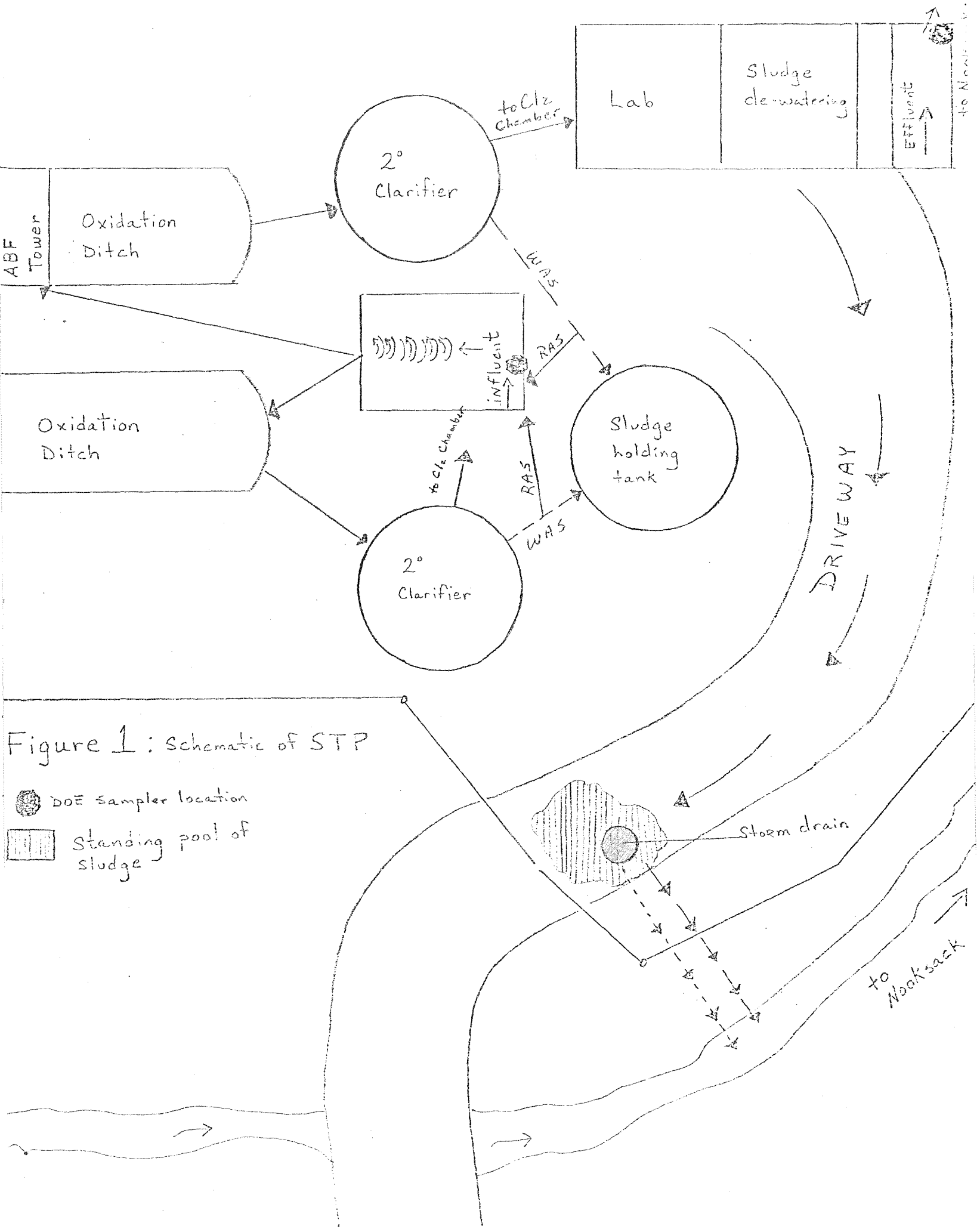

Figure 1: Schematic of STP

Table 1. Summary of Sample Collection Schedule, Locations, and Constituents Analyzed.

Composite Sampler*	Aliquot	Date and Time Installed		Location	Field Data Collected
Influent	230 ml/30 min.	1/13/81	1027	Influent channel below bar screen	pH, Temp., Cond.
Effluent	230 ml/30 min.	1/13/81	1049	Effluent channel at end of chlorine contact chamber	pH, Temp., Cond.
Grab Samples					
Fecal coliforms		1/13/81	1639	Chlorine contact chamber effluent	Chlorine residual
Fecal coliforms		1/14/81	0900	Chlorine contact chamber effluent	Chlorine residual

*Plant has in-place compositors. Samples were taken from the STP's composites on 1/14/81 and 1/26/81. See text for full explanation.

Table 2. Summary of Laboratory and Field Data from Samples Taken January 13, 1981 and January 14, 1981.

Constituent	DOE Samples				STP Samples				NPDES Eff. Limits (Monthly Average)
	DOE Analysis		STP Analysis		DOE Analysis		STP Analysis		
	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent	
Flow (MGD)	--			1.1					
BOD_5 (mg/l)	45	11	51	7	66	4	74	8	30
(lbs/day)	413	101	468	64	605	37	679	73	465
COD (mg/l)	110	63			190	59			
Fecal Coliform (col/100 ml)		10 est. 72 540,000*							200
Chlorine Residual (mg/l)		.9 1/ .8 2/ .7 1.0		.06					
Temperature (°C)	12.5 9.0	11.5 6.3							
Conductivity (umhos/cm)	600 640	850 840							
pH (S.U.)	7.9 7.8	7.9 7.9							6.0 - 9.0
Total Solids (mg/l)	440	480			430	480			
TNVS (mg/l)	270	370			260	380			
TSS (mg/l)	99	8			70	6	120	5	30
(lbs/day)	619	50			438	38	1101	46	700
TNVSS (mg/l)	9	1			6	1			
Turbidity (NTU)	28	5			34	3			
NO_3-N (mg/l)	1.6	3.2			1.4	3.1			
NO_2-N (mg/l)	.80	2.4			.80	2.2			
NH_3-N (mg/l)	16	15			19	15			
O-PO_4-P (mg/l)	13	13			13	13			
T-PO_4-P (mg/l)	15	21			16	22			

1/ Corresponds to first fecal sample taken January 13, 1981.

2/ Corresponds to second fecal sample taken January 14, 1981.

*Sludge Sample.

and conductivity. A continuous pH monitor also was set up at the influent on the 13th. Table 1 summarizes the sample collection schedule, locations, and constituents analyzed.

The laboratory procedural survey was conducted on January 14. A sample was taken for fecal coliform on the 14th. Chlorine residual was measured at several different times on the 13th and 14th.

The Lynden plant has in-line automatic sample compositors so a four-way sample split was possible. The plant's effluent compositor line draws a sample prior to chlorination while the DOE compositor was set up to draw a sample after chlorination. Unfortunately, the composite samples obtained on the 14th were not representative of normal plant operation because one oxidation ditch and secondary clarifier were being drained at the time of the inspection. This procedure resulted in an increase of approximately 500,000 gallons of flow. Because a Class II inspection is intended to determine if a plant is operating in compliance with its NPDES permit under normal conditions, we obtained additional samples from the STP's composite samplers on January 26. The influent and effluent samples from the 26th are used in this report to determine the plant's compliance or non-compliance with the permit. The data collected on the 13th and 14th are summarized in Table 2.

General Description of Plant Conditions

At the time of this inspection, the plant was finishing the process of cleaning up after a major upset. The operator reports that the plant experiences frequent upsets caused by extreme pH's from Darigold year-round and from vegetable and fruit processing in the summer. According to John Glynn of the DOE N.W. Regional Office, the dairy uses calcium hydroxide to clean lines at its evaporation operation. The system is supposed to be self-contained, but John explained that valves stick open occasionally, resulting in discharges of the caustic to the STP. The discharge monitoring report (DMR) showed pH's as high as 13 at the time of the December plant upset. The oxidation ditches' function was disrupted entirely and a considerable amount of solids was deposited in the chlorine contact chamber cells. The oxidation ditches were working by January 13, but the chlorine contact chambers had not yet been cleaned out. Some sludge was observed bulking in the contact chambers during the inspection.

The ordinary sludge dewatering/sludge disposal procedure results in a lot of sludge spillage at the plant. The problems with sludge disposal practices will be dealt with more fully in the compliance section.

At the influent structure, the comminutor was not working and had been broken for six months or more. The operator indicated that they did not intend to repair it. The influent passes through a bar screen which is cleared manually. The influent area is not kept very clean.

Laboratory Procedural Survey

For the most part, the operator seemed to know the proper testing methods and the split sample results were in reasonably close agreement (see Table 3). Recommendations for improvements were as follows:

pH

As extreme pH's often are a problem at Lynden, the accuracy of the pH meter is critical to accurate delineation of the problem and it should be calibrated at least daily against a 7 and a 10 buffer. The meter should be carefully maintained and the probe replaced whenever the meter is operating erratically.

BOD

1. Samples should be allowed to reach 20°C before the test is set up.

2. If the pH of the sample is outside the range of 6.5 to 8.5, the pH must be adjusted and the sample seeded. If samples with extreme pH's are run without adjustment and seeding artificially, low BOD's will be recorded. It is important for the plant to have accurate records especially under "upset" conditions.

3. The temperature of the incubator should be checked daily and the values recorded.

TSS

1. The lab should obtain and use one of the standard methods approved types of filter paper (Reeve Angel 934 A/H or Gelman A/E).

2. A minimum of 50 mls should be filtered for the TSS test.

3. If the filter clogs at partial filtration, the operator should begin again with a new filter. The operator might find that a Gelman or Millapore filtering apparatus works better for filtering larger volumes than the Gooch. The operator reported

Table 3. Analysis of STP Composite Samples taken January 25 and 26, 1981.

	DOE Laboratory			STP Laboratory			NPDES Effluent Limits (Monthly Average)
	Influent	Effluent	Percent Removal	Influent	Effluent	Percent Removal	
BOD_5 (mg/l)	300	36	88	234	17	93	30
(lbs/day)*	1926	231		1502	109		85%
TSS (mg/l)	230	23	90	162	8	96	30
(lbs/day)*	1477	148		1040	148		85%
pH (S.U.)	10.1	8.1	--	10.3	7.6	--	6.0-9.0
Flow (MGD)					.77		

*Lbs/day limitations vary. For the months December through April, limits are 465 lbs/day BOD and 700 lbs/day TSS.

Table 4. Summary of Laboratory Data for Samples Taken January 26, 1981.

	STP Samples				NPDES Permit Limits (Monthly Average)
	STP Analysis (January 26, 1981)		DOE Analysis (January 26, 1981)		
	Influent	Effluent	Influent	Effluent	
Flow (MGD)	.77				
BOD_5 (mg/l)	234	17	300	36	30
(lbs/day)	1502	109	1926	231	465
COD (mg/l)			490	89	
pH (S.U.)	10.3	7.6	10.1	8.1	6.0-9.0
Total Solids (mg/l)			800	570	
TNVS (mg/l)			380	380	
TSS (mg/l)	162	23	230	23	30
(lbs/day)	1040	148	1477	148	700
TNVSS (mg/l)			39	1	

placing the sample in the drying oven "for as long as it takes" when the filter clogged at partial filtration. This method measures total solids rather than total suspended solids.

Fecal Coliforms

1. The phosphate buffer used for the BOD test cannot be used for the fecal coliform test because it contains chemicals which interfere with the fecal test. There seemed to be some confusion on this issue. The operator initially said the same buffer was used for both tests and then said they used different buffers.

2. The operator reported running 100 mls of sample and getting zero colonies. However, the total residual chlorine (TCR) was substantially higher than the operator thought because the lab's amperometric titration equipment was not functioning properly. We do not encourage STP's to try to reduce fecal counts to zero because chlorine is a toxic chemical and the TCR should be kept as low as possible. We therefore recommend that the operator reduce the TCR to a more reasonable level while still keeping fecal counts within permit limits.

3. Once the operator has adjusted his chlorine levels, he will need to review procedures for choosing sample volumes and running dilutions.

4. A thermometer with .1 increments must be obtained for use in the fecal coliform incubation water bath. The temperature for fecal coliform incubation is critical and must be maintained at 44.5 plus or minus .2°. The Lynden laboratory is using a thermometer with 1-degree increments.

5. Greater care should be taken in calculating and reporting the fecal coliform counts. One individial at the plant was reporting the number of colonies per plate as the number/100 mls regardless of the sample volume. Laboratory personnel were unsure of the proper procedure for reporting counts if the plate counts did not fall within the ideal 20 to 60 range; therefore, we review them here:

   a. If all plate counts have fewer than 20 colonies, select the most nearly acceptable plate and calculate the number of colonies per 100 mls and report this value as an estimated count.

b. If all plate counts are above the upper limit of 60, calculate the count using the smallest filtration volume and a colony count of 60. The count is then reported as greater than the count thus determined.

c. If all plate counts are zero, calculate using a count of 1 from the largest filtration volume. Report as less than the calculated value.

As previously mentioned, the TRC was being measured inaccurately. It was unclear whether the error was due to a fault in the equipment or operator technique. If the operator wishes to test TRC by the amperometric titration method, he should review the techniques for that method and use another method of TRC measurement as a cross-check. We recommend a DPD kit for use as a cross-check against the titration method, or in place of it. The DPD kits are inexpensive, accurate, and simple to use.

Discussion of Permit Compliance and Recommendations

The permit violations at the Lynden STP fall into three categories: effluent limitations (section S2); laboratory procedures (section S3); and solid waste disposal (section S5).

The problems in laboratory procedures were discussed in the laboratory procedural survey section of this report. Following proper lab procedure is an important element in permit compliance. Correct procedures are especially important at Lynden because of the difficulties they have been experiencing with upsets. Reliable data on plant performance are essential to finding solutions to the plant's problems. The recommendations in the laboratory procedural section of this report should be acted on, especially those relating to the accuracy of pH measurements.

According to our results from the samples taken on the 26th of January, the plant was in violation of its effluent limitation for BOD. Data from samples taken on the 26th are summarized in Table 4. This violation probably was not the result of the December upset as the samples were taken a month after that upset occurred.

The script chart from the continuous pH monitor we left at the plant showed two days of pH's in excess of 12. The pH meter tends to drift upward but we can say with confidence that pH's exceeded 10. These data support the operator reports on the pH problem at the Lynden plant. We did not independently confirm the source of these high pH's as the regional office has identified the source. We recommend that this problem be dealt with by pH monitoring and adjustment at the source. It is a problem that should be addressed immediately. Upsets that completely disrupt the plant's function cannot be allowed to continue on a monthly or bi-monthly basis. Some effects of the late December upset were still visable during the second week in January. It is safe to assume that during an upset of this severity, a considerable amount of solids and BOD is discharged to the Nooksack River.

Memo to John Glynn
Lynden STP Class II Inspection
April 29, 1981

The third area of non-compliance at the Lynden plant was their solid waste disposal practices (section S5). The permit states that "The permittee shall handle and dispose of all solid waste material in such a way as to prevent their entry into state ground or surface water." (emphasis added)

The plant's disposal practices are in clear violation of this permit requirement. Sludge that spills from the truck and the conveyor belt as well as sludge washed off the sludge dewatering machine is hosed down the plant's driveway where it forms a large pool. This pool was several inches deep and approximately 8 to 10 feet in diameter during our inspection. The pool covered a storm drain which, according to the operator, discharges directly into a flowing drainage ditch which empties into the Nooksack. This normal plant "clean-up" procedure, carried out at least once daily according to plant personnel, results in discharge of sludge to a state surface water. Some means must be found to contain this sludge and prevent it from entering the surface water via runoff or the storm drain. The sludge should be diked and pumped back into the system or the spillage problem itself remedied. It must be noted here that the plant is, in general, quite lax about sludge handling. The sludge truck used to transport sludge to the landfill was observed leaking sludge onto the streets of Lynden. The fecal coliform count of the sludge was 540,000 colonies/100 ml. Application of this sludge to the streets could present a health risk.

A third questionable practice at the Lynden STP is application of sludge to the fields around the plant. Sludge had recently been applied to fields between the plant and the river. As the whole area is in the flood plain and the plant often is completely surrounded by water in the winter months, application of sludge to these fields is a violation of section S5. I was not able to determine if sludge was regularly applied to the flood plain or not. The operator stated that it was never done during the winter which appeared to be a misrepresentation of the facts as both fresh sludge and fresh sludge truck tracks were observed on the flood plain fields.

The problems facing the Lynden STP are not intractable and should be dealt with promptly.

SC:cp

Attachments